



# Examining the impact of Digitalization on the Import Clearance Process at the Tema Port, Ghana

**Esther Addy\***

Department of Operations Management & Information Systems  
Wisconsin International University College, Ghana  
1190039@wiuc-ghana.edu.gh

**Eric Ansong**

Department of Operations Management & Information Systems  
Wisconsin International University College, Ghana  
eric.ansong@wiuc-ghana.edu.gh

**\*Corresponding author**

## Abstract:

Governments are using the possibilities of information and communication technology to provide better services to citizens by breaking down bureaucratic hurdles, reducing corruption, and providing employees with the necessary technological tools to improve their performance. The paperless port system is one such invention. The purpose of this study was to examine the impact of digitisation on the import clearance system at Tema Port as well as identify the factors that drive digitalisation with particular reference to UNIPASS/ICUM. The study was guided by the quantitative research approach. Purposive sampling was utilised to acquire data from 150 employees using questionnaires based on the study's objectives. The data was analyzed using multiple regression analysis technique. It was discovered that using UNIPASS improved document processing at the Tema port, saved time, and reduced human participation. In relation to the factors that drive digitalization, it was discovered that formal and informal connection structures had a substantial negative influence on the adoption of the UNIPASS system to the port, whereas technological support infrastructure had a considerable positive relationship with the adoption of the system. As a result, the study recommends that an upgrade in technological support infrastructure at the Tema port will improve the UNIPASS system and optimise its benefits. The study's originality lies in it being one of the novel studies to examine the issue of digitalization at the Port of Tema with specific focus on the UNIPASS System.

## Keywords:

Digitalization; Import Clearance process; Paperless Port system; Ghana.

**Reference to this paper should be made as follows:** Addy, E. & Ansong, E. (2024). Examining the impact of Digitalization on the Import Clearance Process at the Tema Port, Ghana. *Wisconsin Journal of Arts and Sciences*, 6(2), 61 – 82



## 1. Introduction

International trade has expanded significantly over the past century and remains a cornerstone of the global economy, according to the United Nations Conference on Trade and Development (UNCTAD) (Djanitey, 2018). This growth in trade volumes is largely attributed to industrialization, trade barrier reduction, and digitalization. Most developing nations, thus, have digitalized government-to-citizen or government-to-business operations that benefits processing, customs clearance, or the issue of licenses and passports (World Bank Group, 2016; Bhatnagar, 2014). Digitalization helps to shift the paper-based reporting system in ports into an electronic format, which helps to speed up trade while also lowering costs, which is especially beneficial in West Africa, which has landlocked countries. In terms of seaports, digitalization provide advantages such as faster information interchange, reduced document processing time, less errors, lower document transfer costs, and increased information accuracy (Carlan et al., 2017).

Tema, Ghana's port, is a major West African port and a gateway to the landlocked countries of Mali, Burkina Faso, and Niger (Aryee et al., 2021). The port anticipates that with the introduction of a brand-new container terminal in the month of June 2019, it will be able to firmly establish itself as the port of call of choice for large boats bound for West Africa. Following a global trend toward the digitalization of port operations and trade facilitation, the port is at the centre of public debate regarding the implementation of new digital platforms that will transform the port authority's, government agencies', and other stakeholders' modes of operation. This trend follows a global movement toward the digitalization of port operations and trade facilitation. The office of the Vice President of Ghana made an announcement in September 2017 that the government of Ghana would be implementing a paperless port system in order to combat corruption. However, the vice president's office failed to mention that plans and programmes to digitalize import clearance had been ongoing since 1998. The public's curiosity has been sparked throughout the course of the past two decades by a checkered history of successes and failures in the application of digital technology. This is due to the high expectations placed on the digital transformation of customs clearing operations (Aryee et al., 2021).

People have been worried about how long it takes for products and cargoes to be cleared at the port, which has mostly been blamed on the use of paper-based methods (Osei-Owusu et al., 2020; Wu, et al., 2022; Addo & Avgerou, 2021). But with the arrival of new technology, like the paperless system at the Tema ports, many of these delays have been cut down or eliminated (Senyo et al., 2021). Eye on Port (2018) did a study in which stakeholders in the port industry said that one year after it was put into place, it had improved the process of clearing at the ports and helped clearing agents get the customs classification valuation report (CCVR) in 24 hours instead of 3 days under the old system.

Going paperless has assisted in the eradication of the majority of the problems that were initially associated with doing business at the ports of Ghana prior to 2003, including corruption, delays in the clearance of goods, leakages in government revenue, bureaucracy, and inefficient processes that were traditionally characterised by copious amounts of paperwork (Agbozo, 2017; Agyemang, 2016). While this success was achieved only few years after its introduction, researchers have not examined the current situation to determine whether those benefits or merits are still applicable. Instead, the focus of research has shifted to how stakeholder interests influence decisions and outcomes in the introduction of digital platforms at the port (Aryee et al., 2021), as well as on the impact of these technologies on the port's employees (Amegboe, 2019). There is therefore an issue gap in this field, addressing this issue gap is crucial as it helps to identify the knowledge gaps that need to be addressed to advance the field. By identifying this gap in existing knowledge. This research article is to investigate the impact of digitization on the import clearance procedure at Tema Port, focusing on the Tema Port's paperless project.

The study was guided by the following objectives:

1. To investigate the benefits that are associated with the paperless port system in Ghana.



2. To investigate the factors that have an impact on the digitalization process, with a particular focus on UNIPASS/ICUM.

This research goes beyond most current studies on port paperless systems, which often solely look at the GCNet or UNIPASS/ICUMS systems. This study addresses the point of dispute between freight forwarders and clearing agents on the efficacy of the two methods in determining which one allows for faster clearance processes. The study was also undertaken to describe the benefits of Ghana's port paperless system. The port paperless system has aided in the ease of conducting business at Ghana's ports, as well as in removing some of the obstacles associated with several port improvements in Ghana. As a result, this study was conducted to assess the current condition after five years of going paperless, and it also inspired many people in the port and harbour fraternity to use Ghana ports. There is little question that the findings will assist the Ghanaian government in addressing existing concerns regarding its use and in streamlining policies to assure its continued use.

## 2. Background and related literature

### 2.1 A Brief Overview of the Development of Ports and Customs Procedures in Ghana

Ghana's seaports began to grow long before the 15th century. Trade brought the country into contact with the rest of the world and made it possible for ships and boats to arrive at different spots along the coast. Many forts and castles can be found in coastal towns as proof of this (Oduro, 1999). But Accra didn't start being used as a port until the early 1600s, when a breakwater was built there (Ghana Ports and Harbours Authority, 1991).

#### *Historical Development of Takoradi Port*

A lighter age harbour was built along Sekondi's west shore in 1911, and it was finished in 1914 (GPHA, 1991). Ships calling at this port were anchored offshore, with lighters and surfboats transporting their cargoes (GPHA, 1991). Due to the severe surf that resulted in the loss of life and goods, as well as the general slow rate of operations, this port quickly became inappropriate and unable to handle the century's rapidly rising trade. The necessity for a deep seaport at Takoradi, some 4.5 kilometres west of Sekondi, was obvious. Governor Sir Gordon Guggisberg devised and carried out the plan (Oduro, 1999). The port's construction began in December 1919 and was completed in 1927. On April 3, 1928, the Honourable Sir J. H. Thomas, Secretary of State for the Colonies in the United Kingdom, officially opened the port (GPHA, 2002). Takoradi was chosen and recommended as a good site for a deep seaport following a hydrographic investigation done by the Gold Coast governor. After the port's completion, it handled approximately one million tonnes of both imports and exports cargoes per year. Since its inception in 1928, the Takoradi Port has witnessed significant infrastructure improvement (Ghana Ports and Harbours Authority, 2002).

#### *Historical Development of Tema Port*

The colonial authority commissioned Sir William Halcrow and partners from the United Kingdom to investigate a proposal to establish an aluminium business powered by a hydroelectric station on the Volta River basin in 1949. The decision of Tema was influenced by the necessity for a deep-water port in the country's east. The port's construction began in 1954, with the first cargo arriving in 1958. The port opened to regular trade in January 1962, with the ceremonial declaration issued on February 10th, 1962. (GHPA, 1991).

The Tema port is located on the Greenwich Meridian, 5.4 degrees north of the equator. It is roughly 30 kilometres east of Accra, Ghana's capital. The port covers an area of 3,904,754 m<sup>2</sup> and has a quay length of 2,196 m. The port has a coverage storage area of 53,270m and open storage of 97,200m. Reefers at the port have plug-in refrigerated containers. The port offers bunkering services as well as dry dock facilities (Owusu-Mensah, 2007). The Tema port handles approximately 80% of all imported products in Ghana. The principal commodities



handled by the ports include clinker, oil products, aluminium, automobiles, container freight, rice, wheat, and alumina (Gyebi-Donkor, 2006).

## 2.2 Digitalization in Custom Clearance in Ghana

The single window approach gained traction in customs clearance in the new millennium. It was defined by the World Customs Organization (WCO) as “a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single-entry point to fulfil all import, export, and transit-related regulatory requirements” (United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), 2005, p.7). Users might potentially save time, which is a primary indicator of efficiency, if the information is provided in an electronic format, as this would mean that individual data items would only need to be submitted once.

Countries reap higher benefits, as stated by the World Customs Organization (WCO), when they utilise information and communication technology (ICT) and dataset standards that are broadly accepted by important public and commercial partners (World Customs Organization (WCO), 2012). Blockchain technology is currently emerging as the next key technology to improve trade facilitation. One example of this is the TradeLens platform that Maersk has developed (Milne, 2018), and CargoX is a company that provides digital shipping documents.

Many ports have transitioned from manual to digital operations for the benefit of security and commercial facilitation, deploying powerful scanners to detect illegal products and fraudulent statements. Case studies provided by De Wulf & Sokol (2004) illustrate a widespread motivation for customs processes to be digitised. Turkey, The Philippines, Uganda, Mozambique, Morocco, and Peru have all digitised their customs processes as part of larger policy shifts. It was also necessary for Turkey to bring its customs legislation and administrative processes up to EU standards, in addition to the aforementioned adjustments. In 1998, Ghana began pursuing customs reform to complement a first trade reform aimed at enhancing the country's business climate. What these countries have in common is that politicians pushed for reforms that led to a drop in revenue, particularly at the customs office.

## 2.3 The Ghana national single window

To facilitate commerce between businesses in Ghana, the government has established the Ghana National Single Window (GNSW), an internet portal providing access to numerous business-related services. The Ghanaian government and the logistics industry can share information securely on this trade platform. As a result of this platform, data no longer needs to be entered repeatedly; instead, it can be electronically exchanged and reused, leading to quicker and more accurate findings and facilitating simpler compliance with standards set by the Ghanaian government (Aryee et al., 2021).

eTax Services, TradeNet Services and eRegistrar Services comprise the GNSW. Using TradeNet, the logistics industry may electronically share trade related paperwork with any party participating in the trade-related processes. Through eTax, taxpayers can apply for an I.D., update their information, file their taxes electronically, and pay any outstanding balances due. To import products into Ghana, one must first obtain a tax identification number. By using eRegistrar, investors can quickly and easily register their businesses and pay any related fees online. Any company planning to import products into Ghana must first register their business and obtain a unique automated tax identification number (Aryee et al., 2021).



In addition, the GNSW has an eMDA module that electronically connects shippers the Ghana Integrated Cargo Clearance System (GICCS) as well as with Ministries, Departments, and Agencies (MDAs). eMDA enables ministries, departments, and agencies to submit, process, approve, and distribute a wide range of trade related data online. GICCS, on the other hand, has modules for manifest filing and payment processing. Container transfer, cargo tracking, and delivery order submission are all components of the logistics module (Aryee et al., 2021).

#### *2.4 Stages of Digital Transformation in Tema Port*

##### *Gateway Project*

After reviewing Ghanaian trade reforms implemented in the 1990s, the World Bank and other interested parties concluded that they need the backing of changes in other sectors to fulfil their aims. This resulted in the development of a project known as the “Ghana Trade and Investment Gateway Project”. Ghana Immigration Service, Ghana Ports and Harbours Authority, Customs Excise and Preventive Service, Ghana Free Zones Board and Ghana Investment Promotion Centre were among the agencies targeted for transformation and improvement as part of the project. These organizations interact with businesses, trade and people coming into and going out of the country (De Wulf & Sokol, 2004).

##### *Global Communications Network (GCNet)*

A fundamental goal of Ghanaian policy is to position the country as the premier destination for international investment in West Africa. Due in large part to the efforts of the Gateway project, the Port Authority has been reclassified from a service port to a quasi-landlord port, allowing for increased private involvement in port operations and the launch of the Global Communications Network (GCNet).

The Ghana Revenue Authority's Customs Division owns 20%, the Ghana Shippers Council owns 10%, and two local banks own 5% each of the joint venture company GCNet (Asuliwonno, 2011). Both the TradeNet Electronic Data Interchange and the Ghana Customs Management System (GCMS) are systems that GCNet set up and manages on behalf of the Ministry of Trade and Industry (De Wulf & Sokol, 2004). GCNet is a single-window platform where all stakeholders, including government agencies and private service providers, may input and access data, and it was designed after Singapore's successful TradeNet. There was an increase in revenue collection from customs duties and a decrease in the time it took to process containers at the Tema port, as reported by De Wulf (2004), who also claims that businesses benefited from the automation, simplification, and enhancement of a number of customs and import processes.

The GCNet also made it possible to submit manifests more quickly and efficiently as well as to facilitate the transmission of data and supporting documentation to the appropriate port authorities in a timely manner via the Internet. Also conceivable was the redirection of consignments from transit via GC2Net, which prevent them from being illegally redirected to other markets where they would not be subject to the appropriate tax and charge reporting (Asuliwonno, 2011; Bainiah, 2008). The establishment of GCNet signalled the beginning of the digital revolution of Ghana's import clearance operations. The digitization of customs processes, on the other hand, was not without its drawbacks. According to De Wulf (2004), the project didn't get off the ground until 2002, when the government had settled down and given its blessing to the idea of automating customs operations. This was due to a combination of factors, including changes in legislation to accommodate automation in customs operations, changes in government around the time of incorporation and commitment issues on the part of the newly formed government and customs leadership. By integrating the systems of other government agencies involved in the approval process, GCNet's eMDA platform made the process more efficient. It was an early version of the now common single-window approach. Despite resistance from some of its owners, the company continued to expand the system and invest in its infrastructure. Since 2003, Ghana Communications Network





(GCNet) has been working with West Blue consultancy, now known as Customs World of Dubai, to facilitate trade via Ghana's ports. The government of Ghana has requested that GCNet cease operations at the ports of Ghana on June 30, 2020, even though its mandated contract is set to expire in 2023. This led to the development of a new system known as the UNIPASS/ICUMS (Integrated Customs Management System).

### *UNIPASS/ICUMS*

Ghana Link Network Limited was awarded a single window contract for \$40 million over ten years to facilitate paperless services at the port in March 2018. Proponents of the new UNIPASS system, which claims to have been modelled after the successful Customs UNI-PASS International Agency (CUPIA) in Korea, have made a number of claims about the system's effectiveness (Choo & Nam, 2016). UNIPASS stands out from the crowd since it offers a complete customs management solution. In the words of Ashley (2020), "the end-to-end customs system makes it difficult for anyone to tamper with figures". In other words, UNIPASS is a standalone upgraded comprehensive customs system that can operate in any context. According to Osei-Owusu et al. (2020), UNIPASS is divided into three sub-divisions that adhere to internationally acknowledged practices: business processing component, infrastructure components and support to the business processing component.

Time-based business frameworks, typically consisting of a single portal and non-conform business frameworks, are the focus of the system's business processing component. Intriguingly, this aspect of the system is also related to the actual customs frameworks, which portray the online connectivity activities inherent to the customs process. Cargo management, a clearance system, duty collection, audit inquiry, and surveillance are all functions of the business processing component.

As the name implies, support to the business processing components supporting the UNIPASS business processing component which is built on robust frameworks that speed up and simplify customs clearance. These frameworks are linked to the UNIPASS business processing component element and include, the Performance Management System (PMS), the Customs Data Warehouse (CDW), the Law Compliant System (LCS) and the Integrated Risk Management System (IRMS).

The third and final part of UNIPASS is the system's physical infrastructure, which includes the policies and procedures in place to regulate and monitor customs networks for optimal efficiency in data handling. Some of the frameworks related with the infrastructure component are IT governance and EWACS. Under the old system, various agencies oversaw valuation, classification, risk management, and payment, which led to financial losses for the government and extra time spent on holding up shipments at Ghana's ports. The UNIPASS system, according to Mante –Kodjo (2020), will guarantee a faster turnaround time. Furthermore, it will limit the ability to ship goods from one port to another for the sake of a certain operation and finally, it will ensure that commodities are cleared from the ports within 24 hours of arrival (Ghana Ports and Harbours Authority (GPHA), 2020). Ashley (2020) made a case for two advantages linked with the implementation of the UNIPASS system. First, it will increase trading activity within Ghana's borders and ports, close all loopholes connected with lost national revenue, and ensure that customs clearance is completed as quickly and efficiently possible. Second, because of UNIPASS / ICUMS, the Ghanaian economy will flourish and be seen as a viable trading partner on the international stage by organisations like the World Bank and the International Monetary Fund. The question today is, if UNIPASS/ICUMS will help to assure swift customs clearance at Ghana's ports and borders, why is there such a controversy and resistance? This research aims to address these and other issues.

### 2.5 Empirical Review

This portion analyses similar findings by other researchers in digitalization in the maritime industry. Osei-Owusu et al. (2020) conducted a study titled "Port Paperless System in Ghana, the Way Forward: GCNET or UNIPASS/ICUMS". The study attempted to dive into what the issues were regarding using the UNIPASS/



ICUMS and then propose remedies to avoid any repeat occurrences anytime a new system or programme for clearing cargo at Ghana's ports is introduced. The authors used the qualitative method of investigation to achieve this goal. According to the study, the UNIPASS/ICUMS experienced various issues, including a lack of training, a lack of piloting or simulation due to the hurried style with which the project was launched, and a high cost to the importer due to improper contracts and duplication of services. While the findings of this study are significant, they were undertaken between April and June 2020, when GCNet was asked to shut down and roughly simultaneously with the installation of UNIPASS/ICUMS, therefore most of the issues are considered as standard connected with the introduction of any new system or project. As a result, another investigation into its functioning is required to determine whether the challenges highlighted in this study still exist, which is what this current study tries to address.

Amegboe (2019) in his research investigates the impact of Tema Port's paperless technology on productivity. This study employed a quantitative research approach to show how the paperless port system has improved productivity at the Port of Tema. Purposive sampling was utilized to get data from 85 employees, with questionnaires being employed to collect information based on the study's objectives. According to the findings of the study, the IT infrastructure and staff training are the two most important elements influencing employee performance. In addition to knowing how the paperless port system works and being able to use a computer, it was discovered that none of the other two characteristics had an impact on staff performance. In addition, the research showed that the paperless port system faces difficulties in the following areas: stakeholders' understanding of paperless processing, network and internet issues, coordination between customs, banks and other stakeholders; the General Accounting Office, process integration; security concerns; support/training for staff and clients and complex procedures and document requirements. The challenges in this study were limited to just employee performance. Other challenges in service delivery and clearance process were left out and hence the need for the present study to fill the gap.

Domi's (2019) research evaluates the impact of information technology on guaranteeing the efficiency of Customs Division operations. The study is quantitative in nature, with a sample size of fifty (50) people picked at random. The study concludes that the state has seen an increase in revenue collection and an improvement in the clearing process due to the usage of ICT. According to the results of the study, the time it takes to clear products has decreased significantly due to the increased efficiency of document processing since the use of IT in the clearing process. Despite the positive effects of IT on Customs Service clearing processes, some challenges were identified, including regulatory agencies' reluctance to accept IT; officials' and agencies' reluctance to adopt new ways of doing things; problems with eradicating all forms of human intervention; a lack of sufficient infrastructure and a lack of staff training. The study concentrated on the Ghana Revenue Authority's customs division, necessitating the current investigation to determine the benefits and obstacles related with the implementation of the UNIPASS or ICUMS at the Tema Port.

## 2.6 Conceptual Framework and Hypotheses development

The Technology–Organization–Environment (TOE) Framework, developed by Tornatzky and Fleisher (1990), is a comprehensive and widely recognized model used to understand the factors influencing the adoption of technological innovations within organizations. This framework posits that, three primary contexts – technology, organization, and environment – play crucial roles in shaping the adoption and implementation of new technologies. By providing a structured approach to analysing how internal and external factors interact, the TOE Framework helps organizations identify the drivers and barriers to technological innovation. The technological context involves the existing technologies within the organization as well as the new technologies available in the market, including their perceived benefits, complexity, and compatibility (Baker, 2012). The organizational context refers to the internal characteristics of the organization, such as its size, structure, resources, and culture,

as well as its readiness to embrace new technologies and the level of support from top management (Lippert & Govindarajulu, 2006). Finally, the environmental context encompasses the external environment in which the organization operates, including industry characteristics, market structure, regulatory environment, and the competitive landscape (Oliveira & Martins, 2010). Each of these contexts encompasses a set of characteristics that can either facilitate or impede the adoption process.

The TOE Framework has been applied in numerous studies across various domains to understand the adoption of different technological innovations. For instance, Ansong and Boateng (2018) used the TOE Framework to investigate the factors influencing the adoption of telecommuting practices in a developing country, highlighting the relevance of technological, organizational, and environmental factors in shaping adoption decisions. Their study underscored the importance of considering a holistic view of these factors to develop effective strategies for technology adoption. Similarly, Thong (1999) utilized the TOE Framework to study the adoption of information systems in small businesses, demonstrating how organizational characteristics such as firm size and management support play a crucial role in technology adoption. Zhu, Kraemer, and Xu (2003) applied the framework to e-business adoption, showing the impact of environmental factors such as competitive pressure and regulatory support.

By conceptualizing the TOE Framework in this study, we aim to generate hypotheses on the determinants of Tema Port's digitalization. Understanding how these three contexts influence the adoption of digital technologies at Tema Port can provide valuable insights for developing effective strategies to enhance the port's digital transformation. This comprehensive approach not only helps in identifying potential challenges but also in leveraging the strengths of each context to facilitate a smoother adoption process. The holistic nature of the TOE Framework ensures that all critical aspects influencing technological adoption are considered, providing a robust foundation for strategic planning and implementation.

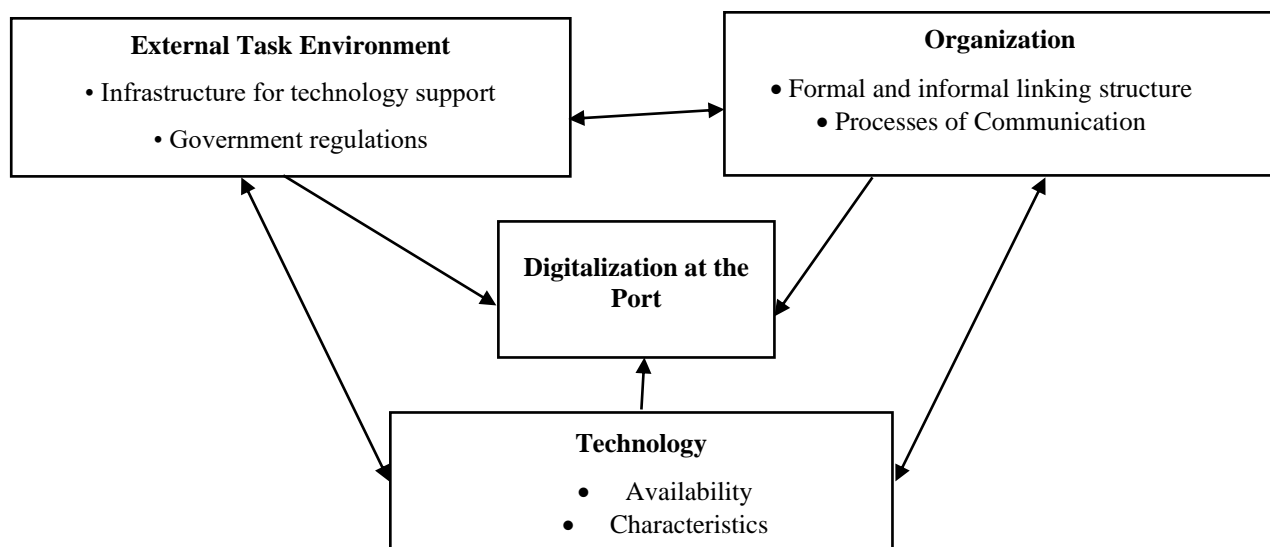


Figure 1: Conceptual framework of the Study

Source: Author's construction (2024)





### *The Technological Context*

All relevant technologies, including those in use internally and those accessible on the market but not yet implemented, are included in the technological context of a company. The company's current technology stack sets the limits on the types and rates of technological innovation that may be implemented, making it a crucial factor in the adoption process (Collins et al., 1988). Existing innovations that are not yet being used by the firm have an effect on innovation by establishing the boundaries of what is possible and by showing firms how technology can help them to evolve and adapt. In conclusion, before introducing an innovation, businesses need to carefully consider what kind of internal shifts will occur as a result. Innovations can have varying degrees of influence on a business and the industry in which it operates. As a result, the study hypothesizes that:

*H1: The availability of technology in a firm influences the adoption process of UNIPASS/ICUMS at the Tema port.*

### *The Organizational Context*

Structures of employee connections and internal means of communication are examples of elements that make up a company's organisational setting. There are a number of ways in which the context affects choices about adoption and execution. To begin, the importance of the company's structure to the innovation adoption procedure has been studied.

Adoption is associated with naturally occurring, decentralised structures (Burns & Stalker, 1962). Teams are highly valued, employees' responsibilities are flexible, and both vertical and horizontal channels of communication are fostered in these types of organisations. Organizational communication processes can either foster or inhibit innovation. Top-level management can help spur innovation by creating a culture that welcomes new ideas and rewards those that contribute to the company's mission and long-term vision (Tushman & Anderson, 1986). Top-level management's leadership behaviours and communication processes can help foster an innovative culture by outlining innovation's place in the company's overarching strategy, stressing its significance to lower-level employees, formally and informally rewarding innovation, highlighting the company's innovative past, and assembling a talented executive team that can paint an inspiring picture of the company's future. Thus, the study hypothesis that:

*H2: Formal and informal linking structures influence the adoption of the UNIPASS/ICUMS at the Tema Port.*

### *The Environmental Context*

The legislative climate, the organisational make-up of the relevant industries, and the presence or absence of relevant technical service providers all contribute to the overall environment. There are a number of ways to look at the structure of industries. To some extent, technological backbone affects creative activity. When it comes to customs networks, for instance, UNIPASS's infrastructure section deals with the processes set up to enable the smooth functioning and control of those networks, which in turn ensures the efficiency of information management. Finally, the impact of government regulation on innovation can be either good or harmful. For instance, the World Bank and other stakeholders' evaluation of Ghana's post-coup trade liberalisation efforts in the '90s sparked the creation of digital transformation in Tema. Thus, the study hypothesis that:

*H3: Technology support infrastructure influence the adoption of the UNIPASS/ICUMS at the Tema Port.*

In summary, these three factors - technological, organizational, and environmental settings – create “both constraints and opportunities for technological innovation” (Tornatzky & Fleischer, 1990, p.154).



### 3. Research Methodology

The study adopted a quantitative research design. A quantitative research design operates on inductive logic rather than deductive reasoning, and for that matter, is highly influenced by the quest for generalization, replicability, and numbers (Creswell & Creswell, 2005). Hence, it is suitable to be used in answering the objective of this study.

#### 3.1 Study population and area

The study's target population is all Tema Port employees who utilize the Paperless Port System, which is projected to be around 2500 people. This population has been chosen because the focus of the study is on the paperless port system hence, users of the system automatically form part of the population

#### 3.2 Sampling

The study utilized a purposive sampling technique to identify and select cases with a lot of information in order to make the most use of few resources” (Patton, 2016, p32). “This entails discovering and sifting through individuals or groups of persons who are particularly informed or experienced regarding a certain topic of interest” (Creswell, 2014). Concerning this study, the researcher was able to gather the necessary number of participants for essential data by making effective use of the constrained amount of time and resources that were available thanks to the implementation of this technique.

#### 3.3 Data collection instrument

Standardised questionnaires were used, the researchers were able to collect quantitative data for the study. The questions included both closed-ended responses. Questionnaire to the respondents were divided into five sections. The first section consists of questions targeted at collecting respondents profile data while sections two to five consist of specific questions seeking responses to the research questions. Responses consist of selection from a list or rating / scaling using five-point scales. The use of structured questionnaires to collect data from respondents is considered most convenient due to the need to get as many responses as possible while being cognizant to keep the time taken to fill it as short as possible (Leckelt, et al., 2018). The purpose of the questionnaire was to collect information about the impact that digitalization had on the import clearance process from the permanent staff working at the Tema port. Table 1 provides the breakdown of the constructs used to collect data.

Table 1: *Constructs used to collect data*

Constructs	Number of Items	Source (s)
Adoption of Information Technology	4	Osei-Owusu et al. (2020)
The availability of technology	4	Amegboe (2019)
Technology Support Infrastructure	4	Amegboe (2019)
Formal and Informal Linking Structures	3	Aryee et al. (2021)

Source: Author's construction (2024)

#### 3.4 Data Processing and Analysis

Questionnaire data were entered into an Excel spreadsheet after being coded (Microsoft office, 2019). Before importing it into STATA 15.0 for statistical analysis, the data was cleaned. Validity and reliability analyses were



performed using SPSS. Frequencies and percentages were used to describe the categorical variables, while means and standard deviations illustrated the continuous ones. The chi squared test of independence was used to compare the means of categorical independent variables and the outcome variable, whereas the t-test was used to compare the means of continuous independent variables. It is possible to evaluate the impact of each independent variable on the dependent variable by employing a multiple regression model. According to the recommendations of Saunders et al. (2012), all statistical analyses are performed at the 5% significant level.

### 3.5 Model Specification

The model for the study is illustrated as:

$$\text{Digitalization adoption} = \beta_0 + \beta_1E + \beta_2O + \beta_3T + e$$

E = Environment

O = Organisation

D = Digitalization adoption

T = Technology

$\beta_0$  = Constant

e = Error term

## 4. Analysis of results

### 4.1 Background of Respondents

This section presents the demographic details of the respondents. In this study, 56.67% of respondents/workers were females while 43.33% were males. Majority 57.33% of the workers fell between the ages of 31-35 and 57.33% were below 30 years. All the workers had tertiary education. Most of the workers 28.67% at the Tema port worked as ICT support officers and cashiers while 14.67% worked as clearing clerks, and logistics officers and managers, both recorded a percentage of 14% each. The majority of workers at Ghana Ports and Harbours Authority have worked for at least 2 to 5 years, representing 57.33%, 14% have worked for 5 to 10 years at the port, and those who have worked for less than 1 year were 28.67%. The background of the respondents is summarized in Table 2.

WJAS

Examining the impact of Digitalization on the Import Clearance Process at the Tema Port, Ghana

Table 2: Background of Respondents

Characteristics	Frequency	Percentage (%)
Gender: Female	85	56.67
Male	65	43.33
Age: 31-35	86	57.33
Below 30	64	64.67
Educational level: Tertiary	150	100.00
Role at the port: Clearing Clerk	22	14.67
ICT support officer	43	28.67
Logistics officer	21	14.0
Manager	21	14.0
Cashier	43	28.67
How long have you worked at the port: 2-5 years	86	57.33
5-10 years	21	14.0
Less than 1 year	43	28.67

**Source: Survey Data (2024)**

#### 4.2 Benefits of port process digitalization

The benefits linked with Ghana's paperless port system as the first objective of the study, the researcher examined the benefits that were linked with the paperless system at the Tema port. It was found that, the use of UNIPASS enhanced document processing at the Tema port. This was corroborated by 85.33% of the respondents while 14.67% had an opposing view that the UNIPASS did not enhance document processing at the port. Respondents were also asked how long it took them to clear a container prior to the introduction of UNIPASS, it was revealed by 43 28.67% that, they could clear a container within an hour, and others 28.67% indicated that it took the port 10 to 12 days. It was also found that 14.67% indicated that it took them 7 to 9 days while the remaining 28% indicated that, it took them 1 to 3 days.

However, with the introduction of UNIPASS, 42.67% of the respondents indicated that, it took them within an hour to clear a container, while 28.67% indicated that, it took them 1 to 3 days, 14% indicated it took them 4 to 6 days and the remaining 14.67% indicated it took them 7 to 9 days to clear a container.

**Table 3: The Benefits Linked with Ghana's Paperless Port System**

Characteristics	Frequency	Percentage (%)
The implementation of UNIPASS allowed for more efficient processing of documents at the port:		
No	22	14.67
Yes	128	85.33
When UNIPASS wasn't around, how long did it take to clear a container:		
Within an hour	43	28.67
1-3 days	42	28.0
7-9 days	22	14.67
10-12 days	43	28.67
Since UNIPASS came out, how long does it take to clear a container:		
Within an hour	64	42.67
1-3 days	43	28.67
4-6 days	21	14.0
7-9 days	22	14.67

**Source: Survey Data (2024)**

In order to ascertain how digitalization impact clearance process at Tema port, mean scores and standard deviation were used. Any mean score between 1.0 to 1.80 is deemed strongly disagree, 1.81 to 2.61 as disagree, 2.61 to 3.40 as neutral, 3.41 to 4.20 as agreed, and 4.21 to 5 as strongly agreed (Rooshdi et al., 2018). When asked if the UNIPASS system has made it easier to find information about exporters and importers, respondents were neutral. and also neutral with regards to whether the efficiency of customs clearance operations has increased, with a mean (M) and standard deviation (SD) of 3.12 and 1.47, and M = 3.13 and SD = 1.26, respectively.

Customs clearance operations have become more efficient. Respondents agreed that adopting the UNIPASS system has resulted in significant time savings and decreased need for human intervention. (M = 3.42 and SD = 0.91). As a result of the deployment of UNIPASS, respondents agreed that clearance procedures have been streamlined (M = 3.71 and SD = 0.70) and respondents also indicated that, with the advent of UNIPASS, Customs and all other parties engaged in the clearance of products can share vital information. (M = 3.55 and SD = 1.30).

Additionally, it was also found that, respondents remained neutral on if the state has been able to collect more money because of UNIPASS, (M = 2.85 and SD = 1.13); neutral on if the use of UNIPASS has made report preparation easier (M = 3.27 and SD = 1.29); neutral on if the use of UNIPASS has made it simpler to track down those responsible for criminal activities. (M = 3.28 and SD = 0.71) and also neutral on how easy it is to communicate with co-workers and customers (M = 3.27 and SD = 1.04). Respondents agreed that the introduction of UNIPASS has reduced congestion at the port (M = 3.55 and SD = 1.30).



Table 4. The Benefits of Paperless Port System

Characteristics	Mean	Std. Deviation	Ratings
The adoption of the UNIPASS system has made access to information about exporters and importers easier	3.12	1.470	Neutral
The speed with which customs clearance is done has gotten better.	3.13	1.255	Neutral
The use of the UNIPASS system has resulted in time savings and a reduction in the amount of human participation.	3.42	.907	Agree
Clearance procedures have been reduced as a direct result of the implementation of the UNIPASS system.	3.71	.700	Agree
With the help of UNIPASS, Customs and everyone else involved in the clearance of goods can now share important information.	3.55	1.303	Agree
The use of UNIPASS has resulted in greater revenue collection for the state.	2.85	1.134	Neutral
The application of UNIPASS has simplified the process of report preparation.	3.27	1.288	Neutral
Because of the usage of UNIPASS, it is now much simpler to track down evidence of criminal conduct.	3.28	.706	Neutral
It is now simpler to communicate with one's co-workers as well as one's clients.	3.27	1.042	Neutral
With the help of UNIPASS, the port has become less crowded.	3.55	1.303	Agree

Source: Survey Data, 2024

### 4.3 Factors that influence port process digitalization

Analysis for the second research objective is presented in this section.

First, descriptive statistics was carried out on the data. Descriptive statistics are necessary in quantitative statistical analysis, especially before doing exploratory factor analysis or multiple regression analysis Pallant (2011), which contains the central tendency metrics such as the median, mean, and mode (Hair et al., 2010). Additionally, descriptive statistics give brief summaries of the data in the research. Descriptive statistics, Dispersion metrics include the standard deviation, kurtosis, and skewness. According to Pallant (2011), the descriptive statistics of the measures enable the researcher to determine the extent to which the participants agreed or disagreed with the various items on the questionnaire. A total of 25 items representing the five components were demonstrated to the participants. The dependent variable is UNIPASS/ICUM Adoption, whereas the independent variables are Formal and informal linking structures, Technology Support Infrastructure, and Technology Availability/characteristics. Table 5 shows the various codes that were utilized.

WJAS

Examining the impact of Digitalization on the Import Clearance Process at the Tema Port, Ghana

**Table 5: Variable Coding Scheme for Data Analysis**

Variable	Code
Formal and informal linking structures	FILS
Technology Support Infrastructure	TSI
Technology Availability/ Characteristics	TA/C
UNIPASS/ICUM Adoption	UNIPASS/ICUMA

The descriptive statistics analysis is presented in summarized in Table 6.

**Table 6: Descriptive Analysis**

Factors	N	Mean	Std. Deviation
FILS	150	13.71	4.308
TSI	150	13.56	3.945
TA/C	150	10.85	3.343
UNIPASS/ICUMA	150	14.56	4.133

Source: Survey Data (2022)

*Exploratory Factor Analysis (EFA)*

The data was subjected to Exploratory Factor Analysis (EFA) using the Statistical Package for Social Sciences (SPSS) version 25. According to Norris and Lecavalier, EFA is a statistical method used mostly to uncover the underlying properties of a large group of variables (2010). The primary purpose of EFA is to discover the underlying relationships between variables in this study. The Kaiser-Meyer-Olkin (KMO) and Bartlett's Tests were employed in this example to determine if the data was eligible for factorization. Table 7 displays the results of the KMO and Bartlett's tests.

**Table 7: KMO and Bartlett's Test**

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.631
Bartlett's Test of Sphericity	Approx. Chi-Square	178.145
	df	21
	Sig.	.000

Source: Survey Data (2022)

*Principal Component Analysis*

Principal Component Analysis (PCA) is used in multivariate analysis to identify the inherent structure of the dataset (Abdi & Williams, 2010). As a consequence, it is recognized as one of the most successful strategies for understanding dataset variance. To put it another way, PCA aids in the visualization of genetic distance and relatedness between variables in a study. The 25 elements were factored using the Principal Component Analysis (PCA) approach with Varimax Rotation.

According to Hair et al. (2010), items should have loadings more than 0.60 in order to be kept for analysis; however, in the social sciences, lower loadings greater than 0.40 may be acceptable for data analysis. In the context of this inquiry, all 25 variables had loadings greater than 0.60 as shown in Table 8.

**Table 8: Exploratory Factor Analysis (EFA)**

Rotated Component Matrix <sup>a</sup>			
	Components		
	1	2	3
FILS1	.899		
FILS2			.674
FILS3	.868		
FILS4			.743
TSI1			.801
TSI2	.783		
TSI3	.978		
TSI4	.786		
TA/C1	.767		
TA/C2			.801
TA/C3	.682		
UNIPASS/ICUMA1	.795		
UNIPASS/ICUMA2	.732		
UNIPASS/ICUMA3	.833		
UNIPASS/ICUMA4			.926

a. 3 factors extracted.

Source: Survey Data (2022)

Note: FILS =Formal and informal linking structures, TS =Technology support and TA = Technology availability.

*Reliability Test*

In addition to the Exploratory Factor Analysis, Table 9 offers measures of internal consistency, such as Cronbach's alpha ( $\alpha$ ) of the variables. According to Hair et al. (2010), the most popular measure of internal consistency is Cronbach's alpha ( $\alpha$ ), and the Cronbach's alpha coefficient should be greater than 0.7. However, in an exploratory investigation, a 0.6 threshold should suffice. Table 9 shows that the Cronbach's alpha coefficients for all variables are more than 0.6. This shows that the factor components are internally reliable, allowing for further investigation of the dataset.

WJAS

Examining the impact of Digitalization on the Import Clearance Process at the Tema Port, Ghana

Table 9: Reliability Test

Variables	Loadings	Number of Items	Cronbach's Alpha ( $\alpha$ )
Formal and informal linking structures		4	.948
FILS1	.899		
FILS2	.674		
FILS3	.868		
FILS4	.743		
Technology Support Infrastructure		4	.941
TSI1	.801		
TSI2	.783		
TSI3	.978		
TSI4	.786		
Technology Availability/ Characteristics		3	.937
TA/C1	.767		
TA/C2	.801		
TA/C3	.682		
UNIPASS/ICUM Adoption		4	.908
UNIPASS/ICUMA1	.795		
UNIPASS/ICUMA2	.732		
UNIPASS/ICUMA3	.833		
UNIPASS/ICUMA4	.926		

Source: Survey Data (2022)

*Multiple Regression Analysis*

The above components were validated and assessed using multiple regression analysis. This was done after ensuring that none of the regression assumptions had been violated. The technique of multiple regression analysis was selected because of its ability to predict the variables presented as well as examine the proportionate influence of each variable. As a consequence, traditional multiple regression was performed, which is allowed when the purpose of the study is to better understand the connection between a dependent variable and independent variables (Pallant, 2011).

The link between digitalization and import clearance process was assessed using regression analysis. Formal and informal linking structures, technology support infrastructure, technology availability/characteristics and UNIPASS/ICUM were the independent variables, while UNIPASS system adoption was the dependent variable.

The correlation coefficient R-square in Table 10 is 0.8178 in the model summary. This indicates that the independent components are well suited to the Adoption of the UNIPASS system at the port. When the components change by 0.8178 units, the adoption of the UNIPASS system will increase by 81.78% on average. As a consequence, the linkages between the constructs are tight and explained the dependent variable. Furthermore, with Adjusted R-Square of 0.8128, the digitalization predicts 81.28% of the variance in adoption of the UNIPASS system. To put it another way, the model almost accounts close to 100% of the variance in the adoption of the UNIPASS system.

**Table 10: Regression Analysis of Factors That Influence Digitalisation Adoption**

<b>Number of obs</b>	= 150			F(4, 145)	=162.70
R-squared	= 0.8178	Adj R-squared	= 0.8128	Prob > F	=0.0000
<b>Adoption of UNIPASS system</b>	<b>Coef.</b>	<b>Std. Err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% Conf. Interval]</b>
FILS	-10.57463	.9060707	-11.67	0.000	-12.36544 - 8.783815
TSI	2.086989	.4415399	4.73	0.000	1.214304 2.959675
TA/C	9.664652	1.867644	5.17	0.000	5.973328 13.35598
UNIPASS/ICUMA	2.781287	.9963157	2.79	0.006	.8121094 4.750465
	4.465185	1.720419	2.60	0.010	1.064847 7.865524

**Source: Survey Data (2022)**

For the first hypothesis, the regression analysis showed that formal and informal linking structures have a significant negative impact on the adoption of the UNIPASS system at the Tema port. When formal and informal linking structures and technology support infrastructure increase by -1057units, adoption associated with the UNIPASS system will decrease by 10.57% on average. H1 is therefore accepted.

For the second hypothesis, it was discovered that technology support infrastructure has a significant positive impact on the adoption of UNIPASS. An improvement of 0.0290 units in technology support infrastructure at the Tema port, it will improve the UNIPASS system adoption by 2.09%. In this regard, H2 is also accepted.

Additionally, technology availability at the port has a positive and significant impact on the adoption of the UNIPASS system. When the technological infrastructure within the country is improved by 0.0967 units, it will increase the operations of the UNIPASS system by 9.67%. The third hypothesis is also accepted.

## 5. Discussion of findings

### 5.1 The Benefits that are Associated with the Paperless Port System in Ghana

The benefits that are linked with the paperless system at the Tema port are discussed here.

It was found that the use of UNIPASS system enhanced document processing at the Tema port. This indicates that the UNIPASS system has improved document processing, which made it easier to clear goods on time. Because with the paper system, it takes a long time to process importers and exporters' documents and also faces a challenge of bureaucracy, but this new paperless system has come to resolve all these bottlenecks at the port. This agrees with Domi's (2019) findings who indicated that, document processing has greatly improved in terms of time required to clear products since the introduction of IT to clearing activities in ports. The paperless approach has helped to cut the time spent at the port clearing goods.

The paperless system has arrived to improve freight clearance at Ghana's Tema port. Several companies-controlled valuations, classification, risk management, and payment in the old system, resulting in income leaks





and unnecessary delays in cargo clearance at Ghana's ports. This confirms the results of a study by Eye on Port (2018), which found that a year after implementing UNIPASS, the clearing process at the ports had greatly improved and clearing agents were able to receive customs classification valuation reports (CCVR) in 24 hours, down from three days under the previous regime.

The study also discovered that the number of people required to process a transaction at the port had reduced after the implementation of the digitalization at the port. This agrees with a study by Osei-Owusu et al. (2020) who found that, since implementing UNIPASS/ICUMS, the Port Paperless System (PPS) has drastically cut down on the number of people needed to complete inspections at the ports from 13 to 3. If the information is electronic, individual data items only need to be provided once, potentially saving users time, which is a major indicator of efficiency. Clearance procedures have been made easier because of UNIPASS. It was also said that with the help of UNIPASS, important information can now be shared between customs and everyone else involved in the clearance of goods. According to De Wulf (2004), numerous customs and import processes is automated, simplified, and enhanced, resulting in cost savings for enterprises, improved customs revenue collection, and faster processing of container traffic at the Tema port.

While respondents were neutral about whether the introduction of the UNIPASS has improved revenue collection, Ashley (2020) argued that it has boost economic activity inside Ghana's borders and ports, shut any loopholes associated with the loss of national income, and guaranteed that customs clearance is performed as fast and effectively as possible. UNIPASS / ICUMS can guarantee that economic development is transferred into the Ghanaian economy and that the Ghanaian economy has a high potential for international recognition from organisations such as the World Bank and the International Monetary Fund.

## 5.2 Factors that have an impact on the digitalization process at the Tema Port

The factors that influence the digitalization process at the port was also investigated using the TOE framework. Three hypotheses were developed and tested using the multiple linear regression analysis technique in this regard.

The first factor was the technological context. DePietro et al. (1990) refers to technical framework to include the organization's essential internal and external technologies. Equipment, processes, and so on are all examples of the kind of technologies we're talking about here. The results of this study prove that improvement in technology support infrastructure will improve the UNIPASS system. This finding is corroborated by extant literature on import clearing process (Domi, 2019).

With regards to the organizational context, the firm size, human resources, managerial structure, number of slack resources, centralization level and employee connection are all examples of elements that make up an organization's context. The results of the study prove that an improvement in the organizational context, in other words the availability of formal and informal linking structures improves the UNIPASS system. This results in consistent with findings in extant literature (e.g., Amegboe, 2019; Osei-Owusu et al., 2020).

Finally, the firm's competitors, available technology in the environment, regulatory environment and macroeconomic position all make up what is known as the environmental context. The study found that, technology availability at the port has a positive and significant impact on the adoption of the UNIPASS system. This finding is supported by a study by Kim et al. (2010) who examined issues related to e-payment at the port from the customers' viewpoint.

## 6. Conclusion and recommendations

The research looked at the benefits of the paperless system at the port of Tema. It was found that the use of UNIPASS has improved the way documents are handled at the Tema port, saved time, and cut down on the



number of people who need to be involved. Also, the study found that the use of UNIPASS has streamlined the clearance process and made it possible for customs and everyone else involved in the clearance of goods to share important information. The use of UNIPASS has also cut down on traffic at the port.

The research also identified factors that influence digitalisation, with specific reference to UNIPASS/ICUM at the Tema port. It was revealed that technological, organizational and environmental factors influenced the adoption of the UNIPASS system. To be more specific, the regression analysis showed that formal and informal linking structures had a significant impact on the adoption of the UNIPASS system while the technology support infrastructure had a significant positive impact on the adoption of the UNIPASS system.

### 6.1 Conclusions

The primary goal of the study was to ascertain whether digitization had any impact on Tema Port's import clearance process. It has been determined through a review of the relevant literature that the adoption of digitalization for all customs clearing processes is crucial for the optimization of customs operations and the enhancement of tax revenue collection by the state. This research investigated the positives of Ghana's paperless port system and the elements that affect digitalization, particularly as they relate to UNIPASS/ICUM. The research demonstrates that customs clearance processes are more efficient and that document procession times have decreased because to the implementation of the UNIPASS system. The customs clearance process has improved. Time and effort have been conserved using the UNIPASS system. Clearing procedures have been simplified thanks to the implementation of UNIPASS, which allows Customs and all other parties involved in the clearance of products to share essential data in real time.

Again, the study found several factors that influence digitalization. Among those factors technology support infrastructure was found to have a significant positive impact on the benefits of the UNIPASS system to the port. Thus, the study concludes that, an improvement in technology support infrastructure at the Tema port, will improve the UNIPASS system and maximize the benefits that comes with it.

### 6.2 Recommendations

The following suggestions are given to enhance the utilisation of digitalization in import clearing operations. These recommendations are made in accordance with the findings of the study.

According to the findings of the study, the presence of a technology support infrastructure has a considerable and favourable influence on the clearance operations at the Tema port. As a consequence of this, ensuring that the information technology department at Tema Port has sufficient personnel is essential to the delivery of high-quality services.

It is recommended that efforts be made to provide appropriate IT resources for workers, such as extremely quick and up-to-date computers and other accessories, to optimise their operations. This could include things like a printer.

In addition, the provision of high-speed internet connectivity and the employment of well-educated individuals in information technology roles to supervise IT departments must be seen as absolutely essential to the operations of the Tema port.

### 6.3 Limitations and Suggestions for Future Research

The study was limited to workers and Tema port in the Greater Accra region of Ghana. Further research can include the Takoradi port in Ghana to better understand the whole phenomenon of the study regarding the benefits of the UNIPASS system.



## Conflict of interest

The authors declare no conflicting interest in the conduct of the study.

## Reference

- Agbozo, E. (2017). Going paperless in the public sector: An exposition on Ghana's ports. *Journal of Scientific & Engineering Research*, 8(9), 2229–5518.
- Agyemang, S. K. (2016). *GCNET and the facilitation of international trade at the port of Tema* (Dissertation). University of Ghana.
- Amegboe, W. N. (2019). *The Introduction of the Paperless System and Its Impact on Employee Performance: A Study of Tema Port* (Vol. 45). University of Ghana.
- Aryee, J., Andersen, C., & Hansen, A. S. (2021). The social-political embeddedness of import clearance: 20 years of digital transformation at tema, ghana. *World Customs Journal*, 15(1), 3–14.
- Asuliwonno, C. (2011). *Improving port efficiency and custom operations in Ghana* (Thesis). Kwame Nkrumah University of Science and Technology.
- Carlan, V., Sys, C., Vanelslander, T., & Roumboutsos, A. (2017). Digital innovation in the port sector: Barriers and facilitators. *Competition and Regulation in Network Industries*, 18(1–2), 71–93.
- De Wulf, L. (2004). *TradeNet in Ghana: Best Practice in the Use of Information Technology*. World Bank.
- De Wulf, L., & Sokol, J. B. (2004). *Customs modernization initiatives: Case studies*. World Bank and Oxford University Press.
- DePietro, R., Wiarda, E., & Fleischer, M. (1990). The Context for Change: Organization, Technology and Environment. In L. . Tornatzky & M.
- Djanitey, R. (2018). *Assessing the impact of national single window on the competitiveness of Ghana's maritime sector*. World Maritime University Dissertation.
- Domi, S. (2019). *The Role of Information Technology in Customs Clearance: A Study of the Customs Division of the Ghana Revenue Authority* [University of Ghana]. file:///C:/Users/Harrison/AppData/Local/Mendeley Ltd./Mendeley Desktop/Downloaded/Doville NK - 2010 - University of Ghana httpugspace.ug.edu.gh University of Ghana httpugspace.ug.edu.gh.pdf
- Gyebi-Donkor, E. (2006). *Tema Port Newsletter: The Evolution of Tema*. GPHA Press.
- Oduro, K. (1999). *The Performance of Takoradi Harbour in Cargo Handling*. Kwame Nkrumah University of Science and Technology.
- Osei-Owusu, J. Y., Mahmood, R., & Sambasivan, M. (2020). Port Paperless System in Ghana , the Way Forward : GCNET or UNIPASS / ICUMS. *ADDRI Journal of Arts and Social Sciences*, 17(July), 72–87.
- Owusu-Mensah, B. (2007). *Ghana Ports Handbook: Our Aim is Quality Port Services for Ghana and Her Neighbours*.
- Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.
- Tushman, M. L., & Anderson, P. (1986). Technological discontinuities and organizational environments. *Administrative Science Quarterly*, 31(3), 439–465.
- World Customs Organization (WCO). (2012). *The single window concept: The World Customs Organization's Perspective*. [http://www.wcoomd.org/en/topics/facilitation/activities-andprogrammes/~/\\_/media/FA35ECDE953D4CDDA32A58D6F620B1FE.ashx](http://www.wcoomd.org/en/topics/facilitation/activities-andprogrammes/~/_/media/FA35ECDE953D4CDDA32A58D6F620B1FE.ashx)



## Biographical notes



### **Esther Addy**

Esther Addy recently graduated from the School of Research and Graduate Studies of Wisconsin International University College, Ghana with a Master of Science (MSc) degree in Logistics and Supply Chain Management. Esther is an entrepreneur and a nutritionist. Her current study, focuses on examining the impact of digitalization on the import clearance process at Tema port.



### **Eric Ansong**

Eric Ansong holds a PhD degree in Information Systems from the University of Ghana. He is a Senior lecturer of Management Information Systems and the head of the department of Operations Management and Information Systems at the School of Research and Graduate Studies of the Wisconsin International University College, Ghana. His research interests include technology adoption, innovations in education, Digital business strategies and ICT4D. He has published a number of research articles in peer-reviewed academic journals and has presented papers in international conferences. His ORCID is <https://orcid.org/0000-0002-0262-3485>.