JOURNAL OF MARITIME RESEARCH

Vol XXII. No. III (2025) pp 307–315

ISSN: 1697-4840, www.jmr.unican.es

The SWOT Analysis of Block Chain Technology: Framework for Sub Saharan African Ports

Adeola Oluwatoyin Osundiran[1,*]

ARTICLE INFO

Article history:
Received 04 Feb 2025;
in revised from 05 Mar 2025;
accepted 25 Apr 2025.

Keywords:
Sub Saharan African Ports, Block Chain, Framework, Strength, Weaknesses, Opportunities and Threats.

ABSTRACT

This research utilizes the Strengths Weaknesses, Opportunities, and Threats (SWOT) framework to analyse Block Chain Technology. The purpose is to examine these elements vis-à-vis its implications for sub-Saharan African ports. Block Chain technology is nascent and none of the sub-Saharan African port has adopted it at the time when this research was being done. Blockchain Technology's potential to expedite the maritime supply chain from the port angle is phenomenal. However, blockchain has not been adopted tangibly amongst the ports in the sub-Saharan African region. Hence, this research stands to profit the various port authorities of sub-Saharan African Ports that are yet to implement Blockchain Technology. The Port of Montreal serves as a Benchmark since it has commenced the implementation of Block Chain. The research findings show the strengths weaknesses opportunities and threats of blockchain technology in enhancing port efficiency. This research develops a framework that will guide ports in the adoption of Block Chain Technology

1. Introduction.

This research utilizes the Strengths Weaknesses, Opportunities, and Threats (SWOT) framework to analyse Block Chain Technology (BCT). The purpose is to examine these elements vis-à-vis its implications for sub-Saharan African ports. Blockchain technology is nascent and it has not been adopted in any of the sub-Saharan African port as at the time when this research is being done. Hence, applying SWOT analysis to provide a better understanding and clarity on the potential of Block Chain Technology. According to Mahajan (2025) the SWOT analysis is one of the best tools for understanding the implications of Artificial Intelligence and Block Chain technology.

Mlambo (2021) posits that African ports lack the necessary infrastructure, to reduce congestion and enhance performance and efficiency, hence Africa's shipping and ports are not up to par with the expected international benchmark.

Carbone and De Martino (2003); and Paixao and Marlow (2003) both state that critical parameters for ports include information and communication technologies (information and document sharing); customer relationships and satisfaction. They agree that if these parameters were in place, it would reduce costs and build up port efficiency.

The Port serves as a critical and essential part of the global supply chain (Li et al., 2025). Port logistics plays an important role in the rapidly growing global trade. Port logistics system is a complex ecosystem involving a large amount of data, information, and key operational processes. Secure, efficient management and sharing of port logistics information are particularly vital to enhancing the entire port logistics system (Li et al.,2025). Guan, P. *et al.* (2024) state that it is significant to note the crucial role of ports in facilitating international trade and commerce, their adaptability and performance in light of emerging technologies should be of paramount significance. Blockchain technology has emerged as a focal point of attention among these technological innovations (Guan, P. *et al.* 2024).

According to Skender, et., al. (2020), modern technologies may improve the safety and efficiency of operations in and outside seaports. Alahmadi, et., al (2022), posit that Blockchain

[1]University of South Africa. Graduate School of Business Leadership, Midrand, 1687 South Africa.
[*]Corresponding author: A.O. Osundiran. Tel. (+027) 733239955. E-mail Address: osundo@unisa.ac.za.

is one of the technologies that can support digital transformation in industries such as the ports and the maritime sector. Blockchain technology is quintessential, hence, providing a decentralized, transparent, and secure environment for organizations and businesses such as shipping companies and the ports (Alahmadi, et.,al, 2022). Pramanik and Pal (2025) affirm that Blockchain technology can transform every part of the supply chain, from production and logistics to inventory control and customer involvement, spurring widespread innovation and opening the door to a new era of openness, efficiency, and cooperation.

The Port of Montreal is critical to Canada and North America because it serves as the gateway to the Canadian economy (Port of Montreal, 2025). The Port offers a wide array of services and is connected to more than One hundred and forty nations (Port of Montreal, 2025).

Blockchain technology is quite young and is yet to be implemented at the Port level of many sub Saharan African ports. This research serves as a theoretical impetus to birth the application of block chain in sub Saharan African ports. Hence, identifying the Strengths, Weaknesses, Opportunities and Threats of Block Chain Technology.

The objective of this research is to do a SWOT analysis on the adoption of Block Chain Technology. This study is germane as it contributes to the burgeoning body of knowledge on the implication of block chain technology in enhancing port productivity. This technology is still in its infant stages and is yet to explode to reach mainstream and enterprise adoption (Boison, & Antwi-Boampong, 2020)

The remaining part of this research is organized as follows: Section 2 explains the global logistics background and the basis for blockchain, discusses the role of blockchain support for digital transformation in shipping and ports, Section 3 gives an overview of blockchain-based SC use case in ports and shipping, including Strengths, Weakness, Opportunities, and Threats (SWOT) analysis, Section 4 discusses the results, and Section 5 discusses the framework and Section 6 summarizes the conclusion and the future work of the research.

2. Review of Literature.

Pramanik and Pal (2025) argue that effective supply chain management (SCM) is pivotal for enterprises across industries in this highly digitalized, globalized, and interconnected business environment. In the era of globalization, seaports play an increasingly important role in globalization specifically in manufacturing and international business (Low et al., 2013). The development and growth of large multinationals have moved the world towards globalization (Coyle et al., 2013). Globalization implies that there are no geographic boundaries to supply chains from origin to destination. Supply chains operate in more dynamic environments, characterized by globalization, rapidly evolving technologies, increased customer responsiveness, and therefore require more integrative and collaborative efforts (Soosay and Hyland, 2015). Thus, globalization is well placed on the platform of maritime shipping with containerized shipping at the forefront of the process (Rodrigue, Comtois, Slack and Anderson, 2017).

Rodrigue and Anderson (2024) stipulate that the importance of maritime transportation in global freight is unmistakable, particularly in terms of tonnage, as it handles about 80% of global trade. Transportation by sea is an integral part of the modern global supply chains and any delay at the ports will have an impact on the end customers; therefore, managing the maritime supply chains is vital to keep the world economic engine humming (Prasad and Gavirneni, 2010).

De la Pe na Zarzuelo (2020) attests that Ports and terminals have evolved and from the 2010s have entered into a fifth stage of evolution characterized by their digital transformation and alignment with Industry 4.0 practices. Mlambo (2021) affirms that ocean-based ports are not only central but are necessary component in facilitating trade. Ports function as interfaces connecting the maritime and continental parts of the logistics chain and as such represent a growth pole with significant potential to trigger the economic prosperity of a country (Low et al., 2013). Effective and efficient systems of transportation are critical to domestic and international business. Also, effective and efficient operations of transportation are essential to optimising transport and transaction costs and global competitiveness (Barnes and Oloruntoba, 2005).

2.1. Sub-Saharan African Ports: Basis for BlockChain Technology.

The maritime sector is very complex due to various dynamics such as the interrelationships of various governmental and nongovernmental agencies, as well as stakeholders. Elymay et al., (2022) posit that due to this inherent complexity, the maritime industry suffers from a lack of trust and secure ownership evidence, protracted documentation procedures, and excessive data aggregation. These inherent challenges are reflected in cargo processing delays and elevated costs in the shipping process (Elymay et al., 2022)

Alahmadi, et al., (2022) confirm that the ports' functions can be seen as a link between land and sea, via unloading and loading operations. Ports play an integral part of logistics networks across the world by offering value-added services and managing cargo flow effectively and efficiently (Alahmadi, et al., 2022). According to Boison, & Antwi-Boampong, (2020), International trade by sea is one of the most important drivers of an import-dependent economy due to the huge volume of shipment that can be transported. Countries in Africa are predominantly import-dependent. This is why issues relating to ports tend to affect these nations positively or adversely. Ports in Africa have been bedevilled by delays and congestion as a result of document-related issues. Some of these delays are attributed to a lack of integrated systems which has led to excessive bureaucracies in the port supply chain network Boison, & Antwi-Boampong, (2020). Furthermore, maritime transport services involve complex stakeholders and have to deal with a large number of transport documents, which hamper the process of delivering goods from one party to another (Wang et al., 2021).

Wilson et al. (2003) argue that burdensome customs and regulatory/security measures may hinder port and maritime supply chain efficiency, which in turn leads to a contraction in trade and overall efficiency. Mlambo (2021) supports African port's infrastructural problems. Ports are now demarcated into traditional and smart port, based on their level of proficiency and adoption of technology. According to Li et.,al (2025),the traditional port supply chain suffers from poor flexibility of centralized authority management, data asymmetry, low efficiency of encrypted data retrieval and high delay of data update.

On the other hand, Smart ports can integrate and intelligently process the infrastructure and production data of other small ports, and also establish websites to query port Internet of things information (Li et al, 2025). Smart Port also provides information about their various port areas online, the data between these platforms of each port area can be queried and exchanged with each other, and can also be aggregated to the port intelligent logistics business information platform to combine the data of each platform for reference, effectively and reasonably allocate resources and progress, hence achieving the goal of intelligent control (Tang, 2024). Yau et al., (202) reiterate that Smart ports, are high performing ports, that apply technology to provide a wide range of smart applications, resulting in vastly improved vessels and container management among others, which subsequently improve the competitiveness and sustainability of the national economy. Even though Blockchain technology has been used in several sectors such as construction, education, extractive, and mining, it is pertinent to examine the application of blockchain in the maritime sector specifically at the ports

2.2. *Block Chain Technology.*

Blockchain is a technology initially created to support the famous cryptocurrency Bitcoin (Monrat, et al, 2019 and Ying et al., 2019). Satoshi Nakamoto is considered as the inventor of blockchain technology (Aggarwal &Kumar, 2021). This is by vurtue of the white paper titled Bitcoin: A Peer-to-Peer Electronic Cash System," which was published in 2008 (Samar, 2018). Ying et al., (2019) affirm that Blockchain technology facilitates a peer-to-peer payment system. According to Boison, & Antwi-Boampong, (2020) and Ying et al., (2019), Blockchain technology serves as the foundation for distributed ledgers by offering a platform for innovation for a new decentralized and transparent transaction machinery in industries and businesses, including ports. Ahamad et al., (2021) posit further that " BCT is an emerging technology that provides traceability, transparency, auditability through immutable prove- nance data of on-chain trusted transactions, in a decentralized manner without intermediaries or trusted third parties".

The application of blockchain technology in the maritime industry can improve customs clearance efficiency and logistics transparency in the container cargo supply chains (Wang et al., 2021). Block Chain technology has the following features which provides the basis for its application; these are security, reliability, transparency, and immutability (Ying et al., 2019). Figure 1 explains the features of Block Chain, by outlining and describing features such as security, reliability, transparency and immutability.

Figure 1: Features of Block Chain Technology.

Security	Reliability	Transparency	Immutability
• Changes on the data are impossible without approval • Every change is denoted by hash	• The Technology is reliable • Dependable cause of being backed in such a way that prevents data crashing	• Every transaction change is obvious to all stakeholders • This builds trust among the stakeholders	• The immutability feature means that information cannot be modified once data is appended to the ledger hence reassuring network users that their data is secure (Kumar, et al, 2024).

Source: Adapted by Author, 2025.

2.3. *Taxonomy of Application of Block Chain in the Ports.*

Using Google Scholar for 2015-2020, a total of 30 peer-reviewed literature sources- articles were reviewed to examine the various applications of block chain technology in the ports. The keywords were "Application of Block Chain Technology in Ports". The purpose of this search was to provide a literary overview of the various application of Block chain within the Port sector.

2.4. *Case Study Blockchain technology at the Port of Montreal.*

The Montreal Port Authority (MPA) is an all-season port that enables maritime cargoes to be shipped via the St. Lawrence River into the industrial hub of North America (Leclerc, & Ircha, 2023). Blockchain is a crucial tool in transforming the Port of Montreal into a Smart port. Leclerc, & Ircha, (2023) describe Smart Ports as those ports that make use of agile and versatile digital platforms such as Block Chain Technology to enhance their ability to operate and grow effectively in an increasingly unpredictable business environment. Since 2016, the Canadian Authority has been categorised as an early adopter of maritime innovation to support its ports (Leclerc, & Ircha, 2023). Figure 2 shows the various application of Block Chain Technology at the Port of Montreal.

2.5. *Theoretical Framework.*

The SWOT analysis theory provides the basis for this research. SWOT analysis is one of the best techniques to comprehend the status of research in Block Chain Technology, Artificial Intelligence, etc (Mahajan, 2025). The SWOT analysis is a process that involves four areas in two major categories. It has four components: 'Strengths', 'weaknesses', 'opportunities', and 'threats. Strengths and weaknesses are internal factors and attributes of AI research while opportunities and threats are external factors and attributes of the environment.(Mahajan, 2025).

Table 1: Table shows the various application of Block Chain in the Ports.

Author	Application of Block Chain Technology	Authors	Application of Block Chain Technolo
Czachorowski, et al., (2019).	Reduction of Pollution at the Port; Improvement of environmental efficiency	Duran et al., (2021)	Provides an innovation platform for decentralized and transparent transactions in the maritime port
Yang (2019)	Customs clearance and management, digitalizing and easing paperwork, standardization	Alahmadi et al., (2022)	Blockchain can be integrated into processes such as financial and document workflow
Dutta et al (2020)	Supply Chain reengineering, security, resilience, provenance, process management, and product management are some of the major functions that can be transformed with blockchain technology	Weernink, et al., (2017).	Improve Port Efficiency
Philipp, et al., (2019)	Smart Contracts	Tsiulin, et al., 2020	Improve document workflow management, financial processes, and
Jabbar, & Bjorn, (2018)	Identification of Port of Origin and Destination of consignment especially for customs	Guan, P. *et al.* (2024)	Integration of blockcha in technology into port operations and ability to enhance sustainability efforts
Dujak, & Sajter, (2019)	Information Exchange in Supply Chain Networks	Gao, N., et al (2022)	Application of customised Block chain that makes use of four smart contracts, Fabric Block Chain
Yau, et al., (2020)	Smart applications for improved vessels and container management among others	Amico & Cigolini., (2024)	Block Chain based Bill of Laden
Yoon et al., (2019)	Enhancing International trade through linking stakeholders across the continent	Liu, et al., (2023)	Build Smart ports and waterways
Tijan et al., (2019)	Usage in Logistics and Supply Chain Management	Farah et al., (2024)	Enhancing security, transparency in payment processes, and efficiency in the maritime industry;
Foroglou, & Tsilidou, (2015)	Tracking of Containers the moment it arrives at the Port	Li ,.et al (2025).	A fine-grained access control model for the port supply chain is designed in the smart contract to achieve auditable and decentralized management of user privileges.
Juma et al., (2019)	Build trust among stakeholders since data can not be tampered with. Facilitates trade among international supply chain stakeholders	Elmay, Salah, Yaqoob, Jayaraman, Battah, & Maleh, (2022.)	The application of blockchain technology to guarantee the full traceability of containers and goods in the port
Koh et al., (2020)	Enhance Cross border trade cargo flows	Rahimi et al., (2020)	Blockchain provides an authentication mechanism which provides a secure communication for wireless communications-assisted UAV sensing system for maritime IoT critical applications, by deploying a private Blockchain network that is connected to a fusion center (FC) in the terrestrial
Chang, Iakovou, &Shi, (2020)	Tracking of goods at the Port of Antwerp	Nash, et al.,(2024).	The use of BCT to improve tracking and tracing services, ensuring data integrity, transparency, and traceability across supply chains.
Ahmad et al, (2021).	Transforms Port Logistics Framework	Xu, Xu & Yang, Yanbin (2021).	The application of the Blockchain-based Hierarchical HybridizedMathematical Model (B-HHMM) has been proposed to analyze logistics port transportation using an integrated logical data optimization model which aids in improving visibility
Elmay, Salah, Jayaraman &. Omar (2022)	The application of smart contracts and non-fungible tokens (NFTs) on the Ethereum blockchain to accelerate the inefficient shipping process by digitizing ownership transfer and process documentation.	Zhang, & Zhang, (2025)	BCT stands as a unconventional strategy to address the issue of information silos present in the complex network system of regional logistics service supply chains

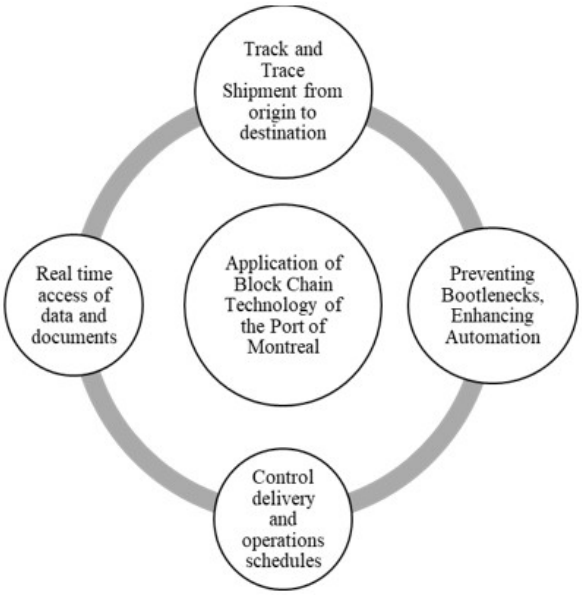
Source: Adapted by Author, 2025.

3. Research Methods.

This research makes use of the Qualitative research method. Penchev (2021) advocates that SWOT analysis is quite suitable for research of this nature because it provides evidence for strategic planning and strategic management. The essence of SWOT finds expression in the analysis of internal and external factors that can influence managerial decisions for the implementation of techniques or adoption of technology.

The non-probability purposive sampling method was used. The research makes use of the Port of Montreal as a Case Study noting that they have adopted the Block Chain technology. Furthermore, the systematic literature review provided evidence of the strengths, weaknesses, opportunities and threats of BCT.

Figure 2: Application of Block Chain Technology at the Port of Montreal.



Source: Adapted by Author, 2025.

4. Results and Discussion.

This section discusses the results. The SWOT framework provides the structure for organizing the discussions. Indeed, the SWOT is a strategic decision-making tool that should assist port authorities in making a logical decision about adopting BCT.

4.1. Strength of Block Chain.

Based on the review of literature, following are the strengths of BCT. Strengths in this instance depicts what the Ports stand to benefit from the implementation of BCT.

4.1.1. Enhancing Secured Proof Transaction.

According to Ying et al., (2019), a block contains information regarding a transaction. Much of this information is stored in the transaction details section. A block also contains a hash number generated based on the transaction information. The hash number will be significantly different if there is any change to this transaction information. Therefore, modifications can be easily spotted when data in one block are tampered with. A block contains not only its hash number but also the hash number of the previous block, hence serving as a link, blocks connect and form a chain.

4.1.2. Improve Decision-Making Process.

Tijan et al (2019) posit that tracking goods through blockchain can improve the decision-making process with end result being a more satisfying service for the end user. Wang et al

(2019) state that as a distributed, shared, and encrypted repository, it is not affected by database changes and damages, keeps copies of the whole blockchain and allows licensees to access trusted data. Wang et al (2021) Blockchain enables simultaneous auditing and makes real-time optimization possible for partners and organizations.

4.1.3. Decentralisation.

Farah et al (2024) attest that Blockchain is a distributed database whose duplicates are deployed at multiple computers in the blockchain network, known as nodes. There is no central authority in the network, and the network is maintained by the participating nodes. For example, updating information in the database requires the consensus of the participants. This distributed means of storing and managing information is more secure because it is not subject to a single point of failure (Farah et al., 2024). This distributed approach is also more trustworthy because any change to the ledgers will be known to the public. Blockchain can improve the security, integrity and efficiency of port logistics (Wang et al., 2021).Dutta et al (2020) Blockchain is a digital shared ledger which is distributed over the network. Once the records are added they cannot be edited without changing the previous records (with the consent of all/majority of involved parties), which makes it very safe to business operations.

4.1.4. Visibility.

Wang et al (2021) posits that when Block Chain is integrated with field-sensing technologies such as the Internet of Things (IoTs), blockchains could create permanent, shareable and actionable records of products' digital footprints throughout the entire supply chain. Such improved visibility would provide product traceability, authenticity and legitimacy – all of which are crucial to the food, pharmaceutical and luxury-item supply chains.

4.1.5. Track and Trace.

Foroglou and Tsilidou (2015) state that BCT can be used to monitor container arrival at the port by labeling it with a cryptographic hash that matches the last received container. The strength of this system is that it automatically keeps track of all the containers and, therefore, prevents scams or mistakes like changes in specific information (Foroglou & Tsilidou, 2015).

4.1.6. Block Chain Based Bill of Laden.

Application of Block Chain Technology in enhancing the process of Bill of Laden. Blockchain technology-based bills of lading, compared to electronic bills of lading, enhance privacy, security, trustworthiness and flexibility (Amico & Cigolini, ., 2024). Farah et al., (2024) posits that Block chain can facilitate seamless and transparent payment processes.

4.2. Weaknesses of Block Chain Technology.

Based on the review of Literature, the following are the weaknesses of BCT. Weakness in this instance depicts situations that ports may encounter during the implementation of BCT.

4.2.1. Adoption Reluctance.

Papathanasiou, et al.,(2020), confirms in their study that despite the benefits of automated processes and reduced paperwork as a result of smart contracts, there is a reluctance by organizations to adopt Block Chain Technology because enterprise resource planning (ERP) transformations have left organizations weary and disenchanted towards further systems development.

4.2.2. Employees.

Employees working in the organization may sabotage the entire change process. People within the organisation may resist the change if they feel that BCT will cause them to lose their jobs. Hence, there is need to have a strategy to motivate employees and procure their buy-in and consent.

4.2.3. Training.

BCT is a young technology there is need for intense training to be done. Employees need to be trained for effective results to be attained. There is lack of awareness and technical expertise. Tremendous lack of local technical hands, hence the need for capacity building, technology management and implementation.

4.2.4. High Cost of Integration.

Farah et al., (2024) proposed that the high cost of integration of BCT is a deterrent for companies and even port that lowering cost is important.

4.2.5. Cross Block Chain.

Cross block chain is a salient problem where multiple blockchains may need to communicate with each other (Farah et al., 2024). Li et al., (2025) stipulate that as the number of transactions grows, nodes may not be able to join the blockchain network if they lack sufficient storage capacity.

4.2.6. Infrastructural Issues.

Block chain relies on heavily on infrastructure such as electricity, water, internet etc. Some sub-Saharan African nations such as Nigeria, South Africa, Ghana still suffer from infrastructural setbacks. This can affect the successful implementation of BCT.

4.3. Opportunities for Block Chain Technology (BCT).

Based on the review of Literature, the following are the opportunities of BCT. Even though, opportunities are external to the organisation they are still beneficial.

4.3.1. Smart Contract.

A contract refers to an agreement between two or more people based on trust and several conditions. However, a Smart Contract is one of the opportunities that BCT provides. According Phillip et al,(2019: 4) "Smart contracts are computer codes that run on the top of the blockchain technology. They are a very simple form of automation with "if-then-else" functions. Accordingly, smart contracts represent transactional protocols

or scripts that can execute and enforce legal contracts". Smart contracts are able "trigger in real-time actions or transactions, respectively, as soon as the pre-defined contractual clauses and rules are fulfilled" (Phillip et al,(2019: 4).

4.3.2. Demand Fluctuations.

Yoon et al., (2019) posit that BCT provides the opportunity to handle fluctuation in demands and serves as a determinant of which mode of transport air or sea is most efficient for the consignment. This helps firms to handle high demand volatility. According to Tijan et al., (2019), Blockchain technology possesses the potential for the creation of new logistics services, as well as new business models.

4.3.3. Builds Trust.

BCT builds trusts among stakeholders because it establishes a secure communication paradigm, where data integrity and immutability can be guaranteed (Juma et al., 2019). Duran et al., (2021) BCT provides a platform for guarantees trust, transparency and traceability of cargo and data to be tracked.

4.4. Threats that Affect Block Chain Technology.

Based on the review of Literature, the following are the threats of BCT. Threats are external in nature and out of the control of the organisation though it can be mitigated.

4.4.1. Resistance to Technology.

Guan, P. *et al.* (2024) posit that the global port industry is known for its historical resistance to technological advancements. According to (Dujak, & Sajter, 2019) BCT can decrease the significance of many of today's large global corporations, institutions, and power structures which have a keen interest in preserving established hierarchies, hence its potential could well remain unexploited.

4.4.2. Information Sharing Risk: Data Privacy.

Firms are resistant to subsequent change and the risk of exposure to shared information in the shipping nexus is considered to cause a threat to competitive survival. Papathanasiou, et al.,(2020).

4.4.3. Cyber Attack Risk.

Farah et al., (2024) purports that several cyber attacks on the BCT can grind the entire process to a halt.

4.4.4. Internet Connectivity.

The high cost of implementation, the bad quality of Internet connections offshore, the old age of decision-makers, the technology-oriented culture, the lack of investment initiatives, the low level of blockchain diffusion through the supply chain, and risk aversion are the main barriers to the application of BCT (Gausdal et al, 2018).

4.4.5. Data Governance.

Governance issues are possible threats to the progress of Block Chain because there are no clear regulations in force even in Africa for this emerging technology (Weernink, et al., 2017).

4.4.6. Mindset.

The mindset has to do with the readiness of the people to embrace change. The question is are the people ready? A major threat to BCT is the mindset of the people, the employees, etc. For instance, ports in Nigeria are already given to transacting in a cash-based society. BCT brings in a cashless and seamless transaction process. It limits money changing hands hence curbing bribe. This innovation might not be welcomed in a society where bribe is seen as a gift or a form of gratification.

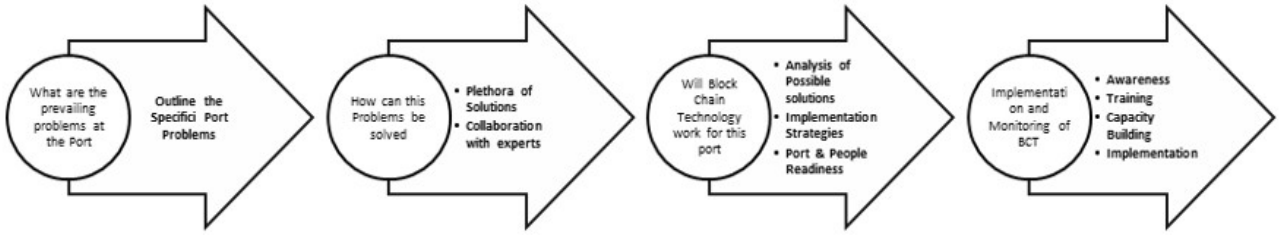
Figure 3: SWOT Analysis for BCT.

Source: Adapted by Author, 2025.

5. The Framework for the Implementation of Block Chain Technology for sub Saharan Africa.

There is a deliberate transition from traditional port to smart port. This transition and transformation process is critical since no port is an island and ports in Africa will definitely be interacting with ports of other nations. Therefore there must not be a gap in the dynamics. The first step in building a smart port is to improve the information processing technology system for port cargo flow in its core port area, which can intelligently track and process port logistics (Tang, 2024). As critical as BCT is for enhancing port efficiency, the framework below raises issues for the consideration for the implementation of Block Chain Technology. Figure 4 displays the framework for the adoption of ports by BCT. The first step is to understand the issue of need. Is there a problem that BCT can solve? For instance information sharing, bill of laden can cause tremendous delays at the Ports. If there is a need then the second step involves the gathering of experts to ascertain the problem and the proffer solutions.

Now, if BCT has been chosen as a tool to resolve the problem(s), then there is a need to determine the Port and people's readiness for this transition. Institutional readiness in terms of creating awareness, training, capacity building, purchasing the



necessary infrastructure, computers, software, internet, electricity, stakeholder engagement etc. People readiness in terms willingness to adopt and learn BCT.

Conclusions.

This research utilizes the Strengths Weaknesses, Opportunities, and Threats (SWOT) framework to analyse Block Chain Technology. The purpose is to examine these elements vis-à-vis its implications for sub-Saharan African ports. Salient but crucial issues such as cumbersome customs procedures, interrupted information flow, deliberate container manipulation in the port area, and time lost due to bureaucracy provide a substantial basis for blockchain technology. Obasi et.al., (2024) reiterate that because ports play a critical role in the global economy, by connecting international transportation networks their efficiency and effectiveness which directly impact the performance of global supply chains can not be compromised. Mlambo (2021) posits that "Africa needs to pursue an intensive course of infrastructure development so as to maintain economic growth and improve port efficiency and trade competitiveness". African ports are inefficient, and there is congestion partly because the ports cannot accommodate further expansion without serious investments (Mlmabo,2021). The SWOT Framework was effective in analysing the various dimensions of BCT and to provide clarity on the adoption of such technology. A framework for the adoption and implementation of the technology was developed. This framework is critical because of the different environments in which the port operates. Hence, individual sub-Saharan African ports must customize the BC technology that will be suitable to meet their peculiar needs and problems.

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