

# Effects of Supply Chain Visibility on Supply Chain Performance in Ghana Health Service: The Case of Kumasi Metro Health Directorate

Kwame Asamoah<sup>1</sup>, Emmanuel Asare-Bediako<sup>2</sup>, Adu-Poku Jacqueline<sup>3</sup>

<sup>1</sup>Dr. Hilla Limann Technical University, Upper West, Ghana

<sup>2</sup>C. K. Tedam University of Technology and Applied Sciences, Navrongo, Ghana

<sup>3</sup>Department of Procurement and Marketing Studies, University College of Management Studies, Kumasi, Ghana

Email: worldatlarge@rocketmail.com, easarebediako.stu@cktutas.edu.gh, adupokujacqueline@gmail.com

**How to cite this paper:** Asamoah, K., Asare-Bediako, E., & Jacqueline, A.-P. (2023). Effects of Supply Chain Visibility on Supply Chain Performance in Ghana Health Service: The Case of Kumasi Metro Health Directorate. *Open Journal of Business and Management*, 11, 437-463.

<https://doi.org/10.4236/ojbm.2023.112024>

**Received:** November 25, 2022

**Accepted:** February 17, 2023

**Published:** February 20, 2023

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## Abstract

The integration of supply chain visibility has become very necessary in today's corporate world. For quality health delivery system to be realised, the critical role of supply chain management cannot be overlooked. This study, which is more of quantitative study examined the effects of supply chain visibility on supply chain performance of Ghana health service. The study used Kumasi Metro Health Directorate as the case study and employed questionnaire to collect data. Both descriptive and inferential statistics were utilized to analyze the data gathered from the study area. Additionally, mean and standard deviation as well as frequencies and percentages were the main descriptive statistics used. Regression analysis was conducted to establish the effect of SCV on SCP. It was revealed that most respondents have a fair idea of the strategies being used to implement supply chain visibility in Kumasi Metro Health directorate. The study identified exchanging or sharing of information, use of asset status knowledge and improved electronic dissemination as SCV measures employed at Kumasi Metro Health Directorate. The findings also revealed that technological constraints, lack of synergy between automated systems and manual operations, inconsistencies in the flow of data between stakeholders, lack of communication between staff and management and budget constraint were noted as some of the bottlenecks that impede the smooth implementation of SCV in the Kumasi Metro Health Directorate. It was also found that Supply Chain Visibility has a positive effect on the supply chain performance of Kumasi Metro Health directorate. It is therefore recommended that Kumasi Metro Health directorate adopt effective networking programs as the basis for enhancing supply chain efficiency and performance.

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## Keywords

Supply Chain, Supply Chain Visibility, Bottlenecks in SCV, Supply Chain Performance

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## 1. Introduction

Suppliers from all over the world are delivering to far-flung locations worldwide, exposing them to considerable risk created by an unmanaged supply chain and lack of visibility. The above phenomena have been necessitated by the complexity associated with supply chain which has grown from simple domestic supply chains to more complex and global supply chains vulnerable to third party risks. To maintain a healthy business, it is very crucial to properly integrate supply chains visibility into supply chain processes especially given modern business complexities. Financial, business, and reputational risk keep all organizations on edge and managing these risks manually can sometimes be extremely challenging amidst other business priorities. Kalaiarasan (2022) posits that at its core, supply chain visibility can be explained as knowing where inventory is at a particular time, tracking their movement and delivery, and understanding thoroughly who you are doing business with. According to him, the obstacle is that most firms don't focus on the human side of trade but when they do, they open the door to a completely transparent world of exchange, whether it be money, goods, or services. In addition to the above, Kalaiarasan (2022) noted, among others, that lack of supply chain visibility leaves organisations at a disadvantage or at risk largely due to the following reasons:

- Disruption: Pandemics, earthquakes, floods, wildfires, hurricanes, all cause a sudden disruption in the natural flow of supply chains. Additionally, trade wars, labor disputes, and politics can also create disruption. Without supply chain visibility, organizations affected by these disruptions may not be equipped with a disaster recovery plan.
- Interruptions: Lack of visibility into supply chain processes can cause companies to lose track of their supply network. A lack of technology that permits comprehensive demand forecast can equally lead to either inadequate or too much inventory at different points in the supply chain.
- Bad data: Data are one of the most important drivers of supply chains. However, lack of full visibility into that data or data spread across disparate systems will lead to poor insights required to generate unity in the supply chain, increase collaboration, and predict challenges.
- Wrong suppliers: More now than ever, organizations are under scrutiny with who they do business with. Greater supplier visibility is becoming a vital part of business as ethical standards and brand alignment grow in importance.

Fan & Stevenson (2018) asserted that from the literature, it has become apparent that a main consideration in supply chain risk (SCR) management is the

visibility of the risk. According to them, a good visibility in the supply chain can yield benefits in operations efficiency and more effective supply chain planning. Indeed, the study of supply chain visibility (SCV) has drawn much recent interest from both researchers and practitioners in supply chain management. They further argued that about 79% of the large companies surveyed globally cited the lack of SCV as their top concern. This indicates the vital role supply chain visibility must in global business operations.

Nikookar et al. (2015) revealed that disruptions culminate in immediate as well as long-term negative impacts on firms' performance and reputation. Qazi, Appolloni, & Shaikh (2022) confirm that firms which had a major disruption in their supply chains experienced a decline of 10% in their shareholder value after public announcement of the disruption which is a major issue which must be avoided at all cost. In order to reduce the impact of unseen risk factors that may affect the progress of any firm, it is important to have tools to predict the influence of major risk factors in advance. However, risk factors keep changing in their probabilities and impacts along a supply chain duration and these changes will be more severe and have more influence if recognized later rather than earlier, and will be harder and more costly to manage hence the need for firms to get their supply chain visibility arsenals intact prior to operations in order to be proactive.

According to Boakye et al. (2021) the flow of several healthcare products and the participation of a number of stakeholders constitute the Supply Chain in a healthcare sector. The key principle of supply chain in the healthcare sector is to deliver products at the appropriate time so as to meet the needs of healthcare providers and customers whilst reducing waste and conserving resources. Yadav (2015) asserted that supply chain returns, critical information regarding need, demand, and consumption are the bedrock for delivering medicines and health products to the population and health system planners. It is further revealed that health system performance improvement indicators such as payment, organization, regulation, and also behavioral aspects are some of the key roles played by supply chain in the health system.

Throughout the public health system, funding is a challenge especially in Sub-Saharan Africa, which is likely to have major implications on the country's supply chain. Ghana National Supply Chain Assessment (GNSCA, 2020) posited that a significant change in the Ghanaian health care sector occurred in 2003 with the enactment of the National Health Insurance Law and the subsequent creation of the National Health Insurance Scheme (NHIS) beginning in 2004. Ghana was the first Sub-Saharan African country to introduce a national health insurance scheme. Its implementation has been a mixed success. GNSCA (2020) reported that the supply chain in the health sector is marred with payment delays and long-standing indebtedness.

The report went on further to note that in all, the Government of Ghana (GOG) recognized that its public health supply chain suffers from serious fragmentation

deficiencies, not just across commodity groups, but also in relation to functions, levels, and Ministry of health (MOH) agencies such as the Ghana Health service (GHS). From the above revelation, [GNSCA \(2020\)](#) postulated that a Technical Working Group was constituted to lead the process of defining the vision, key principles, and strategic interventions needed to form a comprehensive improvement plan for the supply chain. As a result, Supply Chain Master Plan (SCMP) was established, the aim of which is to provide a framework for reforming the supply chain whilst ensuring that good quality health commodities are available, accessible and affordable to all people living in Ghana. The current study intends to examine the effects of supply chain visibility on supply chain performance of Ghana Health Service, Kumasi Metro Health Directorate.

### 1.1. Problem Statement and Research Questions

Global production practices have changed due to globalization and nations' economic engagements with partner countries. These have increased complexities and various forms of risks in supply chains. In current globalized supply chains, which are traversing diverse countries or even continents, disruptive events even if they occur in a remote place to a member inevitably would jeopardize the smooth flow of material. The application of SCM should be designed and integrated in such a way where the information required for supply chain operations can be effectively utilized and shared. To share useful information effectively throughout the internal organizations and with external partners, system integration is necessary in order to ensure compatibility in such exchanges without distortion and disruption. There is a plethora of research work on supply chain management ([Boakye et al., 2021](#)) and supply chain risk management ([Ganiyu, Yu, Xu, & Providence, 2020](#)).

The concept of SCV in business remains ambiguous despite an extensive amount of research in the literature. Research findings by [Amanfu, Bonsu-Osei, & Owusu \(2014\)](#) revealed considerable challenges that impede effective deployment of supply chain visibility in Ghana. Further, findings from their study were limited to the retail sector in Ghana. According to [GNSCA \(2020\)](#) report, Ghana has a network of facilities for distribution with scope for stock rationalization at all levels but a weak system to ensure that these linkages are explored for the benefit of the sector supply goal. In response to these challenges, the Ministry of Health ([MOH, 2018](#)), in 2012 developed a Supply Chain Master Plan (reviewed and revived in 2015) which was essentially aimed at bringing some efficiency to the management of health commodities across the country. Even though some efforts have been made in the past but these have centered on improvements in inventory management yet linkages between operational levels appear very weak.

The reporting mechanism, which is expected to bridge this gap, has proven to be ineffective in many respects. The above situation, according to the [MOH \(2018\)](#) report creates a visibility challenge to the whole logistics system as per-

formance management is reduced to stock availability. Despite the fact that the 2019 GNSCA demonstrates that progress has been made on several fronts, the report still identified persistent gaps and opportunities for improvement (GNSCA, 2020). Ghana's public health system is organized hierarchically, with substantial overlap and decentralization of supply chain responsibilities. Against the backdrop of the weaknesses associated with the existing systems, there is the need to examine the supply chain visibility in the Ghana health service and suggest far-reaching remedies for improvement.

## 1.2. Research Objectives/Hypothesis

Base on the general objective to be achieved, the following are the specific objectives are to:

- 1) identify the supply chain visibility strategies of Kumasi Metro health directorate.
- 2) investigate possible bottlenecks of supply chain visibility in Kumasi Metro health directorate.
- 3) examine the effects of supply chain visibility on supply chain performance of Kumasi Metro directorate.

Based on the objectives above, the following are the hypothesis to be tested to prove or otherwise of the statements:

- 1)  $H_0$ : there are no strategies of supply chain visibility
- 2)  $H_0$ : there are no bottlenecks of supply chain visibility
- 3)  $H_0$ : there are no effects on supply chain visibility and performance

## 2. Literature Review

### 2.1. Supply Chain

Dias, Hernandez, & Oliveira (2020) explained that it is essential to understand the supply chain as interconnected network but not only as a relation between a supplier and customer. They noted that the quality, cost and risk of a product offered is a function of the performance of this entire network. The authors also affirm that decision making as far as supply chains are concerned stands apart because it involves various members, each one playing a role and aggregating value to the final result. Dias et al. (2020) asserted that Supply chain management is a process that offers the opportunity to capture intra and inter-organizational synergies to assure the excellence of the business processes and efficient relations with the members. Simply put, it involves managing the multiple relationships that occur along the chain.

Chibba (2017) also defined supply chain as a network of physical and decision-making activities connected by material and information flows that cut across organizational boundaries. According to him, the purpose of supply chain is to produce value for the ultimate customer and in the same vein satisfy other stakeholders in the chain. Gurzawska (2020) asserted that supply chain design decisions are coordinated since it may be decentralized, such that a manager at

each facility makes decisions, or may be centralized so that decisions cut across facilities. According to him, in recent years, international manufacturing sources whether company-owned or external suppliers have been sought out by managers because of reduced cost, increased revenues, and improved reliability. Gurzawska (2020) however noted that experts maintain that global supply chains are more difficult to manage than domestic supply chains. He maintained that significant geographical distances in these global situations not only increase transportation costs, but complicate decisions because of inventory cost tradeoffs due to increased lead-time in the supply chain especially in the era of the global pandemic. Again, different local cultures, languages, and practices diminish the effectiveness of business processes such as demand forecasting and material planning. Gurzawska (2020) concluded that infrastructural deficits in developing countries in transportation and telecommunications, as well as low skilled workers, supplier availability, supplier quality, equipment as well as technology provide challenges normally not experienced in developed countries. According to him, these challenges block the degree to which a global supply chain provides a competitive advantage.

## 2.2. Supply Chain Visibility

Nikookar et al. (2015) asserted that visibility has seen a lot of attention in literature as a useful cure for supply chain disruption. According to their market research, many companies aren't particularly well positioned in this area despite the hype, hence research is eminent in such an area. Nikookar et al. (2015) argue that it is important to gain knowledge on actual changes that are happening in the firm's environment and that will improve the thoughtfulness of a firm in the event of any major change such as disruption in the flow of material and the more reason visibility comes to the picture to achieve that knowledge. Nikookar et al. (2015) defined visibility in the supply chain context as the extent to which actors within a supply chain have access to or share information which they consider as vital or essential to their operations which will benefit both mutually. Therefore, enhanced visibility within a supply chain allows members to see the actual state of the supply chain.

Ahimbisibwe, Ssebulime, Tumuhairwe, & Tusiime (2016) on their part defined supply chain visibility as the extent to which participants within a supply chain have accesses to or share information which is considered as essential or crucial to their operations. They explain further that it includes a clear understanding of the upstream and downstream inventories, demand and supply conditions, and production and purchasing schedules. Ahimbisibwe et al. (2016) postulated that the above notwithstanding, electronic dissemination, filtering and monitoring can be extremely fast and cost effective when dealing with vast amount of data being created in today's enterprises. It is obvious from the above that the knowledge of visibility boosts a firms supply chain confidence through information sharing such as current inventory position, procurement status, manufacturing schedules, distribution reliability, order status as well as demand forecasts.

Ahimbisibwe et al. (2016) listed the dimensions of supply chain visibility which include among other things, information technology, information exchange, business intelligence gathering and knowledge of asset status. They explained information technology as the use of computerized systems to amalgamate supply chain operations and provide visibility of internal operations as well as processes. According to them to enhance information flexibility, internal integration requires cross-functional collaborations that enable the overall organization to absorb and utilize information. Ahimbisibwe et al. (2016) asserted that information exchange is the degree to which information is communicated between the partners in the chain. They claimed that in facilitating vital actions and decision-making, the exchange of information of a sufficiently high quality is essential in the coordination of operations within supply chain. Ahimbisibwe et al. (2016) complement their argument that a firm's ability to respond quickly to changes in its business environment can be made possible with greater information access. From the above, it is obvious that information sharing is the catalyst that holds all the activities and resources together along the supply chain from raw materials procurement to customer services. Ahimbisibwe et al. (2016) concluded that shared information among supply chain participants is essential to improve supply chain visibility. The statement above is due to the fact that information reduces uncertainty and thus reduces the amount of buffer inventory that is needed.

Ahimbisibwe et al. (2016) postulate that business intelligence mentioned above has a two-sided coin, namely a process and a product and it extends beyond the boundaries of even the supply chain. They maintained that the aim is to provide leading indicators of future trends and to predict the behavior of competitors, suppliers, customers, technologies, acquisitions, market, product and services, and the general business environment with a certain amount of certainty. Lastly, Ahimbisibwe et al. (2016) argue that for general efficiency especially in times of difficulties, the state of assets including facilities, equipment, inventory and personnel is crucial to effective decision making. The requirement of converting this status data to knowledge is the dissemination of information to the right people, at the right time and in a form they can use effectively. They asserted that visibility within supply chain enables the suppliers, manufacturers, retailers, shippers, and even final consumers to have that concept accurately. Ahimbisibwe et al. (2016) recommended that visibility could be obtained from the comfort of economical sensors and connectivity through internet components which have created supply chain visibility which is easier for producers in the last few years.

Moshood, Nawanir, Sorooshian, & Okfalisa (2021) posit that there are several beneficial outcomes by optimizing predicting, preparation, arranging, and order implementation, to name a few in ensuring adequate visibility in a company's supply chain. Moshood et al. (2021) noted that with the latest technologies in the industry, such as Digital Twins, Artificial intelligence (AI), Internet of things

(IoT), and Robotic Process Automation (RPA), more automation is now possible for managing end-to-end supply chain simply put visibility. According to them, a high degree of visibility is only possible when the core elements namely, people, technology, and process work in synchronously. [Kimseng, Javed, Jeenanunta, & Kohda \(2020\)](#) argue that the key advantages of visibility in the supply chain are the increase in market efficiency in general, which serves as a foundation for better decision-making, both at strategic and organizational levels. According to them, firms benefit from proper visibility of the supply chain at a functional level by having the capacity to modify the supply chain swiftly and effectively, an ability that is becoming extremely relevant in quickly changing market conditions and which creates a competitive advantage. [Swift, Guide, & Muthulingam \(2019\)](#) suggest four main visibility processes namely visibility for learning, visibility for sensing, visibility for integrating, and visibility for coordinating. [Swift et al. \(2019\)](#) asserted that the above visibility processes enable a firm to reorganize its supply chain in compliance with both its own requirements and external demands.

### **2.3. Bottlenecks in SCV**

[Biel \(2020\)](#) asserted that better visibility running through a complex supply chain leads to fewer disruptions, increased customer satisfaction and lower costs. A SCV of the firm empowers product teams to identify and fix weaknesses in the supply chain before they get out of hand or cause any harm to the firm, weaknesses such as inventory shortfalls or order fulfillment issues. The more reason why [Biel \(2020\)](#) explains SCV as both company's own operational borders internally and across a partner network. According to him, the internal operations is obviously less of a challenge though cannot be written off completely due the fact that the company controls access to relevant data sources. Tracking the movement of a product from an assembly plant to a wholesale distributor and on to retailer or the customer is a multifaceted operation requiring integration of diverse partner systems.

[Stanly \(2020\)](#) observed that businesses have suffered one set back or the other due to a lack of comprehensive visibility in their supply chain networks. According to him, common challenges observed are among other things lack of supply chain planning, integration, and execution. Others are inefficiency in organizing, processing, and managing data. Another problem identified by the authors is limited availability of useful insights due to technological constraints, lack of synergy between automated systems and manual operations, inability to predict and prepare for risks, inconsistencies in the flow of data between stakeholders as well as lack of a single data model to connect vital information from disparate planning and execution systems. The current study is on the mission to investigate whether Kumasi Metro Health Directorate faces any of the above challenges in their supply chain visibility.

According to [Dunakin \(2019\)](#) there is a compelling surveys and other research



which show that cost is a major hindrance to investment in technology. The reason being that technology is inherently risky, there is always the contemplation of whether the technology will be compatible with suppliers and customers? Or will it go obsolete quickly? Or will it require frequent maintenance and re-tooling? Dunakin (2019) concluded that all these risks are much more manageable if the firm or organization has a strong SCV in operation. He justified the above statement by noting that there is no easy one-size-fits-all plug in that will solve complex supply chain problems.

Dunakin (2019) argues that the human aspect of supply chain visibility also comes to play; he further maintained that aside the processes being in place and the tasks fairly routine and simple, issues with communication, management and being on the same page is what affects operational efficiency the most can also pose a challenge to SCV. Tarofder, Azam, & Jalal (2017) in support of the argument above asserted that with regard to utilization of the internet as a SCV tool, possible challenges include lack of senior management support, budget concerns, and insufficient competitive pressure account. According to them, lack of executive support has also been recognized as a potentially threat to new technology adoption.

#### **2.4. Supply Chain Visibility and Supply Chain Performance**

Asnordin, Sundram, & Noranee (2021) contended that supply chain performance (SCP) is an essential vehicle driver of organisations as well as market performance. They defined SCP as the benefits an organization gets from supply chain participation of course not limited to efficiency improvement, price reduction, as well as enhancement in cycle time (Yu, 2015). Asnordin et al. (2021) observed that previous research has actually confirmed that an effective and reliable supply chain supplies top quality products on time and in the right amounts. Again, it reduces order cycle time and it benefits affects all supply chain partners. Asnordin et al. (2021) asserted that dimension of performance can be defined in various aspects, of course depending on the technique and the factor for determining that dimension of performance. Wood, Reiners, & Srivastava (2017) therefore explained efficiency measurement as the method of examining an individual or multiple tasks in an effective and efficient manner. Sardi et al. (2020) went straight to the point by explaining the dimension of efficiency as the interpretation of efficiency results into the kind of recorded and communicated information that can be shared and utilized in order to upgrade and enhance procedures. Asnordin et al. (2021) concluded that the vital role of supply chains in a firm's competition has necessitated the need for keeping track of procedures (visibility) to manage not only the business's performance, but additionally that of the supply chain performance as well. The current study seeks to examine the supply chain visibility and its effects on supply chain performance.

Okore & Kibet (2019) asserted that supply chain performance has become a focal point of competitive advantage for business organization. They posit that

effective supply chain performance is important to build and sustain competitive advantage in product and services of the firms. [Okore & Kibet \(2019\)](#) argues that supply chain performance encapsulates the complete supply chain hence the best complex functions which includes multiple parties involved in supply chain management, the very reason it is termed ultimate supply chain. They observed that supply chain performance is typically measured from the angle of logistics, especially when companies begin to see potential in collaborating with their suppliers for the purpose of achieving total quality management. [Okore & Kibet \(2019\)](#) noted that practically, supply chain performance can be joint product development, thus delivery scheduling and process optimization, with the aim to benefit all parties involved. They concluded that the entire supply chain can work in a synchronized manner, as if it was just one company when information sharing and collaboration is allowed.

[Zhang & Su \(2020\)](#) contended that the global supply chain management has tremendously gained prominence since the past decades due to the competition among businesses globally and they argue that the choice of supply chain strategy such as visibility has enormous impact on competitive performance of the firm. They believed that the internationalization of supply chains which is best done with visibility has increased foreign competition in the countries' local markets. [Zhang et al. \(2022\)](#) admonished earlier on that organizations must be swift and decisive in their decisions at strategic and operational levels regarding the global sourcing of goods and services in order to limit the extent of procurement risks or problems and the best way to do this is visibility. [Zhang & Su \(2020\)](#) in support of the above statement also recommended that organizations should establish relationships networks which can be seen at any point (visibility) with their key suppliers when they perceive supply risks, a sure way to achieve performance. It can be inferred from the above that visibility affects supply chain performance significantly; an objective the current study seeks to achieve using Kumasi metro health directorate as a case study.

### 3. Theoretical Review

#### 3.1. Transaction Cost Theory

##### 3.1.1. Network Theory

According to [Okore & Kibet \(2019\)](#), firm's continuous interaction with other players becomes an important factor in the development of new resources and that's the basis for the Network theory. [Okore & Kibet \(2019\)](#) argues that the relationships between firms are able to combine the resources of two or more organizations to achieve more advantages than through individual efforts which is viewed as a quasi-organization. [Okore & Kibet \(2019\)](#) argue that the value of a resource is most at times anchored on its combination with other resources, the more reason why inter-organizational ties may become more important than possessing resources alone. [Tsofa, Molyneux, & Goodman \(2015\)](#) contended that the resource structure determines the structure of the supply chain and becomes

its driving force. Tsofa, Molyneux, & Goodman (2015) postulates that the Network theory contributes immensely to the understanding of the dynamics of inter-organizational connection by emphatically stressing the importance of relationship between the parties involved, positive long-term cooperative relations through the build-up of trust as well as the collective adaptation of routines and systems through exchange processes.

Kovalevskaya et al. (2022) posited that visibility is made possible through direct communication, information sharing etc. and the relationships between these generate a sense of uniqueness, which ultimately result in resilient supply chains that meet individual customer requirements. The parties gradually build up mutual trust through the social exchange processes. Kovalevskaya et al. (2022) asserted that the network theory actually displays how the suppliers connect with organizations as well as with the organization's customers. The network theory is related to the current study where organizations link and partner with suppliers using information sharing and other supply chain visibility tools to assist in the best supply chain performance.

### 3.1.2. Empirical Review

Yu & Goh (2014) investigated the twin effects of supply chain visibility (SCV) and supply chain risk (SCR) on supply chain performance. Their model incorporates the objectives of SCV maximization, SCR minimization, and cost minimization under the constraints of budget, customer demand, production capacity, and supply availability. A numerical example was used to demonstrate the applicability of the model and their findings suggest that decision makers tend to mitigate SCR first then enhance SCV.

Nikookar et al. (2015) identified many resilience antecedents in the supply chain literature meanwhile there is limited research relative to firm's resources that contribute in improving supply chain resilience through visibility. As an early-stage study, they used Resource-based view to identify two main organisational resources for improving supply chain resilience and proposed a conceptual model to improve supply chain resilience through visibility. Munyuko (2015) determined the effects of Supply chain risk management on organizations performance. Previous studies have focused on risk management within the general context of an organization but little attention has been focused on how supply chain risk affects organization's performance in terms of its bottom-line profits and overall organizational objectives. The population for the research included staff at Andy Forwarders and Logistics services. The researcher employed both primary and secondary data, both interviews and questionnaires were used, questionnaires being the main instrument of data collection. The results obtained showed that there was a direct link between supply chain risk management and organization performance. It was concluded that supply chain risks affect organization performance in the event they materialize and therefore there was the need for organization to identify risk exposure, analyze the risk exposure and have in place mitigation plans for the risk identified within their supply chain.

Dey (2016) used the systems theory as the conceptual framework, in his qualitative case study to explore strategies supply chain managers in Ghana use to reduce disruptions in the supply chain. The data collection was through face-to-face, semi-structured interviews from 12 supply chain managers who gave tape-recorded interview responses to 8 questions. Transcript evaluation, member checking, and methodological triangulation ensured reliability and strengthened the credibility of the data collected. Data analysis revealed 6 themes, which included identification of disruptions before they occur, information sharing and collaboration between partners, management strategies to mitigate supply chain disruptions, inventory optimization, availability of human capital, energy, and finance problems. The identification of disruptions was important to participants because they believed if they identified potential disruptions, they might prevent them from happening. The collaboration between partners was important because participants believed that the speed at which stakeholders work together after a disruption determines the extent of the cost and the recovery period. Business leaders could apply the findings to provide insight to businesses to reduce disruptions, improve best practices, and increase business profits. Implications for social change include the enhancement of company profits given efficiencies in the supply chain. Such increase in profits leads to increases in taxes, which contributes to the overall betterment of the local communities. It has been established that absence of visibility in the supply chain process creates the greatest disruptions which his study failed to capture, a gap the current study seeks to fill.

Ahimbisibwe et al. (2016) examined the relationships between supply chain visibility, supply chain velocity, supply chain alignment and supply chain relief agility using a case of humanitarian agencies in responding to Bududa Land Slide disasters in Eastern Uganda. A cross sectional data was collected from a sample of sixteen (16) humanitarian agencies that were involved in responding to landslide disasters in Bududa district in Easter Uganda region. The results indicate significant positive relationships between supply chain visibility, supply chain velocity, supply chain alignment and supply chain relief agility. Findings also revealed that supply chain visibility and supply chain alignment are significant predictors of humanitarian supply chain relief agility.

Somapa, Cools, & Dullaert (2018) presented a literature review that aims to provide insight into the characteristics and effectiveness of supply chain visibility (SCV), as well as to identify metrics that capture these aspects in business processes. They used a systematic review of the supply chain literature conducted to identify the characteristics and the effectiveness of SCV. The synthesis of SCV effectiveness and its metrics are based on the process-oriented approach which relates the effectiveness of SCV to improved business performance. Their study reveals that the characteristics of SCV can be captured in terms of the accessibility, quality, and usefulness of information. The benefits of SCV are found to extend beyond improvements to operational efficiency of business processes or to the strategic competencies of an organization. This study confirmed that clear

agreements between all players involved in the SC can help to solve problems caused by information completeness (type and amount of information), and unlock the full potential of SCV projects. By using a process-oriented approach, this review provides a comprehensive explanation of the functions of SCV, as well as its first-order effects, in terms of automation, information, as well as transformational characteristics.

Saqib, Saqib, & Ou (2020) aimed to develop a policy for manufacturers to connect all operational issues related to the supply chain. They suggested a concept of visibility that represents a beneficial role among business partners such as manufacturers, supplier, and customers. Their findings revealed that implementing supply chain visibility becomes easier just because of passing information about products globally which is more a matter of priorities and investment, which is not the case when sharing “official data” about people. As social technologies become more prominent, this may change over time. So, supply chain visibility is beneficial for supply chain partners.

Messina (2019) based his theoretical foundation on the analysis of the main concepts of supply chain risk management, supply chain disruption management, supply chain visibility and information management. His literature review made it clear that there is a lack of analysis of supply chain risk management and related decisions, as an information management problem. According to him, in order to fill this gap, there is the requirement to understand how visibility over supply chain processes can be created, in order to improve decision makers’ capabilities to focus on mitigating supply chain risks. From the above premise, he aims at studying how information management processes support decision makers towards mitigating risks in supply chain, and at developing innovative information management solutions to enhance visibility in order to face supply chain risks within the context of complex supply chain. This work is based on the Design Science Research paradigm, which will be applied through several research methods, namely literature review, case study research, and focus group methodology.

Ganiyu, Yu, Xu, & Providence (2020) outlined potential risks in the supply chain network of Ghanaian enterprises and investigated the impact of these potential risks and supply chain risk management (SCRM) strategies on enterprise performance. Data for the study was collected from 210 enterprises in Ghana and analyzed by modeling the constructs of supply chain risks, supply chain risk management (SCRM) strategies and enterprise performance and also measuring the complex relationships among the constructs using a structural approach. The structural model result shows that, enterprises with distinct organizational structures dedicated to supply chain risk management with the purpose of mitigating supply chain risks tend to perform better than their competitors. The results also indicated a negative association between supply chain risks and the performance of Ghanaian enterprises. According to them, their research provides direction for managers to adopt and develop adequate enterprise supply chain risk register and supply chain risk management (SCRM) strategies to mitigate the conse-

quences of supply chain risks in their planned business operations. Failing to consider supply chain visibility constitutes a gap in their work which the current study seeks to fill.

Moshood et al. (2021) evaluated how organizations can benefit from introducing Digital Twins to enhance their logistics supply network visibility and also reviewing deployment issues as well as technologies supporting Digital Twins. They employed ATLAS.ti 9 software tools to save, classify, and evaluate the data for the analysis to systematically review the literature. They reviewed, compiled, and sorted papers from 227 publications for this article and then recognized 104 as critical to the work scope; this analysis' quest date was set from 2002 to 2021. Their article represents the first attempt at dealing with the issue of supply chain visibility through the Digital Twins in the logistics field. The results of their findings confirmed that Digital Twins would help companies develop predictive metrics, diagnostics, projections, and physical asset descriptions for their logistics. They suggested some steps to take in order to overcome the challenges in implementing a Digital Twins system in the logistics industry.

### 3.2. Methodology

The study employed both quantitative and qualitative data to examine the effects of supply chain visibility on performance of Kumasi Metro health directorate. Additionally, survey research based on self-administrated questionnaires was used to collect primary data from managers responsible for supply chain activities in Kumasi Metro Health Directorate. Further, the survey utilized standardized questions, which were administrated in the same way to all respondents; the fact that facilitates easy comparison and allows the researcher to have more control over the research process. In addition, the study has an explanatory purpose, since the empirical objective was to examine and ascertain the linkage between supply chain visibility and supply chain performance of Kumasi Metro Health Directorate. In accordance with this, questionnaires were formulated and then empirically tested in the survey.

Since the study is a case study, the population for this study was made up of all the staff of the Procurement and Supply Chain department as well as the management and administrative staff of Kumasi Metro Health Directorate. The target population then comprised all the staff at the Procurement and Supply Chain department of Kumasi Metro Health Directorate. The sampling techniques employed were purposive sampling and simple random sampling technique. Purposive sampling was used basically to sample the staff of the Procurement and Supply Chain department of Kumasi Metro Health directorate since they are the experts who can give the needed information on supply chain and its related issues. Most researchers arguably posit that simple random technique is the best technique to obtain a representative sample.

According to Saunders et al. (2017), the statistical rule of thumb for sample size which can represent any population is 30 units. This study took the cost and

time limitations into consideration, and selected a sample size of 100 which is satisfactory based on the recommendation of [Saunders et al. \(2017\)](#). This number is also more than the 30 that was recommended by [Singleton & Bruce \(1999\)](#). The 100 was drawn from the Kumasi Metro Health Services which is organized around nine (9) Sub Metro Health Teams; namely, Bantama, Asokwa, Manhyia North, Manhyia South Kwadaso, Tafo, Oforikrom, Suame and Subin. Thus 10 from the Kumasi Metro Health Directorate and 10 staff each from the Procurement and Supply Chain department of each sub metro.

The study gathered data through both primary and secondary data sources. The main primary data instrument used was questionnaire. According to [Al Kindy et al. \(2016\)](#), questionnaire translates the study objectives into specific research questions as these questions provide enough data for hypothesis testing. The questionnaires focused on the objectives of the study. The questionnaires were tested using the health facilities at Obuase in the Ashanti Region of Ghana. Some changes were made after the test to ensure the questionnaires cover the objectives of the study. The wording of the questionnaire was very simple and were clear from ambiguity. The five-point Likert scale with 1 as strongly disagree and 5 as strongly agree was adopted. The Likert scale allows the responses to be ranked. The self-administration-based questionnaire was employed to obtain data about the transfer of risk in international purchasing.

Secondary data for the study were gathered from reviewed papers. The secondary data formed the conceptual, theoretical and empirical reviews of the study.

Time and space were given to the respondents just to ensure they respond to the questions feeling less pressure ([Saunders et al., 2017](#)). The pilot testing in relation to this study was done in Oforikrom Municipal Health Directorate. This place was deliberately chosen in view of the fact that the institutional settings of Oforikrom have close resemblance with those of Kumasi because the former was carved out of the later. Descriptive statistics like mean, standard deviation and tables were used to analyse the data. For the inferential statistics, Correlation analysis and Regression analysis were conducted. This was done to examine the effects of supply chain visibility on supply chain performance of Kumasi Metro Health Directorate. Analysis of variance (ANOVA) was also conducted. This was done to find out the efficacy of the regression model. The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 22 for windows. Since Ghana Health service is the mother agency responsible for all the health directorates in all Metropolitan, Municipal and District Assemblies (MMDAs), the researchers are of the firm believe that the current study can be generalized in Ghana Health Service and their affiliate agencies as well as other government agencies with similar supply chain characteristics.

## **4. Data Analysis and Results Discussion**

### **4.1. Demographic Data of Respondents**

Out of the 100 respondents who received the questionnaires, 98, representing

98% of the sampled respondents completed the questionnaire. The 2% were uncompleted. The validity of the questionnaires was facially checked. All the completed ones were discarded. The reliability test value of 89.8% was realized. This means that there was clear consistency in the data collected.

The demographic data comprise sex, level of education, job status as well as number of years that respondents have been working in the Ghana Health Service; see **Table 1**. The findings of the study reflected more male staff (73.5%) perspectives than female (26.5%) since more males responded to the questionnaire. It was revealed that majority of the staff had the professional qualification which can be the basis for the effective implementation of any effective supply chain strategy. On the job status, Junior staff were 62.2%. The job status is normal with what pertains in any organization as the junior staff always outnumber the seniors as well as the management members. This study showed the extensive work experience of the study respondents and hence their qualification to give credible data to the study.

**Table 1.** Demographic characteristics.

	Freq. (%)
Sex	
Male	72 (73.5)
Female	26 (26.5)
Total	98 (100)
Level of Education	
HND/Diploma in SCM/Procurement	15 (15.3)
Degree in SCM/Procurement	51 (52.0)
Masters in SCM/Procurement	12 (12.2)
Other	20 (20.4)
Total	98 (100)
Job Status	
Management	15 (15.3)
Senior Staff	22 (22.4)
Junior Staff	61 (62.20)
Total	98 (100)
Job Experience	
1 - 5 yrs.	26 (26.5)
6 - 10 yrs.	23 (23.5)
11 - 15 yrs.	32 (32.7)
16 - 20 yrs.	17 (17.3)
Total	98 (100)

Source: Field Survey, 2022.



## 4.2. Descriptive Statistics

Descriptive design as viewed by Saunders et al. (2017) is the process where data is gathered for the goal of producing as well as testing the hypothesis with the aim of providing answers to the research question in a specific area of study.

## 4.3. Supply Chain Visibility Strategies

Respondents were asked to indicate the supply chain visibility strategies they were using at their outfit with a closed ended questions using a five-point Likert scale. Table 2 presents the descriptive statistics on SCV strategies. With mean score of 3.71, 3.94 and 3.74 which are closed to score 4, it could be said that respondents agreed on the following statement: my health directorate exchange or share information as part of its SCV improvement measures; my health directorate uses knowledge of its asset status as SCV strategy; and my hospital has improved on electronic dissemination. However, with mean score of 3.05, 2.92 and 3.24 which were closed to 3, it could be said that respondents were uncertain with items 1, 3 and 6. With the standard deviation, it could be said that the responses on item 3 was the least spread as compared to responses on item 2. The responses on item 3 were less spread around the mean, followed by items 5, 6, 4, 1 and then 2. With standard error of the mean of 0.054, it could be said that the mean of item 3 was less deviated from the population mean of the study respondents. This shows that the mean of item 3 was representative of the population

**Table 2.** Descriptive statistics of SCV strategies.

	N	Mean	Std. Deviation	
	Statistic	Statistic	Std. Error	Statistic
My health directorate uses Information Technology as SCV strategy	98	3.05	0.087	0.866
My health directorate exchange or share information as part of its SCV improvement measures	98	3.71	0.094	0.931
My health directorate gather Business Intelligence as part of its SCV measures	98	2.92	0.054	0.531
My health directorate uses knowledge of its asset status as SCV strategy	98	3.94	0.081	0.797
My hospital has improved on electronic dissemination	98	3.79	0.073	0.722
My health directorate use Filtering and Monitoring as part of SCV measures	98	3.24	0.074	0.733
Valid N (listwise)	98			

Source: Field Survey, 2022.

of the study followed by items 5, 6, 4, 1 and 2 in that order. This means that most of the respondents were uncertain about the use of information technology as SCV strategy. They were also not certain about gathering of business intelligence as part of SCV strategy. They further stated that they were not aware of the use of filtering and monitoring as part of SCV measures.

It could be said that Kumasi metro health directorate uses asset status knowledge (ASK) most often to assess its supply chain visibility. The second strategy used the most was electronic dissemination and the least use strategy was identified to be information sharing.

#### 4.4. Bottle Necks in SCV Implementation

The study seeks to answer the question of whether there are possible challenges or bottlenecks in the implementation of supply chain visibility strategies in the health directorate. **Table 3** depicts the descriptive statistics on bottle necks in SCV implementation. The mean score of item number 2 was 2.24 which means that most respondents disagreed with item number 2. For items number 1, 3 and 7 the mean scores were 2.70, 2.51 and 3.08 respectively. This means that majority of the respondents were not certain about those three statements. The mean

**Table 3.** Descriptive statistics on bottle necks in SCV implementation.

	N	Mean	Std. Deviation
My health directorate lacks Supply Chain Planning	98	2.70	1.151
There is no integration and execution of SCV in my health directorate	98	2.24	0.964
There is inefficiency in managing organizing, and processing of data by my health directorate	98	2.51	0.955
My health directorate is faced with technological constraints	98	3.80	.717
There is lack of synergy between automated systems and manual operations at my health directorate	98	3.76	0.826
There are inconsistencies in the flow of data between stakeholders at my health directorate	98	3.74	0.900
There is lack of a single data model to connect vital information at my health directorate	98	3.08	0.742
There is lack of communication between staff and management leading to poor planning of SCV at my health directorate	98	3.72	0.961
My health directorate is faced with budget constraint	98	3.59	1.024
Valid N (listwise)	98		

Source: Field Survey, 2022.

scores for items 4, 5, 6, 8 and 9 were 3.80, 3.76, 3.74, 3.72 and 3.59 respectively. It could be inferred that majority of the respondents agreed with statements corresponding to those items.

By commenting on the standard deviation, with standard deviation of 1.151, it could be said that responses of item 1 were largely distributed or dispersed around its mean, this was followed by items 9, 2, 8, 3, 6, 5 and 7. The responses on item 4 were the least dispersed around its mean.

Out of the nine (9) possible challenges/bottlenecks presented to respondents, respondents agreed that five (5) of them namely “my health directorate is faced with technological constraints”, “there is lack of synergy between automated systems and manual operations at my health directorate”, “there are inconsistencies in the flow of data between stakeholders at my health directorate”, “there is lack of communication between staff and management leading to poor planning of SCV at my health directorate” and “my health directorate is faced with budget constraint” were the possible bottlenecks in the implementation of SCV in the Kumasi Metro Health directorate with a mean scores approximately 4.

#### 4.5. The Effects of SCV on Supply Chain Performance

The study seeks to examine the effects of supply chain visibility on supply chain performance of Kumasi Metro directorate by answering the research question “what are the effects of SCV on supply chain performance?” With the six (6) items presented to respondents to indicate whether there is any effect of SCV on SCP, on average, most of the respondents agreed that supply chain visibility has an effect on the performance of supply chain of Kumasi Metro Health directorate. The standard deviation of item 1 was 1.141 and that of item 2 was 1.003 with item 5 having the least standard deviation of 0.917. This means that the responses on item 5 were least dispersed around its mean.

The mean score for all the items on the questionnaire was approximately 4 indicating that the respondents agree to the fact that establishing network which can be seen at any point, being swift and decisive in strategic and operational levels decisions, high levels of delivery schedules and process optimization, sharing information and effective collaboration with stakeholders, on time usage of quality products and finally enhanced cycle time which benefits all its supply chain partners are the supply chain visibility practices that lead to effective supply chain performance in Kumasi Metro Health directorate. The information is displayed in **Table 4**.

#### 4.6. Regression Analysis

From the regression analysis as displayed by **Table 5**, the R-squared value of 0.214 indicates that the exogenous variables i.e., SCV, explains the variations in the endogenous variable SCP by 21.4%. The adjusted ( $R^2$ ) which minimizes the influence of the number of explanatory variables was 0.206. The adjusted  $R^2$  of

**Table 4.** Descriptive statistics on effects of SCV on supply Chain performance.

	N	Mean	Std. Deviation
My health directorate has established relationships networks which can be seen at any point	98	3.65	1.141
My health directorate is swift and decisive when it comes to strategic and operational levels decisions	98	3.72	1.003
My health directorate delivery schedules and process optimization levels are high	98	3.60	0.928
My health directorate information sharing and collaboration with stakeholders is effective	98	3.71	0.919
My health directorate uses quality products on time	98	3.60	0.917
My health directorate has enhanced its cycle time and it is benefiting all its supply chain partners	98	3.69	0.924
Valid N (listwise)	98		

Source: Field Survey, 2022.

**Table 5.** Model summary of the relationship between SCV and SCP.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.463 <sup>a</sup>	0.214	0.206	4.16268

<sup>a</sup>Predictors: (Constant), SCV; Source: Field Survey, 2022.

approximately 20.6% indicates that after removing the influence of the explanatory variables, the dependent variable is still explained by the equation. Based on these probability statistics from the regression, the model is good for analysis and policy interpretation.

#### ANOVA

**Table 6** presents the Analysis of Variance results of the relationship between SCV and SCP.

It can be noticed that the selected model of the study was found to be statistically significant. The ANOVA test results showed that there is a statistically significant relationship that exist between the variable of SCV and SC Performance. ANOVA table results again confirm the robustness of the models. The ANOVA table also indicates that the model as a whole is significant ( $p < 0.000$ ).

From **Table 7**, the coefficient of SCV was 0.709 and it was statistically significant at 1% significance level. This shows that SCV strongly affect SC performance.

#### 4.7. Discussion of the Results

Respondents confirmed that the SCV strategies been used by the Kumasi Metro directorate were exchanging or sharing information, use of asset status knowledge and improved electronic dissemination measure. This indicates that the

**Table 6.** ANOVA of the relationship between SCV and SCP.

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	453.507	1	453.507	26.172	0.000 <sup>b</sup>
	Residual	1663.483	96	17.328		
	Total	2116.990	97			

a. Dependent Variable: SCP; b. Predictors: (Constant), SCV; Source: Field Survey, 2022.

**Table 7.** Coefficients.

	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.347	2.893		2.540	0.013
	SCV	0.709	0.139	0.463	5.116	0.000

a. Dependent Variable: SCP.

metro health directorate acknowledged the need for SCV and therefore have instituted strategies to ensure its implementation. The findings of the study confirm the literature reviewed above, [Ahimbisibwe et al. \(2016\)](#) who posited that supply chain visibility comprises information technology, information exchange, business intelligence gathering and knowledge of asset status, [Swift et al. \(2019\)](#) asserted that the above visibility processes enable a firm to reorganize its supply chain in compliance with both its own requirements and external demands. Again, [Moshood et al. \(2021\)](#) noted that with the latest technologies in the industry, such as Digital Twins, Artificial intelligence (AI), Internet of things (IoT), and Robotic Process Automation (RPA), more automation is now possible for managing end-to-end supply chain visibility and electronic dissemination.

The above findings confirm the rejection of the null hypothesis ( $H_0$ ) and rather accept the alternate hypothesis ( $H_1$ ) that there are supply chain visibility strategies the Kumasi Metro Health directorate is implementing to achieve supply chain visibility.

In the implementation of SCV strategies, bottlenecks are inevitable as it is with human institutions the world over. Respondents agreed that five (5) possible challenges/bottlenecks namely technological constraints, lack of synergy between automated systems and manual operations, inconsistencies in the flow of data between stakeholders, lack of communication between staff and management leading to poor planning of SCV and budget constraint were the possible bottlenecks in the implementation of SCV in the Kumasi Metro Health directorate.

The findings of the study are consistent with literature as stipulated by [Tarofder et al., \(2017\)](#) supported the argument above by asserting that with regard to utilization of the internet as a SCV tool, possible challenges include lack of senior management support, budget concerns, and insufficient competitive pres-

sure account. They again postulated that lack of executive support is recognized as a potential threat to new technology adoption. Dunakin (2019) also argued that the human aspect of supply chain visibility also comes to play. He maintained that aside the processes being in place and the tasks fairly routine and simple, issues with communication, management and being on the same page is what affects operational efficiency the most which can also pose a challenge to SCV. Then finally, Stanly (2020) observed that common challenges observed are among those indicated above. This led to the acceptance of the alternative hypothesis ( $H_1$ ) that there are challenges/bottlenecks in the implementation of supply chain visibility by Kumasi Metro Health directorate.

The last hypothesis seeks to establish the fact that supply chain visibility practice actually leads to supply chain performance. Majority of the respondents agreed that all the six indicators of SCV implementation actually results in supply chain performance. The regression analysis, ANOVA as well as the coefficient of correlation indicates that SCV implementation positively correlates with supply chain performance which is statistically significant at 1%.

These results confirm the works of various researchers as discussed in the literature review in chapter two. Zhang et al. (2022) admonished earlier on that organizations must be swift and decisive in their decisions at strategic and operational levels regarding the global sourcing of goods and services in order to limit the extent of procurement risks or problems and the best way to do this is visibility. Zhang & Su (2020) in support of the above statement also recommended that organizations should establish relationships networks which can be seen at any point (visibility) with their key suppliers when they perceive supply risks, a sure way to achieve performance. The above concludes that visibility affects supply chain performance significantly. Okore & Kibet (2019) noted that practically, supply chain performance can be achieved through joint product development; thus delivery scheduling and process optimization, with the aim to benefit all parties involved. They concluded that the entire supply chain can work in a synchronized manner, as if it was just one company when information sharing and collaboration is allowed.

Sardi et al. (2020) explain the dimension of efficiency as the interpretation of efficiency which results into the kind of recorded and communicated information that can be shared and utilized in order to upgrade and enhance procedures. Asnordin et al. (2021) concluded that the vital role of supply chains in a firm's competition has necessitated the need for keeping track of procedures (visibility) to manage not only the business's performance, but additionally that of the supply chain performance as well.

## 5. Summary of Major Findings

The study seeks to identify the supply chain visibility strategies of Kumasi Metro health directorate as its first research objective. Based on the results, the following conclusions were drawn. Kumasi Metro health directorate is implementing

supply chain visibility as a supply chain tool using the following strategies; exchange or share information measures, use of asset status knowledge strategy and improve electronic dissemination strategy. Moreover, most of the staff members were neutral when it comes to the following as SCV strategies, that is; use of Information Technology strategy, gather of Business Intelligence strategy and use of filtering and monitoring measures.

The following findings were made from the second objective which investigates possible bottlenecks of supply chain visibility in Kumasi Metro health directorate. The study revealed that, technological constraints, lack of synergy between automated systems and manual operations, inconsistencies in the flow of data between stakeholders, lack of communication between staff and management leading to poor planning of SCV and budget constraint were noted by the respondents as the possible bottlenecks in the implementation of SCV in the Kumasi Metro Health Directorate. However, the study further concluded that the bottlenecks stated above, if not checked, will hamper the smooth implementation of the SCV.

The third objective delved into examining the effects of supply chain visibility on supply chain performance of Kumasi Metro directorate. The study revealed that most of the respondents agreed that supply chain visibility has an effect on the performance of supply chain of Kumasi Metro Health directorate. The respondents agree to the fact that establishing network which can be seen at any point, being swift and decisive in strategic and operational levels decisions, high levels of delivery schedules and process optimization, sharing information and effective collaboration with stakeholders, on time usage of quality products and finally enhanced cycle time which benefits all its supply chain partners are the supply chain visibility practices that lead to effective supply chain performance in Kumasi Metro Health directorate.

## 6. Conclusion

Based on the confirmation of the alternative hypothesis to the effect that “there is a supply chain visibility strategy”, the conclusion drawn from the findings is that most of the staff of the supply chain/procurement have a fair idea of the strategies being used to implement supply chain visibility in Kumasi Metro Health directorate. With the rejection of the null hypothesis of the study which states that “there are no bottlenecks in the implementation SCV”. The conclusion drawn was that the staff of the supply chain/procurement offices of the Kumasi Metro Health directorate appreciated and acknowledged the fact that bottlenecks/challenges exist in their quest to implement the strategies of supply chain visibility in Kumasi Metro Health directorate. The third hypothesis also confirmed the alternative which states that “SCV has a positive effect on Supply chain performance”. The study concluded that supply chain visibility strategies have a positive and statistically significant effect on supply chain performance in Kumasi Metro Health directorate.

## 7. Recommendations

The study established that SCV strategies play an important role in increasing supply chain performance. Based on this, the study recommended that Kumasi Metro Health directorate needs to take SCV strategies being used and the other ones not being used in supply chain visibility operations seriously if they are to deliver high quality services to their customers.

The study revealed that networking as a SCV in the form of Information Technology, Business Intelligence as well as Filtering and Monitoring influences supply chain performance in Kumasi Metro Health directorate. This research therefore recommended that the supply chain/procurement department of Kumasi Metro Health directorate needs to adopt effective networking programs in order to enhance customer satisfaction and supply chain efficiency hence increasing supply chain performance.

The study recommends that the bottlenecks investigated by the study should be tackled and addressed by the management of Kumasi Metro Health directorate in order to ensure smooth implementation of supply chain visibility since it becomes easier to achieve SC performance.

## 8. Limitations

The researchers encountered a number of stumbling blocks in the process of seeking information to undertake the study some of which are listed below:

The researchers had a tough time getting permission to distribute the questionnaire to the staff due to the long bureaucratic process of government institutions in Ghana.

Again, the COVID 19 pandemic has also changed the face of questionnaire administration in Ghana since some of the respondents sometimes use it as an excuse to refrain from taking part in the research. Some of the respondents unduly delayed in answering the questionnaire which nearly affected the time lines of the researcher. Last but not least, financial constraints posed considerable challenge to the researchers especially travelling to and from the various Municipals and the Sub-Metros of the Kumasi Metro several times for the administering and collection of the questionnaire.

## 9. Recommendations for Further Research

The study recommends that any future research should consider incorporating supply chain visibility within the public procurement law. Again, future research can also consider extending the work to various hospitals within the Metropolis.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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