

IMPACT OF SUSTAINABLE SUPPLY CHAIN IN GHANA'S PHARMACEUTICAL SECTOR ON UPSTREAM PHARMACEUTICAL INDUSTRY

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ABSTRACT

Purposes: In today's business landscape, success isn't solely reliant on financial goals. Adapting to the global economy is crucial for a company's viability. Stakeholders prioritize business sustainability, evident in empirical studies exploring sustainable supply chain management theories in the sector. The study aimed to assess how Sustainable Supply Chain in Ghana's Pharmaceutical Sector influences firm performance within the upstream industry.

Method: The study was conducted in the accessible southern part of Ghana, known for its concentration of pharmaceutical companies. Specifically, individuals involved in procurement and supply chain activities within these companies were selected for inclusion in the study. The study used quantitative methods to explore Sustainable Supply Chain Management (SSCM) in the upstream pharmaceutical industry. Out of 2000, 210 managers were randomly sampled, and SPSS Version 26 was employed for structural equation modeling (SEM) analysis.

Results and Conclusion: The study found that there was a significant relationship between SSCM and supply chain performance (SSCMP). Besides, the study found moderation impact between Top Management Commitment (TMC) and SSCM and SSCMP respectively. Pharmaceutical companies should not solely focus on economic performance; rather, strategic efforts and policies must prioritize sustainability. Top management commitment is crucial for enhancing supply chain performance. Their dedication ensures the integration of Sustainable Supply Chain Management (SSCM) with strategic objectives, embedding sustainability across the entire supply chain, from procurement to distribution.

Research Implication: Top management should drive sustainability strategy, integrating it into operations and fostering a culture of sustainability for robust Sustainable Supply Chain Management in the pharmaceutical upstream sector.

Originality/Value: the study leverages on the theoretical understanding of upper echelon theory to provide empirical evidence on the impact of top management commitments on performance of supply chain which hitherto has been scarcely deployed in recent years.

Keywords: operational performance, pharmaceutical supply chain, supply chain performance, sustainable supply chain, top management commitment, upper echelon theory.

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IMPACTO DA CADEIA DE ABASTECIMENTO SUSTENTÁVEL NO SETOR FARMACÊUTICO DO GANA NA INDÚSTRIA FARMACÊUTICA A MONTANTE

RESUMO

Propósitos: no panorama empresarial atual, o sucesso não depende apenas das metas financeiras. Adaptar-se à economia global é crucial para a viabilidade de uma empresa. As partes interessadas priorizam a sustentabilidade empresarial, evidente em estudos empíricos que exploram teorias de gestão da cadeia de fornecimento sustentável no setor. O estudo teve como objetivo avaliar como a Cadeia de Suprimento Sustentável no Setor Farmacêutico de Gana influencia o desempenho firme dentro da indústria a montante.

Método: O estudo foi realizado na parte sul acessível de Gana, conhecida por sua concentração de empresas farmacêuticas. Especificamente, indivíduos envolvidos em atividades de aquisição e cadeia de suprimentos dentro dessas empresas foram selecionados para inclusão no estudo. O estudo utilizou métodos quantitativos para explorar a Gestão Sustentável da Cadeia de Suprimentos (SSCM) na indústria farmacêutica a montante. Em 2000, 210 gerentes foram amostrados aleatoriamente, e a versão 26 do SPSS foi empregada para análise de modelagem de equações estruturais (SEM).

Resultados e Conclusão: O estudo constatou que havia uma relação significativa entre o SSCM e o desempenho da cadeia de suprimentos (SSCMP). Além disso, o estudo encontrou um impacto de moderação entre o Top Management Commitment (TMC) e o SSCM e o SSCMP, respectivamente. As empresas farmacêuticas não devem concentrar-se apenas no desempenho econômico; em vez disso, os esforços e as políticas estratégicos devem dar prioridade à sustentabilidade. O compromisso da alta gerência é crucial para melhorar o desempenho da cadeia de fornecimento. Sua dedicação garante a integração da Gestão Sustentável da Cadeia de Suprimentos (SSCM) com objetivos estratégicos, incorporando a sustentabilidade em toda a cadeia de suprimentos, desde a aquisição até a distribuição.

Implicação da Pesquisa: A gestão de topo deve impulsionar a estratégia de sustentabilidade, integrando-a em operações e promovendo uma cultura de sustentabilidade para a gestão robusta da cadeia de fornecimento sustentável no setor farmacêutico a montante.

Originalidade/valor: o estudo aproveita a compreensão teórica da teoria do escalão superior para fornecer evidências empíricas sobre o impacto dos compromissos de gestão superior no desempenho da cadeia de suprimentos, que até agora foi pouco implantado nos últimos anos.

Palavras-chave: desempenho operacional, cadeia de suprimentos farmacêutica, desempenho da cadeia de suprimentos, cadeia de suprimentos sustentável, compromisso de gestão superior, teoria superior echelon.



IMPACTO DE LA CADENA DE SUMINISTRO SOSTENIBLE EN EL SECTOR FARMACÉUTICO DE GHANA EN LA INDUSTRIA FARMACÉUTICA ASCENDENTE

RESUMEN

Propósitos: En el panorama empresarial actual, el éxito no depende únicamente de los objetivos financieros. Adaptarse a la economía global es crucial para la viabilidad de una empresa. Las partes interesadas priorizan la sostenibilidad empresarial, evidente en estudios empíricos que exploran teorías de gestión sostenible de la cadena de suministro en el sector. El estudio tuvo como objetivo evaluar cómo la cadena de suministro sostenible en el sector farmacéutico de Ghana influye en el rendimiento de la empresa dentro de la industria ascendente.

Método: El estudio se llevó a cabo en la parte meridional accesible de Ghana, conocida por su concentración de empresas farmacéuticas. Específicamente, se seleccionaron individuos involucrados en actividades de compras y cadenas de suministro dentro de estas empresas para su inclusión en el estudio. El estudio utilizó métodos cuantitativos para explorar la Gestión Sostenible de la Cadena de Suministro (SSCM) en la industria farmacéutica ascendente. De 2000, 210 gerentes fueron muestreados aleatoriamente, y se empleó la versión 26 de SPSS para el análisis de modelado de ecuaciones estructurales (SEM).

Resultados y conclusión: El estudio encontró que había una relación significativa entre el SSCM y el desempeño de la cadena de suministro (SSCMP). Además, el estudio encontró un impacto de moderación entre el Compromiso de Alta Dirección (TMC) y el SSCM y el SSCMP, respectivamente. Las empresas farmacéuticas no deben centrarse únicamente en el desempeño económico, sino que los esfuerzos y políticas estratégicos deben priorizar la sostenibilidad. El compromiso de la alta dirección es crucial para mejorar el rendimiento de la cadena de suministro. Su dedicación garantiza la integración de la Gestión Sostenible de la Cadena de Suministro (SSCM) con objetivos estratégicos, incorporando la sostenibilidad en toda la cadena de suministro, desde la adquisición hasta la distribución.

Implicación de la investigación: La alta dirección debe impulsar la estrategia de sostenibilidad, integrándola en las operaciones y fomentando una cultura de sostenibilidad para una gestión sólida de la cadena de suministro sostenible en el sector farmacéutico ascendente.

Originalidad/Valor: el estudio aprovecha la comprensión teórica de la teoría del escalafón superior para proporcionar evidencia empírica sobre el impacto de los compromisos de la alta dirección en el rendimiento de la cadena de suministro, que hasta ahora se ha desplegado escasamente en los últimos años.

Palabras clave: desempeño operacional, cadena de suministro farmacéutico, desempeño de la cadena de suministro, cadena de suministro sostenible, compromiso de alta dirección, teoría del escalón superior.

1 INTRODUCTION

The marketing climate of organizations is not static rather it continues to evolve due to marketing conditions that remains beneficial to the changes itself to benefit from these changes (Dolumbia et al., 2021; Hoffman & Bowditch, 2020; McWilliams et al., 2018). Given the present global economy, entities that find it difficult to adapt are likely



to be without the requisite resources or faced with failure. One of the primary concerns of stakeholders revolves around business sustainability. Several empirical studies report on sustainability of businesses in the supply chain management sector through different theories on sustainable supply chain management (SSCM) (Brandenburg & Rebs, 2015; Koberg & Longoni, 2019; Sánchez-Flores et al., 2020). Pharmaceutical industry continues to be one of the leading industries that produces huge waste within the environment (aus der Beek et al., 2016; Hoffman & Bowditch, 2020; Shree Bhagwati, 2016). Examining their sustainability adoption therefore becomes very important.

Pharmaceutical sustainable supply chain management can be seen in five tiers (primary manufacturing, secondary manufacturing, main and local distribution centers, and destination zones) (Zahiri et al., 2017a). The market environment of an organization experiences different changes continually and since these changes affect operations and profitability, an organization must position itself to take advantage of these changes. Firms that cannot adopt to the new ways of operation in this global world, either lose resources or eventually collapse (Aduhene & Osei-Assibey, 2021; Dogbe et al., 2019). Sustainable Supply chain management (SSCM) may be considered as the effective and efficient management of the associated environment, social, and economic consequences in the construction and maintenance of global supply chains (Dubey et al., 2017; Muñoz-Torres et al., 2020; Thorlakson et al., 2018). Sustaining the environment and social demand will ensure that businesses become sustainable in their operations. Leveraging the existing supply chain to ensure sustainable business development is one of the numerous strategies businesses market leaders deploy (Adjei-Bamfo et al., 2019; Scholten & Fynes, 2017).

Empirical study by Nsowah¹ and Phiri (2023) identified various issues that policymakers should address to promote SSCM practices, including energy and material consumption, recycling and recovery, standardized product design, environmentally friendly materials and processes, easy disassembly, and product life cycle analysis (Nsowah & Phiri, 2023). In the study by Hong, Zhang and Ding (2018) where SC dynamic capabilities and Sustainable Supply Chain Management practices were considered, findings were that SC dynamic capabilities had a positive significant impact on environmental performance but did not have any significant influence on the two other indicators of sustainable performance: economic and social indicators. The study further found a partial mediation effect on the association between SSCM practices and



enterprise performance. The findings highlight the significance of reinforcing SC dynamic capabilities and implementing effective SSCM practices, particularly for firms in developing countries, to enhance overall performance (Hong et al., 2018).

Empirical studies on sustainable supply chain management have focused rather on the general manufacturing industry within developing countries (Nsowah & Phiri, 2023; Tyan et al., 2020) with limited focus on the pharmaceutical sub-sector. Understanding of sustainable supply chain management within pharmaceutical industry within developing countries like Ghana will provide information that guide policy and business strategies within the sector. This study aims to establish how businesses can become sustainable. The paper is structured in various sections as follows: introduction, literature review, methodology, result, conclusion and recommendation. The context of this paper was featured in the introduction. Thereafter the literature section detailed secondary data on the supply chain management, the sustainable supply chain, pharmaceutical supply chain as well as the theory that underpins the study.

2 RELATED LITERATURE

2.1 SUPPLY CHAIN MANAGEMENT

Supply chain management (SCM) is the embodiment of institutional or organizational procedures and processes that ensures that raw materials are transformed into finished products for the onward delivery to the customer (Chanthes et al., 2023; Langley et al., 2020; LeMay et al., 2017). SCM ensures the maximization of customer value from the perspective of supply-side operation and consolidate competitive position of the firm within the market (Copacino, 2019; Mukhamedjanova, 2020). Suppliers undertake to design and implement the supply chains that are as effective and cost-effective as possible through the SCM procedures. Product development, sourcing, production, logistics, as well as the information systems as the key coordinators of these activities are all covered by procedures of SCM (Mangan & Lalwani, 2016; Mukhamedjanova, 2020; Xu & Zhao, 2022). SCM procedures are followed to increase customer value and create a long-lasting competitive advantage (Mukhamedjanova, 2020).



The aim of SCM is to centrally coordinate or link the activities of product's production, shipment, as well as distribution. Both the private and public entities can reduce unnecessary expenses and to enhance the overall delivery of goods to customers through the management of supply chain. According to Xu and Zhao (2022) and Truong et al (2017, different related activities such as internal inventories and production, internal sales and distribution as well as company inventories that all closely monitored to achieve the stated objectives (Truong et al., 2017; Xu & Zhao, 2022).

The embodiment of SCM is the careful and systematic connection of all stakeholders within the supply chain for the successful delivery of transformed goods and services. Thus, several firms interact and or collaborate to ensure that customers are satisfied in the most profitable manner as far as possible (Truong et al., 2017; Xu & Zhao, 2022). Notwithstanding the well-established presence of supply chain across the globe, firms continue to grapple with the challenge of supply chain management and more so the complex nature of sustainable supply chain management and the recognized value they can add to their operations (Hong et al., 2018; Mukhamedjanova, 2020; Truong et al., 2017).

2.2 SUSTAINABLE SUPPLY CHAIN

Sustainable supply chain management encompasses actions that businesses take towards self-identifying the impact that their products are likely to pose to the environment as well as people once procured, processed, stored, transported, and all the links in between from where they sourced products and materials (Ding, 2018; Hong et al., 2018; Koberg & Longoni, 2019). The goal is to positively impact people and societies within their reach of operations, excluding negative impacts by drawing down utilization rates for energy, water, and waste production (Cristini et al., 2021; Hong et al., 2018; Islam et al., 2020; Nangpiire et al., 2024; Nurmala et al., 2024).

Fundamentally, businesses must be seen to be addressing not only the economic aspect of the environment where they operate but contributing to social and environmental aspect as well (Nurmala et al., 2024; Sánchez-Flores et al., 2020). As per this, an encompassing strategy is seized to reduce waste and environmental facet together with improving working conditions, health and safety, and thereby, eradicating labor exploitation (Adegoke et al., 2021; da Silva et al., 2019). An ethical supply chain that



would be fully sustainable is one that would encompass all facets of the business and ensure that every practice is ethical. It not only helps environmental and occupants 'health but also supports the commercial growth that is required for the economic growth of a city (Adegoke et al., 2021; da Silva et al., 2019; Dai et al., 2021). Simply, a supply chain that assimilates moral behavior and environmentally friendly consideration unbroken into a competitive worth creating model is known as sustainable.

The sustainability strategy for the supply chain should incorporate all aspects of procurement, production, packaging, delivery, end consumer sales, and returns and disposal of used products (Adegoke et al., 2021; Baah & Jin, 2019; Jia et al., 2018). This sort of compliance objectives and sustainability criteria for ethical supply chain management are following the standardization as the firms are coming hard and with urgency for responsibility. For the attainment of sustainable supply chain management across the globe, United Nations Global Compact postulated 10 criteria as a benchmark (da Silva et al., 2019; Shoukoohyar & Seddigh, 2020). Some important topics that have been addressed in the 10 criteria include but are not limited to labor issues, corruption, and environmental responsibility. The aforementioned 10 principles are based on this premise that sustainable or responsible behaviors and purchasing bring value not only to people and the earth but also to the companies and their competitive advantage and sustainable profitable future (da Silva et al., 2019).

2.3 PHARMACEUTICAL SUPPLY CHAIN

The pharmaceutical supply chain embodies an entire system of ensuring that drugs and pharmaceutical services are delivered to patients in a timely and profitable manner (Ding, 2018; Omoush et al., 2020). Pharmaceutical products are manufactured and transferred to wholesale distributors before being stocked in retail, mail-order, and other types of pharmacies (Chen et al., 2019; Papalexii et al., 2020; Sood et al., 2021). They are then subjected to price negotiations and processed through quality and utilization management screens by pharmacy benefit management companies before being dispensed by pharmacies and finally delivered to and taken by patients (Ouf, 2021; Papalexii et al., 2020). However, owing to the constant dynamics of the different stakeholders in the supply chain and the differentiation of the commercial relationships



based on area, type of medication, and other factors, there are countless variations to this basic framework (Ouf, 2021; Papalexi et al., 2020).

While the structure of the chain particularly in the pharmaceutical industry makes it challenging to manage such complexities for proper supply chain efficiency, the gains are evident. Frequent and systematic inaccurate inventory control measures could be due to ineffective information systems and transport costs could be impacted (Ding, 2018; Papalexi et al., 2020; Shree Bhagwati, 2016). In the pharmaceutical supply chain process, pharmaceutical manufacturers act as the channel supply for the prescription medications. The pharmaceutical manufacturing business comprises manufacturers of brand-name pharmaceuticals and those of generic drugs manufacturers (for instance Pfizer, Merck, and Novartis). Many generic pharmaceutical organizations give some of their revenue for international research and production of new pharmacological treatments (Ding, 2018; Shree Bhagwati, 2016). Manufacturers are responsible for the distribution of drugs starting from the manufacturing plants and sometimes up to drug wholesalers, retail pharmacy chains, mail, order and specialty program pharmacies, and Hospital chains (Chen et al., 2019; Shree Bhagwati, 2016; Sood et al., 2021).

There is no robust, economic and versatile supply chain in the pharmaceutical firms (Pwc Report-Pharma 2020). The industry supply chain stretches from research, development and manufacturing of products that may include drugs or medical equipment, packaging, and distribution through medical wholesalers, retailers, and pharmacy as well as direct engagement with the patient. Today's pharmaceutical firms no longer employ JIT or production-on-demand systems of operation, for they produce their products, stockpile the commodities and subsequently diminish their efficiency.

2.4 ORGANIZATIONAL PERFORMANCE

The idea of organizational performance might be hazy (Đorđević et al., 2020; Omran et al., 2021). Depending on the company, its objectives, and the market, organizational performance may be arbitrary. While the idea itself relies on numerous indicators that characterize the given organization, experts struggle with identifying what more organizational performance even implies on a universal level due to the lack of a universally accepted definition (Đorđević et al., 2020; Omran et al., 2021; Princy & Rebeka, 2019).



The term "performance" has been defined in a variety of ways by various authors (Đorđević et al., 2020; Omran et al., 2021). Attaining the performance translates into achieving the goals. Since performance is a relative metric and an organization's objectives cannot be accurately defined or are multiplied, defining performance becomes more and more challenging (Elena-Iuliana & Maria, 2016). It is necessary to distinguish a set of measures in terms of evaluating the performance of the overall organization so that every aspect can be examined and appraised properly. There is a conscious effort to extend the meaning of the measure of organizational performance to include sustainability of work processes and outcomes (Balasubramanian & Shukla, 2017).

The literature has also extensively studied how adopting SSCM methods affected organizational performance. Similar conclusions were drawn by Balasubramanian and Shukla (2017) in their research on the application of SSCM techniques in the construction industry, where the authors found out that using environmentally sustainable SSCM practices can lead to the positive effects on the economic performance indicators (Balasubramanian & Shukla, 2017). On the other hand, Zailani et al. (2012) have also classified many performance indicators as competitiveness, financial performance, economic, marketing performance and environmental performance. Some authors took a broader perspective stating their view (Zailani et al., 2012).

2.5 UPPER ECHELON THEORY

Hambrick and Mason presented the upper echelons theory as a management theory in 1984. It claims that the managerial background traits of the top-level management team can predict organizational outcomes in part. The hypothesis aims to explain a relationship between management background traits and organizational outcome. It emphasizes how top-level management team members' managerial backgrounds may help predict organizational results to some extent. Performance within the organizational setting is heavily influenced by the ideals, knowledge, and traits of top managers (Díaz-Fernández et al., 2020; J. Kim, 2021; Tran & Pham, 2020). The core tenet of the upper echelons hypothesis is that top executives view their situations, including opportunities, risks, options, and the likelihood of various outcomes, through highly personalized lenses. These distinct views of strategic issues are a product of executives' experiences, values, personalities, and other human traits. According to the



notion, as a result, firms adopt the traits of their top executives (Díaz-Fernández et al., 2020; Hambrick, 2018; J. Kim, 2021).

The idea that organizational results are better understood as the consequence of collective decision processes rather than individual action is one of the supporting notions in Hambrick and Mason's (1984) paper, which is generally seen as crucial to the upper echelons theory (Hambrick, 2018). This is because strategic choices often include more than simply the CEO (CEO). As a result, top management team (TMTs) is frequently seen as a key component of upper echelons theory.

Top executives are known to have a substantial influence in establishing the course of a business, according to the upper echelon theory (Díaz-Fernández et al., 2020; Hambrick, 2018). Managers oversee daily operations, participate in the creation of policies and strategies, and put them into practice so that goals may be reached. Institutional goals for themselves are impossible to achieve. Managers that are sincerely devoted to their mission so set the example and enable employees to follow proper procedures, foster collaboration where appropriate, and get resources in the proper way to improve performance outcomes (Hambrick, 2018; J. Kim, 2021)

Extant literature has shown that upper echelon theory relies on two pillars: CEO experience and CEO personality (Hambrick, 2018; Tran & Pham, 2020). Top managers have a significant impact on organizational results through the decisions they make, which are in turn influenced by the managers' personal qualities, according to the theory. According to Hambrick and Mason (1984), an organization's success may be explained in part by the characteristics of the organization's highest echelons and their strategic choices. The Upper Echelon Theory is often applied in the context of organizational and employee performance. Additionally, the upper echelon theory's primary framework is the cognitive and value domains of top management. The Upper Echelon Theory has expanded in existing literature to focus on situational variables, including company and environmental features (Kim, 2021; Tran & Pham, 2020).

Executive compensation, succession planning, and governance procedures are just a few of the many phenomena that the idea of management discretion has an impact on. The moderator of all upper echelons forecasts is management discretion, namely that executive traits will only be reflected in organizational outcomes to the extent that executives have discretion. Literature has demonstrated importance of top management commitment within organizations and how this leads to several gains within the



organization (Hedima et al., 2020; Zahiri et al., 2017b). Practically, the top management theory and upper echelon theory provide some underpinnings to why top management are important to ensuring that strategy adoption and implementation, and overall organizational performance increases within an organization (Dubey et al., 2018). With the forgoing understanding on upper echelon theory, this study adopts same and relies on the top-management as a moderator of the attainment of high-performance outcomes as sustainable supply chain practices are undertaken.

2.6 HYPOTHESES

H1a. Environmental management practices are a proxy for sustainable supply chain management.

H1b. Socially inclusive practices for employees are a proxy for sustainable supply chain management.

H1c. Socially inclusive practices for the community are a proxy for sustainable supply chain management.

H1d. Supply chain integration is a proxy for sustainable supply chain management.

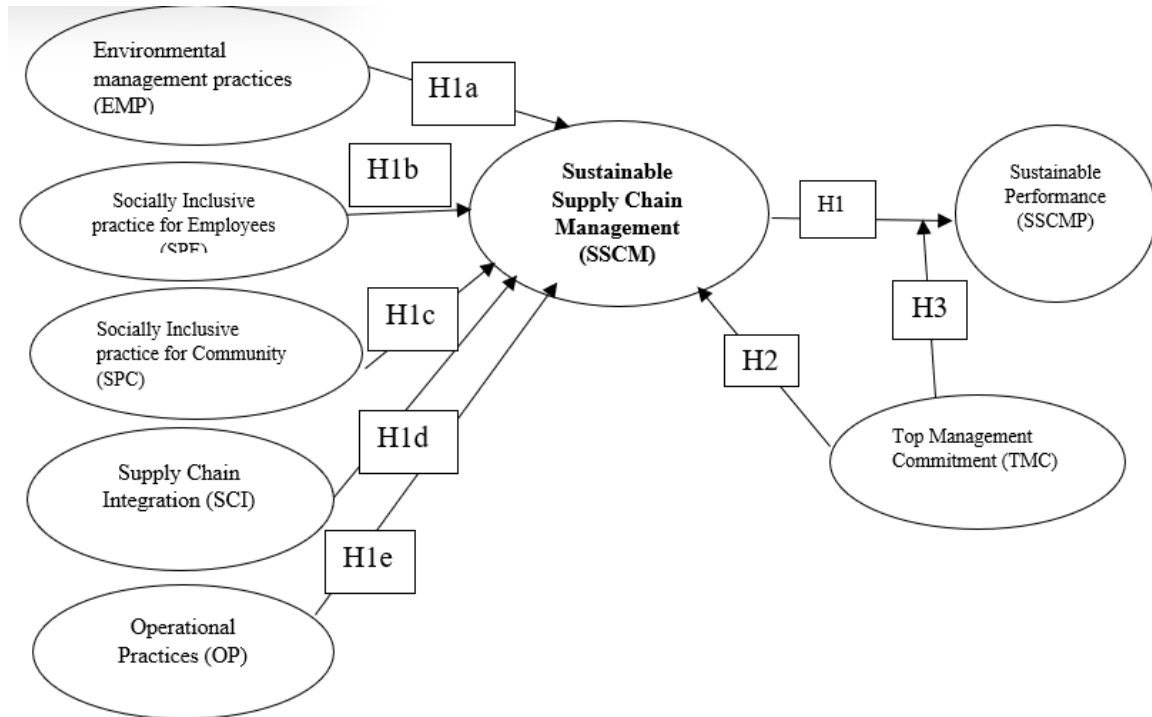
H1e. Operations practices are a proxy for sustainable supply chain management.

2.7 CONCEPTUAL FRAMEWORK

This study proposes that pharmaceutical sustainable supply chain management practices will lead to increased performance. Thus, top management commitment is considered as a moderating variable as depicted in Figure 1 below.

Figure 1

Conceptual Framework



According to the upper echelon theory (UET), senior managers' perceptions of their corporate environments have an impact on the strategic decisions they make, which in turn have an impact on the performance of the firm (Díaz-Fernández et al., 2020; Hambrick, 2018). It goes on to say that their cognitive foundation and values limit their fields of vision, or the areas that top managers focus on, and by extension, the impressions of the environment that follow. This is due to the fact that the additional process is restricted by the finite amount of information that humans can comprehend at any given moment. As a result, our decision to pay attention to particular aspects of the environment is influenced by our personality traits and dispositions. In other words, top managers' personal traits dictate the components of their surroundings that they can perceive and what they perceive influences the strategic decisions that they make about sustainable supply chain management practices, which in turn affect the organization's bottom line.

3 RESEARCH METHOD AND DESIGN

This study employs the quantitative research designs with the aim of examining upstream pharmaceutical sustainable supply chain management practices and how these



practices influence the performance of upstream pharmaceutical companies in Ghana. Specifically, this study adopts explanatory research design framework to assess the relationships that exist among the key variables of interest: pharmaceutical sustainable supply chain management practices, top management commitment, and performance. Through the explanatory design the study explains the relationship that exist among the independent variable (that is, upstream pharmaceutical sustainable supply chain management practices), moderator (that is, top management commitment), and dependent variable (organizational performance) (Casula et al., 2021).

The study focuses on upstream pharmaceutical sustainable supply chain management practices. The entire study was conducted within the southern part of Ghana where it is comparatively easier to move about and collect data. Again, the southern belt of the country has a lot of pharmaceutical companies. Within the various pharmaceutical companies, those who will form part of the study are those who deal directly with procurement and supply chain activities.

To collect data from participants, this study first designed the questionnaire on google forms and distributed it to participants under the quantitative design framework. The quantitative analytic method will involve the application of structural equation modelling, data will be presented in tables, charts, and text where necessary.

To meet the requirements of the maximum likelihood method of estimation for structural equation modeling, it is important to verify the normalcy assumption before examining the validity and reliability of the measurement items. The threshold values are expected to fall within the ranges necessary to support the univariate normality assumption (univariate skewness 2, kurtosis 7) (Cain et al., 2017; Jammalamadaka et al., 2021; H.-Y. Kim, 2013).

4 FINDINGS AND DISCUSSIONS

4.1 DESCRIPTIVES ANALYSIS

The study distributed a total of 350 questionnaires to managers in varied supply chain position within the upstream pharmaceutical supply chain. A total of 288 were retrieved. This represents 82.29% response rate. Through data screening a total of 210 retrieved questionnaires were finally used for this study. Overall, 72.92% of retrieved



data were used in the final analysis. The demographic information of the respondents is depicted in Table 1 below.

Table 1
Demographic Information

		Frequency	Percent	Cumulative Percent	Mean	Std. Deviation
Gender	Male	133	63.3	63.3		
	Female	77	36.7	100		
Experience in years	2	7	3.3	3.3	12.1333	8.07627
	3	14	6.7	10		
	4	7	3.3	13.3		
	5	28	13.3	26.7		
	6	7	3.3	30		
	8	21	10	40		
	9	7	3.3	43.3		
	10	14	6.7	50		
	11	7	3.3	53.3		
	12	7	3.3	56.7		
	13	14	6.7	63.3		
	14	7	3.3	66.7		
	15	21	10	76.7		
	17	7	3.3	80		
	18	7	3.3	83.3		
	19	7	3.3	86.7		
	21	7	3.3	90		
22	7	3.3	93.3			
30	7	3.3	96.7			
38	7	3.3	100			
Position	Director Supply Chain	14	6.7	6.7		
	Manager Procurement	91	43.3	50		
	Manager Logistics	56	26.7	76.7		
	Manager Others	7	3.3	80		
	N of Respondents	42	20	100		
		210	100			

To bolster the case of experience and industry understanding of supply chain engagement and practices, the data from Table 4.1 indicates that the managers surveyed had an average of 12 years work experience in their current positions.

4.2 MEASUREMENT MODEL ANALYSIS

The measurement model has been applied in this research (Hair et al., 2017; Leguina, 2015). Utilizing the measurement model, the validity and reliability of the



variables were examined. Cronbach's alpha and composite reliability are used to measure reliability, whereas convergent validity and discriminant validity are used to conduct a validity checks.

Extant literature has relied on skewness and kurtosis to measure normality of data (Bayoud, 2021; Blanca et al., 2013; Jammalamadaka et al., 2021). Skewness measures the degree of asymmetry in the distribution, while kurtosis measures the degree of peakedness or flatness in the distribution.

Table 2

Normality Test

Factors	Indicators	Mean	Median	Standard deviation	Skewness	Kurtosis
Operational Practices (OP)	SSCM1	3.47	4.00	1.23	-0.193	-1.270
	SSCM2	3.07	3.00	1.34	0.045	-1.230
	SSCM3	3.53	3.50	1.03	-0.278	-0.348
	SSCM4	3.50	3.50	0.99	-0.310	-0.188
	SSCM5	3.60	4.00	1.17	-0.681	-0.411
Supply Chain Integration (SCI)	SSCM6	3.77	4.00	1.18	-0.657	-0.676
	SSCM7	3.57	4.00	1.15	-0.567	-0.355
	SSCM8	3.67	4.00	0.87	-0.216	-0.598
	SSCM9	3.33	3.00	1.14	0.280	-1.330
Environmental Management Practices (EMP)	SSCM10	3.10	3.50	1.28	-0.384	-1.080
	SSCM11	3.40	4.00	1.12	-0.549	-0.521
	SSCM12	3.43	3.50	1.15	-0.371	-0.577
	SSCM13	3.53	4.00	1.03	-0.466	-0.324
	SSCM14	3.47	4.00	0.99	-0.631	-0.275
	SSCM15	3.40	4.00	1.15	-0.426	-0.645
	SSCM16	3.70	4.00	1.16	-0.818	-0.102
Socially Inclusive Practices for Employees (SPE)	SSCM17	3.70	4.00	1.10	-0.896	0.327
	SSCM18	3.90	4.50	1.38	-1.060	-0.092
	SSCM19	3.33	3.50	1.20	-0.431	-0.643
	SSCM20	3.67	4.00	1.25	-0.592	-0.717
Socially Inclusive Practices for Community (SPC)	SSCM21	3.53	4.00	0.96	-0.096	-0.925
	SSCM22	3.13	3.00	1.23	-0.257	-0.892
	SSCM23	2.93	3.00	1.24	0.128	-0.959
Environmental performance (EPR)	EPR1	3.70	4.00	0.86	-0.321	-0.487
	EPR2	3.70	4.00	0.94	-0.839	0.774
	EPR3	3.57	4.00	0.96	-0.886	0.291
Operations performance (OPR)	OPR1	3.50	3.50	0.89	0.000	-0.714
	OPR2	3.70	4.00	0.94	-0.839	0.774
	OPR3	3.57	4.00	0.99	-0.707	0.004



Factors	Indicators	Mean	Median	Standard deviation	Skewness	Kurtosis
Community-centred social performance (CSP)	CSP1	3.40	4.00	1.05	-0.339	-0.697
	CSP2	3.10	3.00	1.22	-0.082	-1.070
	CSP3	3.33	3.50	1.20	-0.431	-0.643
Top Management Commitment (TMC)	TMC1	4.00	4.00	0.93	-0.499	-0.771
	TMC2	3.67	4.00	0.87	-0.216	-0.598
	TMC3	3.70	4.00	1.04	-0.815	0.042
	TMC4	3.40	3.00	1.02	0.084	-1.120
	TMC5	3.83	4.00	0.97	-0.767	0.614
	TMC6	3.37	4.00	1.17	-0.622	-0.503
	TMC7	3.60	4.00	1.15	-0.248	-1.370
	TMC8	3.50	4.00	0.89	-0.291	-0.714
	TMC9	3.33	3.00	1.20	-0.075	-0.846

Skewness and kurtosis should be between -2 and +2 and -7 and +7, respectively, as a general guideline for testing normality (Bayoud, 2021; Blanca et al., 2013; Kwak & Park, 2019). As can be observed from Table 2, both the skewness and kurtosis calculated in this study were within the typical range for achieving normalcy.

4.3 CONVERGENT VALIDITY AND DISCRIMINANT VALIDITY

One intermediate reliability criterion is Cronbach's alpha. According to the results, Cronbach's coefficient appears to be more than 0.7 for each construct, indicating that each element is reliable (Hair et al., 2017; Leguina, 2015).

Table 3

Reliability Indices

Variable	Cronbach's α	Ordinal α	ω_1	ω_2	ω_3	AVE
SSCM	0.957	0.964	0.963	0.963	1.054	0.603
TMC	0.928	0.949	0.944	0.944	1.015	0.747
SSCMP	0.852	0.877	0.877	0.877	0.939	0.522

4.4 ASSESSMENT OF STRUCTURAL MODEL (MEASUREMENT MODEL)

The assessment of convergent validity has taken into account the average extracted variance (AVE). As each construct's AVE value is higher than the suggested range of 0.50, ranging from 0.55 to 0.65, all constructs showed significant convergent



validity (Hair et al., 2017; Leguina, 2015). HTMT (Heterotrait-Monotrait Ratio of Correlations) is a criterion for assessing discriminant validity, which is the extent to which constructs that are expected to be different are actually different. Here are the criteria for HTMT: HTMT ratio of two constructs should be less than 0.85. The HTMT ratio is calculated by dividing the correlation between two constructs by the square root of the product of the correlations of each construct with itself. A value below 0.85 indicates that the constructs are sufficiently different from each other. If the HTMT ratio is between 0.85 and 1.00, it suggests that the constructs may have weak discriminant validity and further investigation is needed. A value above 1.00 indicates that the constructs are highly correlated and likely measuring the same underlying construct, which is a violation of discriminant validity.

Table 4

Heterotrait-monotrait (HTMT) ratio of correlations

	SSCM	TMC	SSCMP
SSCM	1.000		
TMC	0.819	1.000	
SSCMP	0.712	0.759	1.000

The estimated HTMT scores were less than 0.85 which indicates that the data is adequately ensuring discriminant validity.

4.5 COEFFICIENT OF DETERMINATION (R-SQUARED (R²))

The coefficient of determination, also known as R-squared (R²), is a statistical measure that indicates the proportion of the variance in the dependent variable that is predictable from the independent variable(s). In simple terms, it measures how well the independent variable(s) explain the variation in the dependent variable. The coefficient of determination ranges from 0 to 1. A value of 0 means that the independent variable(s) have no explanatory power in predicting the dependent variable, while a value of 1 indicates that the independent variable(s) perfectly explain the variation in the dependent variable. The interpretation of the coefficient of determination depends on the context of the analysis. For example, in a regression analysis, the R² value indicates how well the



regression model fits the data. A high R^2 value indicates that the model explains a large proportion of the variation in the dependent variable, while a low R^2 value suggests that the model does not explain much of the variation in the dependent variable.

Table 5

Coefficient of determination

Variable	R^2	Adjusted R^2
SSCMP	0.678	0.668

Therefore, based on the sample data provided, it is found that the adjusted R-squared coefficient is **Adjusted $R^2=0.6685$** , which indicates that approximately 66.85% of the variation in the dependent variable is explained by this linear regression model. It is not always required to re-specify a model if it fits the data well since it is at least partially consistent with the data. The general guideline for ensuring that the model chosen for this investigation has a satisfactory fit is presented in Table 6.

Table 6

Model Fit Threshold and Estimates

Model Fit Index	Rule of thumb values	Model Estimates
CMIN (Chi-square p value)	>.05	0.119
CMIN/df	≤ 3	1.180
Comparative Fit Index (CFI)	$\geq .90$	0.938
Tucker-Lewis Index (TLI)	$\geq .90$	0.935
RMSEA	$\leq .05$	0.001

The stated models generally satisfied the model fit requirement when the RMSEA was less than or equal to 0.05 (RMSEA=0.023). Chi-probability square's value of 0.119 was higher than 0.05.

4.6 HYPOTHESES TESTING - PATH COEFFICIENT

The findings demonstrate that SSCM has a significant and favorable association with SSCMP ($\beta=1.094$, $p < 0.01$), whereas the direct impact of TMC on SSCMP is insignificantly negatively associated ($\beta=-0.045$, $p=0.206$). But the moderation effect of TMC on the association between SSCM and SSCMP was found to be positively significant ($\beta=1.128$, $p < 0.01$).



Table 7

Regression coefficients

Predictor	Outcome	Estimate	Std. Error	z-value	p	95% Confidence Interval		Hypotheses	Status
						Lower	Upper		
OP	SSCM	0.075	0.006	12.618	< .001	0.918	1.256	H1e	Supported
SCI	SSCM	0.083	0.006	13.264	< .001	0.770	1.037	H1d	
EMP	SSCM	0.084	0.005	15.684	< .001	0.859	1.104	H1a	Supported
SPE	SSCM	0.076	0.005	15.767	< .001	0.900	1.156	H1b	Supported
SPC	SSCM	0.077	0.006	13.208	< .001	0.978	1.319	H1c	Supported
SSCM	SSCMP	1.094	0.102	10.677	< .001	0.893	1.295	H1	Supported
TMC	SSCM	0.194	0.048	4.054	< .001	0.100	0.288	H2	Supported
TMC	SSCMP	-0.045	0.035	-1.266	0.206	-0.114	0.025		Not Supported
TMC*SSCM	SSCMP	1.128	0.094	11.979	< .001	0.943	1.313	H3	Supported

4.7 DISCUSSIONS

The findings from this study primarily indicates that there is a significant positive weight for the factors (OP, SCI, EMP, SPE, and SPC) of SSCM. This confirmation of the factors clearly support evidence from earlier empirical studies conducted by Das (2018). Particularly, the positive indication of EMP on SSCM corroborates the earlier works by Das (2018), Yang, Han, Zhou and Yuan (2015) as well as Pagell and Wu (2009). In those studies, emphasis was made for companies to ensure pollution prevention, waste reduction, and product design for the environment. This is a clear support for **H1a** as an indicator of SSCM.

On the part of attaining employee's willingness and commitment to manufacturing of health products by upstream companies, leveraging appropriate labour practices within the supply chain is key as supported in this **study (H1b)**. Thus, the study supported SPE as an indicator of SSCM within the upstream pharmaceutical industry as is the case in the study conducted by Das (2018) and Klassen and Verecke (2012).

This study confirms works conducted by Waddock and Bodwell (2004), where emphasis was made that businesses with inclusive and diversified supply networks are more adept at navigating disruptions like natural catastrophes and geopolitical crises (Waddock & Bodwell, 2004). Simply, **H1c** was supported.



Supply chain integration becomes a central focus as manufacturing firms endeavor to become sustainable. This study confirmed **H1d** and that of earlier extant studies where supply chain integration was used as a proxy for sustainable supply chain management (Dhaigude, Kapoor, Gupta and Padhi 2021).

H1e was confirmed as a proxy for SSCM. Thus, a strong case is upstream pharmaceutical companies to leverage supply chain operational practices such as lean processing, sourcing, warehousing, logistics practices and green purchasing practices with view on maintaining sustainable operations as seen in extant literature (Desta & Legesse, 2021; Truong et al., 2017).

Works by Das (2018) and Wang and Dai (2018) were confirmed as H1 was supported. Thus, SSCM has a significant positive association with supply chain performance (SSCMP). Sustainable supply chain management refers to the integration of environmental, social, and economic considerations into the procurement, production, and distribution processes of a company. Research has consistently shown that sustainable supply chain management practices positively impact supply chain performance. This is because sustainable practices, such as reducing waste, improving energy efficiency, and promoting ethical labor practices, can result in cost savings, increased efficiency, enhanced reputation, and improved stakeholder relationships. In addition, sustainable supply chain management can help companies mitigate risks related to environmental and social issues, leading to long-term sustainability and resilience.

Top management commitment leads to the adopting and implementation of sustainable supply chain practices often as was confirmed in this study (H2). This finding affirms earlier studies (Sandberg & Abrahamsson, 2010; Xu & Zhao, 2022). The decision made by top management has the biggest influence because it affects processes like resource allocation and deployment that affect how environmental policy develops.

Top management commitment plays a critical role in the implementation and success of sustainable supply chain management (SSCM) practices. The findings in this study supported the moderating role of top management commitment (H3). Empirical evidence has shown that top management commitment moderates the association between SSCM and supply chain performance. For example, in a study conducted by Zhu et al. (2018) on Chinese manufacturing firms, it was found that top management commitment positively moderated the relationship between SSCM and supply chain performance. The study revealed that companies with high levels of top management commitment were able



to effectively implement SSCM practices and achieve better supply chain performance outcomes. Similarly, in a study by Walker et al. (2018) on Australian companies, it was found that top management commitment was a critical success factor in the implementation of SSCM practices and was positively associated with improved supply chain performance. When senior management commits the time, money, and expertise at their disposal to these strategies, performance will increase. The more top management is committed to advancing the SSCM agenda, the better the company's overall performance is expected to be.

5 CONCLUSION AND RECOMMENDATION

Based on the literature review and findings thereof, this study makes the following conclusions and recommendations for the attention of those in academia as

5.1 CONCLUSION

Companies within the pharmaceutical industry cannot align themselves with economic performance only, cautious efforts, strategies, and policies must be geared towards the attainment of sustainability. Designing policy framework for attainment of sustainability within the supply chain requires collaborations and stakeholders' engagement. From the perspective of material and services sourcing, material handling and final delivery of finished products to customers, pharmaceutical companies and the industry at large must be seen to be delivering sustainable outputs. By adopting sustainable supply chain management practices, pharmaceutical companies can improve their reputation and credibility, attract new customers, and increase profits. They can also reduce their environmental impact and contribute to the achievement of the United Nations Sustainable Development Goals (SDGs). Moreover, pharmaceutical companies are expected to comply with regulatory requirements regarding environmental and social issues, and the adoption of sustainable supply chain management practices can help them comply with these regulations more effectively.

The attainment of increased performance within the supply chain is further consolidated through the commitment of top management. The alignment of SSCM with the company's strategic objectives and its integration into the wider business plan are



guaranteed by the commitment of top management. This makes it possible to guarantee that sustainability issues are included into every stage of the supply chain, from distribution to procurement. For the purpose of implementing SSCM procedures, financial and human resources must be allocated, and top management commitment is crucial to this process. It might be challenging to obtain the funding required for sustainable projects without the backing of top management.

5.2 RECOMMENDATIONS

The study makes the following recommendations based on the findings and extant literature reviewed based on sustainable supply chain management practices within the pharmaceutical industry. Overall, top management can drive sustainable supply chain practices by adopting crucial steps. Firstly, crafting a clear sustainability strategy aligned with UN Sustainable Development Goals is imperative, outlining specific targets. Secondly, integrating sustainability into daily operations through metrics in performance indicators and establishing dedicated committees to fosters this commitment. Engaging with suppliers is vital, enforcing sustainability standards and providing incentives for eco-friendly practices. The supplier engagement will consolidate the appreciation and incorporation of the interest of stakeholders and by extension the large interest within the community. Encouraging innovation by investing in environmentally conscious technologies and processes is pivotal. Moreover, instilling a culture of sustainability within the organization is crucial, achieved through awareness campaigns, employee engagement, and recognition of sustainable practices. Implementing these recommendations not only showcases top management's commitment to sustainability but also inspires employees, suppliers, and stakeholders to embrace these practices throughout the pharmaceutical industry.



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