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Supply chain integration and supply chain sustainability relationship: A qualitative analysis of the UK and Ghana pharmaceutical industry.

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Abstract

This study identifies and proposes a framework that provides insights into supply chain integration (SCI) and supply chain sustainability (SCS) relationship. Drawing on dynamic capability theory, stakeholder theory, and contingency theory, it analyses primary qualitative data obtained by interviewing managers and executives and conducting observations, as well as secondary data within leading pharmaceutical companies, national pharmaceutical institutions, and regulators in the UK and Ghana. The study illustrates how and why (i) SCS can be achieved through SCI, and (ii) identifies the internal and external contextual factors (IECFs) that influence the relationship between SCI and SCS, that is, 'external uncertainty (EU)', 'patient satisfaction', and 'leadership style'. The contribution of the paper lies in (i) providing an in-depth understanding of the IECFs affecting supply chains' sustainability performance, and (ii) proposing a framework that extrapolates the IECFs influencing the relationship between SCI and SCS for both developed and developing country contexts. Practitioners are provided with guidance on how to effectively and efficiently operationalise SCI to achieve SCS whilst managing the effects of the IECFs on supply chain activities.

Keywords Supply chain integration, Supply chain sustainability, External uncertainty, Pharmaceuticals.

1. Introduction

Over the last years, supply chain integration (SCI) has received attention by both academics and practitioners (Alfalla-Luque et al., 2012; Li et al., 2021; Munir et al., 2020; Yu, 2015; Zhao et al., 2020). Scholars have acknowledged the role SCI plays in improving not only a firm's economic performance (Danese et al., 2020: Munir et al., 2020, Yu, 2015), but also the social and environmental performance measures for all stakeholders within/across the supply chain (Gimenez et al., 2012; Wolf, 2011). A report by PWC (2013) has suggested that industrial firms known to engage in integrating their activities with partners in the supply chain maximized their delivery (98%), cost (93%), and flexibility and responsiveness (74%). A recent article by McKinsey & Company (2020) highlighted the importance of SCI in the success of supply chain organizations.

However, despite the interest of managers and academics in SCI, there are limited studies that discuss how and why SCS can be achieved through SCI (Ahi and Searcy, 2013; Asif et al., 2013: Danese et al., 2020; Gimenez et al., 2012: Wiengarten and Longoni, 2015), and in particular *how and why companies can effectively and efficiently generate and/or transform generated resources through SCI to impact on economic, social, and environmental performance within/across the supply chain* (creating 'truly sustainable supply chains') (Pagell and Shevchenko, 2014) considering all the key supply chain stakeholders from a developed and developing country perspective (Appendix A, Table A1). It is important to consider the three dimensions of SCS as there is a high increase in (1) "stakeholder pressure for companies to consider employee health and safety, and the life of the external community, (2) demand for companies to account for their effective/efficient use of resources" (Gimenez et al., 2012), and (3) "demand for companies to achieve truly sustainable supply chains by improving the economic performance, with no negative impact on environmental/social performances within/across the chain" (Pagell and Shevchenko, 2014). As customers are highly demanding for products that are produced under ethical conditions and are environmentally friendly and price competitive (Wolf,
2011), this raises the timely importance of considering all three dimensions of SCS in studying the SCI-performance relationship, which has been less explored. To address this main gap, the objective for this study is to *explore how and why firms can effectively/efficiently generate and/or transform generated resources through SCI to impact on SCS considering all the key supply chain stakeholders from a developed and developing country perspective.*

To address this gap, we adopted an exploratory qualitative research design (Yin, 2002) with inductive approach. We collected and analysed data through semi-structured interviews, observations, and secondary data from 18 leading pharmaceutical companies, national pharmaceutical institutions and regulators in Ghana and the UK. This study focuses on the pharmaceutical industry as its supply chains are exposed to high and diverse uncertainties, to different and complex supply chains and regulations, and are characterised by high cost (Yadav and Smith, 2012). Aside from these factors, Ghana and the UK industry captures the supply chain activities of leading pharmaceutical companies in the developed and developing country perspective, which also enables the study to capture and examine how such differences (Yadav and Smith, 2012) affect the SCI-SCS relationship similarly/differently. We drew on 'dynamic capability theory' (Beske et al., 2014: Helfat et al., 2007) by exploring how companies create, extend and/or modify resources through SCI to impact SCS. We also drew on 'stakeholder theory' (Freeman, 2005) considering manufacturers, wholesalers, distributors, retailers, regulators, and national trading associations in studying the SCI-SCS relationship as they all play vital roles in ensuring effective/efficient functioning of the supply chain. Lastly, we used 'contingency theory' (Donaldson, 2001) considering pharmaceutical companies in Ghana and the UK and explored how and why such contexts affects the SCI-SCS relationship similarly and differently. Thus, our study contributes to the SCI and SCS literature by considering all the dimensions of SCI and SCS and studying how and why SCI influences SCS, taking into consideration all the key stakeholders within and across the supply chain from a developing (Ghana) and developed (UK) country

context. From a managerial perspective this is important, as managers often find it challenging to abstract the skills and requirements of the supply chain beyond that of their immediate firm boundary.

The rest of the paper is structured as follows. Section 2 reviews the literature on SCI and SCS. Section 3 describes the methodology of the research whereas section 4 details the research findings, and section 5 discusses the research findings. The last section details the research implications, limitations, and opportunities for future work.

2. Literature review

2.1 Supply chain integration

Integration denotes the act of adding one thing or entity to another to create a whole to achieve a specified objective. In applying this concept to the area of supply chain management, the literature defines SCI as the extent to which a firm is interconnected and aligned with it members in the supply chain (Mangan et al., 2011; Yu et al. 2019). Flynn et al., (2010) further defined SCI as a *strategic collaboration* of activities within organisations and among supply chain players through coordination and information sharing. Although different scholars have defined SCI from different perspectives, the two key elements underpinning the operationalisation of SCI are 'collaboration' and 'coordination', being used interchangeably. To achieve integration, firms need to collaborate and or coordinate on agreed processes and activities to optimise their supply chain effectively and efficiently.

Few scholars have argued that collaboration must be implemented at the strategic level to generate both operational and strategic benefits (Flynn et al., 2010: Mackelprang et al., 2014: Richey et al., 2009). Thus, when companies collaborate their activities as part/as a form of strategy, these companies can differentiate themselves from their competitors, hence gaining competitive advantage. Nevertheless, as these companies collaborate to differentiate, the benefit of the collaboration also reflects in their operational performances such as speed, quality, dependability, and flexibility". Researchers have supported the importance of using SCI to achieve improvements in a number of performance measures (Wiengarten et al., 2019). Examples include: quality and cost (Schoenherr and Swink, 2012), where companies are able to reduce product/service defect, and better understand the needs of customers to tailor their products/services to the exact demands of customers. The cost reduction performance is also seen in forms such as increase in productivity due to less defects and product redundancy; flexibility (Wong et al., 2011) through adequate/accurate information sharing which facilitates quick access to demand to enable service and product fulfilment; and delivery (Wiengarten et al., 2019) where through adequate and timely information sharing, companies are able to achieve reliable, quick and timely product and service delivery.

Researchers have explored SCI as encompassing supplier- and customer- external integration, and the focal firm- internal integration (Swink et al., 2007: Vanpoucke et al., 2014: Weingarten et al., 2014). Other researchers also explored SCI unidimensionally (Huang et al., 2014: Rosenzweig et al., 2003). A lack of consensus on how SCI should be explored/measured (Alfalla-Luque et al., 2013) has also led to the inconsistent SCI-performance results (Flynn et al., 2010), thus aside less explored hidden factors that may also influence the SCI-SCS relationship. Few researchers argue that considering both external and internal integration is important (Flynn et al., 2010: Weingarten et al., 2014) as both play different roles and influence performance uniquely. Firstly, for external integration several studies have shown a positive effect of collaborating with suppliers (Schoenherr

and Swink, 2012) and customers (Narasimhan and Kim, 2002: Wiengarten et al., 2019) on firm performance. Moreover, as most firms now compete based on the value of their supply chain (Flynn et al., 2010), but not only at the focal firm level, it is vital not to only use internal integration but also external integration. Secondly, internal integration which is defined as the interlinkage and alignment between the various departments within an organisation (Mangan et al., 2011) has also shown a significant effect on firm performance with both positive (Schoenherr and Swink, 2012) and negative (Gimenez and Ventura, 2005: Koufteros et al., 2005) results. Although the results are inconsistent, the findings indicate that to fully analyse the effect of SCI on firm performance, internal integration must be considered. Despite this importance, many studies that have contributed to the SCI literature ignored arguably internal integration (Wiengarten et al., 2019: Wiengarten and Longoni, 2015). Furthermore, the majority of the SCI literature (Appendix A, Table A1) does not consider the social, environmental, and economic performance measures but focus on the economic dimension only (Danese et al., 2020: Vanpoucke et al., 2017: Zhao et al., 2020).

2.2 Supply chain sustainability

Supply chain sustainability is "the management of social, environmental and economic impacts and the encouragement of good governance practices, throughout the lifecycle of goods and services" (Sisco et al., 2011, p.5). SCS aims to incorporate and influence the social/economic/environmental dimensions of the triple bottom line to achieve sustainable supply chains (Elkington 1998: Wolf, 2011). The social dimension encompasses activities such as acts that are just and favourable to labour and communities (Golicic et al., 2020: Sloan, 2010), health and safety, and employment practices (Bai and Sarkis, 2010): Whilst that of environmental broadly covers measurements of natural resources (e.g., food, water, soil, and minerals) and encourages for the maintenance/sustenance of the environmental capacities of these natural resources: Whilst the economic dimension, in the context of the SCI literature, covers the operational (e.g. speed of delivery, quality of products, flexibility and cost of production) (Donkor, 2020: Wong et al., 2011) and financial (e.g. profit margin, return on sales, sales growth, growth in market shares) (Donkor, 2020: Flynn et al., 2010) performance of a firm. The important recognition of sustainability in supply chain management has placed enormous pressure not only on focal firms but also on supply chain member/stakeholders in terms of how they can be integrated to operationalise strategies (e.g. SCI) that can influence their SCS. That is, sustainability extends beyond the focal firm and encompasses intra/inter-organisational members (Zhu et al., 2005). Although several factors have been identified as the enhancers for operationalising/achieving SCS, holistically the key enhancers are identified to come from internal (focal company) and external stakeholders (e.g. regulators/government, and investors) (Zhu et al., 2005). Therefore, it is imperative to engage and involve all supply chain stakeholders, both internally and externally, to enable achieve SCS. This argument underpins stakeholder theory, defined as the combination of a firm fulfilling its business goals toward its stakeholders whilst maintaining the morals and values in managing the organisation (Friedman and Miles, 2002: Wolf, 2011). In studying the SCI-SCS, it is important to consider the various stakeholders such as manufacturers, wholesalers, distributors, retailers, regulators, and national trading associations, hence the use of the stakeholder theory.

Companies are even facing a greater challenge as they are expected to achieve SCS *and* ensure that their supply chains are truly sustainable, that is, they seek to achieve SCS but with no negative impact on social and environmental performance (Pagell and Shevchenko, 2014). In addition to

the need of operating truly sustainable supply chains, it is important to consider the three dimensions of SCS as there is a high increase in (1) "stakeholder pressure for companies to consider employee health and safety, and the life of the external community, (2) demand for companies to account for their effective/efficient use of resources" (Gimenez et al., 2012), (3) high pressure of customers demanding for products that are produced under ethical conditions and are environmentally friendly and price competitive (Wolf, 2011). To understand how companies can create, extend, or modify resources through SCI to impact all the dimensions of SCS, scholars apply the dynamic capability theory which looks at the capacity of a firm to create, modify or extend its resources to attain a high economic value (Beske et al., 2014: Helfat et al., 2007) over competitors with similar/same resources. The dynamic capability theory emphasizes on a firm's ability to create and modify its distinctive resources both internally and externally purposely to meet up with the changing environment (Augier and Teece, 2009). This study applies the dynamic capability theory by exploring how pharmaceutical companies create, modify, or extend resources through effective/efficient SCI to affect SCS. In reference to the aforementioned three dimensions of SCS, literature shows that SCI impacts firms' economic performance by enabling an efficient/effective flow of products/services across and within the supply chain (Swink et al., 2007: Zhao et al., 2011). For the *environmental dimension,* literature indicates that internal integration enables product design and processes improvement (Ettlie and Stoll, 1990), and the efficient use of natural resources (land, water, etc.) (Griffith and Bhutto, 2008). With external integration, firms and their members are able to share maximize their capacity and use fewer resources to meet demands (Russo and Fouts, 1997). For the *social dimension*, firms that recognise their employees' talent through involvement face less attrition and are considered as the best firms to work for (Welford and Frost, 2006). Companies that also involve stakeholders in social developmental works, boost supplier and customer satisfaction and the reputation of the focal company (Zhu et al., 2016). From a stakeholder theory perspective, Wolf (2011) argued that the joint effort of all the key supply chain stakeholders is required to simultaneously affect the social, economic, and environmental performance of the focal firm and it members. Despite this significance, most SCI-performance studies focus *solely* on the focal firms (Flynn et al., 2010: Yeung et al., 2013) and *economic* dimension (Munir et al., 2020: Vanpoucke et al., 2017: Yu, 2015). In this study we take into consideration all the dimensions of SCS (Ahi and Searcy, 2013: Gimenez et al., 2012: Wiengarten and Longoni, 2015).

2.3 The stakeholder theory

A stakeholder is used to describe a person/group that has a direct (primary) or indirect (secondary) influence on a company's activities or is influenced by the operations or outcomes of a company (Freeman, 1984). Based on this definition, it is evident on how significant every player within and across the supply chain is in achieving the set aims of focal firms and supply chain players. In context to this paper, the primary stakeholders (manufacturers, wholesalers, distributors, retailers, pharmaceutical regulators) and secondary (national pharmaceutical trading associations) stakeholders in the pharmaceutical supply chain are considered as both play key roles in achieving supply chain sustainability (Wolf 2011) throughout the supply chain. This argument underpins the stakeholder theory, which is defined as the combination of a firm fulfilling its business goals toward its stakeholders whilst maintaining the morals and values in managing the organisation (Friedman and Miles, 2002: Wolf, 2011). This raises the imperative need for firms to consider all the key stakeholders within and across their supply chain to not only improve upon their (and that

of the supply chain stakeholders) economic performance, but also whilst complying to ethical (social) and environmentally friendly products/processes within/across the supply chain. We applied the stakeholder theory in this study by considering the various stakeholders such as manufacturers, wholesalers, distributors, retailers, regulators, and national trading associations, in studying the influence of SCI on the social, environmental, and economic dimensions of SCS. Considering all these key stakeholders is imperative as practitioners face challenges in abstracting the skills and requirements of the supply chain beyond that of their immediate firm boundary. Thus, through the collaborative effort of all the key stakeholders across the supply chain, adopted skills and requirements or practices within firms by individual players can be transferred across the supply chain through the collective involvement and collaboration with the supply chain players (stakeholders).

2.4 The dynamic capability theory

The dynamic capability theory extends that of the resource-based view (RBV) by not only considering the resources available to firms, but emphasizes on the capacity of a firm to create, modify or extend its resources to attain a high economic value (Beske et al., 2014: Helfat et al., 2007) over competitors with similar/same resources. Thus, the dynamic capability theory emphasizes on a firm's ability to create and modify its distinctive resources both internally and externally purposely to meet up with the changing environment (Augier and Teece, 2009). This study applies the dynamic capability theory by exploring how pharmaceutical companies create, modify, or extend resources through effective/efficient SCI to affect SCS. Based on this argument, it is imperative for firms to develop the capability of creating, modifying, or extending their internal resources and external resources (generated through close collaboration with supply chain players) to influence their performance and that of supply chain players. We integrated the dynamic capability theory in this study by exploring *how and why* the pharmaceutical companies *create/extend/modify* resources through effective/efficient SCI to impact SCS.

2.5 The contingency theory

The contingency theory mainly argues that the impact of an adopted practice on performance is dependent on the context in which the practices are applied (Sousa and Voss, 2002). That is, there needs to be a fit between a firm's internal structure and its external environment (Donaldson, 2001). This argument mainly came into effect after some studies realised that in some cases, what is generally known as "best practices" tend to yield no significant influence on performance. This is evident in the SCI literature were some scholars identified a positive (Donkor et al., 2021: Yu et al., 2013), negative (Flynn et al., 2010) and no significant (Donkor et al., 2021: Flynn et al., 2010) relationship between SCI and performance. This places a high need to properly understand the different context in which SCI influences SCS positively. With regards to this paper, we applied the contingency theory by considering pharmaceutical players in both the UK (developed country) and Ghana (developing country) in studying the influence of SCI on SCS. Thus, we compared how the SCI-SCS relationship differs and/or are similar between the UK and Ghana context. We further discuss why the selection of pharmaceutical players from the UK and Ghana in section 3.2.

2.6 Research Gap and Question

Based on the reviewed literature, the main gap identified is how and why companies can effectively and efficiently use SCI to simultaneously impact on all the SCS dimensions (Ahi and Searcy, 2013: Asif et al., 2013: Danese et al., 2020: Gimenez et al., 2012: Wiengarten and Longoni, 2015) considering all the key supply chain stakeholders from both a developed and developing country perspective (Appendix A, Table A1). Thus, operationalising the aforementioned argument through the use of a qualitative approach to understand the how and why reasons behind the SCI-SCS relationship still remains as one of the major gaps in the SCI-SCS literature (Appendix A, Table A1). Hence, the study aims to identify and propose a framework which provides insight into the SCS-SCI relationship. The research question is detailed in Table I.

(Table I: Insert around here)

3. Methodology

3.1 Method

This study used qualitative research to explore a less known phenomenon, that is, the relationship between SCI and SCS. Exploratory research design with an *inductive approach* was used, since detailed information was used to understand the less known phenomenon (including hidden/unknown factors that influence the SCI-SCS relationship) of this study (Yin, 2003). Interviews, observations, and secondary data were the main ways used for data collection (Silverman, 2011: Walliman, 2011). Thematic (for interview) and content (for secondary data) analyses were used (Braun and Clarke, 2006).

3.2 Scope of the study

The pharmaceutical industry in developed and developing countries is exposed to diverse and different uncertainties, supply chains and regulations respectively (Shah, 2004: Yadav and Smith, 2012). These dissimilarities are highly noted among the pharmaceutical industry in the UK and Ghana. Hence, to capture these variations in the framework to be proposed, it was key to select pharmaceutical companies from both the UK and Ghana.

From a developed country perspective, the UK was selected as it houses several world-leading pharmaceutical companies. These companies have large market sizes and contribute significantly to global economies (Christel, 2018: Ellis, 2019) by supplying essential drugs to most medical stores, health centres, and households globally. For example, GlaxoSmithKline and AstraZeneca which are UK companies are ranked among the world's fifteen largest pharmaceutical companies (Christel, 2018). Most of the pharmaceutical companies operating in the UK also have same/similar operations in most European countries. This makes it justifiable to select companies and institutions in the UK as it gives a representation of the pharmaceutical market in the UK (developed country) and to a certain extent, Europe. To support this representation, a giant institution that represents all the key pharmaceutical players in both the UK and Europe is considered.

From a developing country perspective, Ghana was selected on the same basis as having giant pharmaceutical companies known for their significant market sizes in West African and most African countries. These companies contribute significantly to the economies in Africa (Sulaiman and Boachie-Danquah, 2017) by supplying essential drugs to most of the health facilities and households in West Africa and most parts of Africa. For example, Ernest Chemist which is the

oldest and the largest pharmaceutical company in Ghana operates in Ghana, Nigeria, Gambia, Cameroon, Mali, and other African countries. Other giant multinational companies in Ghana are Tobinco Pharmaceuticals, Oson's chemist, Danadams, and Mpharma. These companies also contribute significantly to the economies in Africa through their supply chain activities (Sulaiman and Boachie-Danquah, 2017). Many world-leading pharmaceutical companies (e.g. Pfizer, GlaxoSmithKline, AstraZeneca etc.) partner with some of the leading pharmaceutical companies in Ghana to reach most of the African market. Based on this analysis, the results from the study give a representation of the pharmaceutical market in Ghana and to some extent, several African countries.

3.3 Data collection

Multiple sources, which increase the reliability and internal validity of results (Yin, 2002), were used, that is, interviews, observations, and secondary data.

A contact list of Ghana companies and national institutions to be studied was obtained from the Pharmaceutical Manufacturers Association of Ghana (PMAG) and the Pharmaceutical Society of Ghana virtual platform. That of the UK was retrieved from the National Health Service (NHS) – UK database and the Association of British Pharmaceutical Industry (ABPI) virtual platform. The European Federation of Pharmaceutical Industry Association (EFPIA) which was selected houses all the key manufacturing companies in the UK and Europe. This list served as the pool from which the participants were later selected. The selection process is detailed below.

As we adopt an inductive approach, Siggelkow (2007) proposes that limited cases can be used as far as the cases are applied as motivating further research and justifying more refined conceptualization. In total, 18 pharmaceutical companies and institutions were used, selected using purposive and convenient sampling (Ferlie et al., 2005). The 18 companies and institutions (Table II) were selected from a list of leading pharmaceutical companies and institutions generated from the created pool. The companies are classified as leading based on their high financial and market sizes as compared to other companies in the pharmaceutical industry. *Thus, these leading companies are giant companies known to contribute immensely to the global economies (Christel, 2018: Ellis, 2019: Sulaiman and Boachie-Danquah, 2017) by manufacturing and supplying essential drugs to health facilities and households.* Following a theoretically guided approach in selecting cases affect the external validity of the findings (Yin, 2002). As the study considers the *supply chain* of the pharmaceutical industry, it was key to select companies at each level of the chain from both the UK and Ghana. Thus, manufacturers, wholesalers and distributors, retailers, and national pharmaceutical associations and institutions. Please note, manufacturers and wholesalers can also be classified as final product suppliers. Only high echelon managers and executives (supply chain managers, CEOs, and experts) were considered for the interview as they have more knowledge on the phenomenon been studied. For Ghana, 11 pharmaceutical companies comprising of 4 SME's, 6 large companies, and 1 large national regulatory body were used. For the UK, 7 pharmaceutical companies were used. This comprised of 4 large companies, 2 SME's, and 1 large multinational pharmaceutical institution (Table II). All the interviews were conducted in English.

(Table II: Insert around here)

Semi-structured interviews, observations, and secondary data were used. Although semi-structured interviews enable the generation of more open and in-depth data by not restricting the interviewee (Ng and Coakes, 2013), they also enable the achievement of data consistency (Yin, 1994). The same fundamental interview questions were posed to all participants. This consistency reflects in the data collected from all the participants. A pilot test was initially conducted with experts. A few wordings were corrected to make the interview questions very clear and understandable. 16 interviews were conducted face-to-face and 2 via telephone. With consent, 13 of the interviews were digitally recorded and transcribed for coding and analysis. Field notes were taken during and after the sessions. 5 interviews were not recorded due to company policies and regulations. However, the interviewees gave ample time for notes to be taken during the interview and immediately after. The interviews took 40 -150 minutes. The secondary data was gathered from company reports, corporate, and national pharmaceutical associations and institutions using their virtual platforms. The virtual platforms of independent third-party institutions that monitor and report on pharmaceutical sustainability were also used. The operational activities of 10 of the interviewed companies were also observed whilst notes were taken. The observation took between 20 – 40 minutes. The secondary data was triangulated with the observation and interview data purposely to crosscheck the accuracy and validity of the interview data. According to Yin (2002), using multiple sources increases the internal validity and reliability of the results.

3.4 Data analysis

Thematic analysis (Braun and Clarke, 2006) was used to analyse the interview data. Through content analysis we compared interview data with secondary data (documents, e.g. company reports) and observation data mainly to crosscheck the validity of the interview data. The interview, documents and observation data were analysed to establish deeper content of the impact of SCI on SCS. The collected data were critically analysed to identify common patterns out of which we generated themes (Table III) and a proposed framework.

(Table III: Insert around here)

The thematic analysis was performed for each company and on a cross-company basis. The analysis for each company was used to identify the key issues faced by each company in integrating their supply chain activities. How these issues impact SCS and whether the companies are truly sustainable were also analysed. The cross-company analysis (Miles and Huberman, 1994) was used to identify patterns of similarities and differences in issues faced by the companies. The issues were also compared among companies in the UK and Ghana. A three-stage coding (detailed in Table IV) was used. Thus, with the first coding, the transcript was read and coded on a line-by-line basis. This was operationalised whilst understanding the meaning of the transcript and identifying the key issues in the transcript. The codes generated are mainly based on the transcript data. Example of the first code is "Wholesalers integrate their operations with each other". After generating the first codes, we further coded all the first codes to generate the second codes. The generation of the second codes were also mainly based on the transcript data. For example, the second code generated from the first code "Wholesalers integrate their operations with each other", is "External integration". We then classified all the same first codes under the second codes mainly to group

all the codes for each category to form the sub-theme. Examples of the first codes "Wholesalers integrate their operations with each other", "Sales are communicated in real time with partners" where grouped under the second code "External integration". We then proceeded with the third coding which was based on the second codes and theory. Thus, we reviewed the sub-themes and grouped the sub-themes to form the themes. The themes generated are relative to a wider conceptual and theoretical context. Based on the first and second code examples given, the general theme generated through the third coding is "Supply chain integration". The coding and analysis were executed using both manual and the Nvivo12 software. Key steps used for the thematic analysis are presented in Table IV. The interview was based on the factors (themes) SCI, and SCS. The additionally identified factors after detailed interaction with the respondents on the main issues facing the pharmaceutical industry, were EU, leadership style, and patient satisfaction (Table III). To the best of our knowledge, these identified factors have not been captured in literature as key contextual factors that *directly affect the SCI- SCS relationship.*

(Table IV: Insert around here)

4. Findings

4.1 Supply Chain Integration (SCI)

Various key SCI factors that impact on SCS were identified (Table V). The results show that although the companies generate and extend their capabilities through SCI to impact all the dimensions of SCS, all the enablers/effective and or efficient SCI factors adopted by the sampled companies mainly target the economic dimension. In the context of this study:

- "Effective" denote achieves perceived outcome, whilst "efficient" denotes attaining effectiveness with the least possible resource available, and vice versa for "ineffective" and "inefficient". From a dynamic capabilities perspective, the ineffective and/or inefficient factors negatively affect the ability of the companies to generate the needed capabilities and modify existing resources to impact their performance. The ineffectiveness and inefficiencies are largely due to the less involvement and collaboration with all the supply chain stakeholders (following stakeholder theory) in the operationalisation of SCI.

From Table V, it is also noticeable that although some companies have a positive impact on all the dimensions of SCS through a specific SCI factor, none of the companies have truly sustainable supply chains per this definition, that is, to positively impact the economic with no negative impact on social and environmental dimensions within/across the supply chain (Pagell and Shevchenko, 2014). Table V details *only* the main SCI factors whilst the other identified general factors which also impact the SCS dimensions are detailed in Table VI.

(Table V: Insert around here)

For the impact level ratings of the SCI factors, low/high denotes not only been (in)effective/(in)efficient, but also identified by the majority of the companies as contributing

lowly (low rating) /strongly (high rating) to providing maximum value to the customer at low cost and high speed (Flynn et al., 2010).

4.1.1 Internal integration

The general key issue of less efficient and effective internal integration was noticed among all the sampled companies. This issue was mainly shown through inadequate direct and on-time communication, and unsynchronized activities among internal functions. All these issues affect the efficiency and effectiveness of internal operations:

> *It is stressful when you demand something from another department and their schedule doesn't fit in with your request which ends up in long hours of wait and delays. It creates inefficiencies. (RES-2)*

4.1.2 External integration

Customer integration

Companies in Ghana, the UK, and most developing and developed countries make use of sales or marketing representatives to communicate with customers. These representatives mainly solicit and introduce their products to customers (e.g. retailers, hospitals, etc.) but share less information on other vital operational activities. Example, product development. For the UK representatives in Ghana, they have their own scientific offices set up and registered as a business entity. However, some representatives are also hosted by their existing local customers (manufacturers or wholesalers) in Ghana. The operations manager for one of the leading wholesale companies in Ghana stated:

> *So for now, we are importing from about 20 companies but then for the ones we are hosting their reps are about 2 companies. For these two companies, we host their reps and pay for their remuneration. (RES-4)*

Supplier integration

Companies at the same level of the supply chain and sourcing products from the same multinational company were known to share information. Others also share generated capacity and barter trade among themselves. This is to facilitate flexibility and quick market response during disruptions or shortages. This type of integration is mostly influenced when the companies share the same market authorization of the multinational supplier. However, there is less integration among players at different levels in the chain. This issue was known among both the sampled UK and Ghana companies.

> *Wholesalers, however, they do trade together. Sometimes they do barter trade. For example, if C4 brings X products and C5 is importing Y products, they do exchange some of these products in order to be more flexible in variety. Hence as a retailer, I depend on a wholesaler who stocks the majority (>70%) of the products that I need. (RES-1)*

4.2 Supply chain sustainability

After the individual and cross-company analysis, *all* the identified factors enabling and inhibiting SCS, and their correspondence to SCI, were categorised under the triple bottom line (Table VI). The enablers enable whilst the inhibitors negatively affect the companies' ability to generate the needed resources and extend and modify existing company resources to impact SCS through

effective and/or efficient SCI operationalisation (Table VI). The most lamented SCS factors from Table VI are detailed below.

4.2.1 Economic dimension

The high cost of operations and low-profit margins were mentioned by all the UK and Ghana companies. The companies lamented on high tariffs for utility, lack of funds from external bodies and internally due to adopted leadership style and mismanagement, high cost of energy, delays in payment from customers, high cost of labour especially pharmacists and biological scientists, highly saturated downstream market, and high cost and duration of research and development (R&D). One of the supply chain managers (Ghana Company) stated:

> *Over the past 5 years we established we haven't been profitable, yes we haven't. There have been cases where our funds have been held up in other countries we operate in like Gambia, Cameroon, Mali. You export to these countries and they don't pay on time. (RES-6)*

Moreover, although there is a high investment in R&D, only a few of the highly researched products make it to the market. This affects profit. The market access manager for arguably the largest pharmaceutical association in Europe lamented on this issue:

> *In the development of a new pharmaceutical product, in most cases, only 1 out of 10,000 medicine discoveries and tests make it to the market. (RES-7)*

(Table VI: Insert around here)

4.2.2 Environmental dimension

The sampled companies in the UK and Europe had a greater awareness of the economic benefits when being environmentally sustainable than the companies in Ghana. Even though there is less environmental regulation enforcement in Ghana, the majority lamented that pricing is what drives business in Ghana and the developing countries but not to be environmentally sustainable.

> *What drives the business here is the pricing but not to be environmentally sustainable. That concepts haven't gotten here yet. However, there are customers who look out for specific brands of products as they use this as a reference point to guarantee quality. (REF-3)*

Waste is generated in the chain especially with the manufacturing activities. This was noted for both sampled UK and Ghana companies. The generated waste is refined using treatment plants and tanks before disposed of, indicated by all sampled manufacturing companies. C3, for example, uses the effluent plant and further uses the recycled water for irrigating gardens and washrooms on site. However, only a few of the sampled companies in Ghana eradicate their waste:

> *Fortunately, our operations do not generate a lot of CO2 emissions but rather it is our liquid waste is the key effluent. So we have our own effluent machine that we use to treat the liquid to make it less harmful before disposing of them. (RES-3)*

Most patients and few of the pharmaceutical companies were known to wrongly dispose of unwanted pharmaceutical products. Although this was noted among both the UK and Ghana sampled companies, the issue was more profound in the Ghanaian setting as companies perceive the entire disposal process as lengthy, and costly.

> *Waste disposal has been a great challenge. With waste disposal, I just tie them in rubber and put them in the normal bin. For the liquids, we pour them away using general drainage systems and dispose of them in the normal bin. (RES-1)*

4.2.3 Social dimension

All the sampled companies were known to engage in several CSR activities. They also emphasised engaging in ethical behaviour. Thus, from the sourcing of raw materials and products from ethical suppliers, putting the right information about products on the market for consumer safety, avoiding work discriminatory practices, and consistently following the various pharmaceutical codes of conduct, Good Manufacturing Practices (GMP) and Good Distribution Practices (GDP). The respondent for EFPIA- an institution that houses all the major pharmaceutical companies in the UK and Europe, stated:

> *They are very ethical. We comply with all the rules and regulations. I think we use cutting edge technology and medicines to help people manage their disease and some cases cure their disease. I think there is a huge value we bring to society but sometimes it is not appreciated. Not so more as compared to other industries with regards to ethical issues. (RES-7)*

Most of the sampled companies in the UK and Ghana provide several benefits to their employees. However, this was more profound among the sampled companies in Ghana. For example, C5, which is the biggest pharmaceutical wholesaler in Ghana, houses over 80% of its staff, pays their utility and transports the workers to and from work. Some of the companies (e.g. C4 and C5) also provide free drugs for workers dependents and spouses.

4.3 Internal and external contextual factors

Beyond the themes (SCI, SCS) used for the interview, additional IECFs (Table VII) were identified as mentioned by the sampled companies. Based on contingency theory, these factors were identified to strongly influence the companies' ability to generate, extend and modify their capabilities by optimally integrating their supply chain activities with all key stakeholders to achieve SCS. Hence the IECFs factors are rated as high for impact level rating. Although EU is an IECF, the other IECFs are differentiated from that of EU as they are not characterized by highly unpredictable and unexpected changes. The results for the new IECFs are presented.

4.3.1 External uncertainty

All the main EU factors for each company and their corresponding impact on the three dimensions of sustainability were established from the analysed sampled data (Table VII). Drawing on contingency theory, we also identify EU factors that are common to the UK and Ghana context. The results illustrate which main SCI dimension(s) influence the EU factors (Table VII). Although all the companies were engaging in SCI to generate and extend their capabilities, it was noticed that the SCI was not effectively and efficiently operationalised to keep up with the high levels of uncertainty exposed to the companies in both the UK and Ghana. For the impact level ratings, high denotes: EU factor was not only an inhibitor but also identified by the majority of the companies as contributing strongly to the ineffective/inefficient (due to unpredictability) operationalisation of SCI to influence SCS.

The pharmaceutical industry in the UK and Ghana faces many uncertainties. This was lamented by the companies in forms of market unpredictability, frequent and uncertain change of regulations, demand unpredictability, and increasingly unpredictable availability of raw materials due to unpredictable seasonality of ingredients. The production manager for one of the leading manufacturing companies in Ghana stated:

> *This year I was supposed to do 2million capsules of piroxicam based on a forecast. However, the demand changed so high that just from January to February I have already produced and sold the 2 million already. Even though historically we don't do more than 2million. (RES-3)*

The rapid increase in unpredictable drug shortages and unavailability was identified as more profound in the UK. Complex supply chains due to international trade and globalisation have contributed to the issue of unpredictable shortages and unavailability. Excessive price cuts from authorities, parallel trade due to marginal price differences, and regulatory issues were identified as key causes of unpredictable drug shortages and unavailability:

> *Member states like France and Belgium indicate that the problem of shortages and unavailability is getting worse and worse. (RES-7)*

The issue of shortages was also lamented by C10, which serves as a trading body for all key community pharmacies in the UK:

> *Yes, drug shortages are getting worse especially looking at the feedback we get from our members. (RES-9)*

(Table VII: Insert around here)

4.3.2 Leadership style

In the UK and Ghana, the pharmaceutical industry faces critical *funding challenges, whilst the type of leadership style adopted by the companies was identified as a key contributing factor*. Most of the companies are structured in a way that allows only a few company leaders to have full control over the company's wealth (thus less involvement of all key stakeholders). They decide where, when and how to invest the company monies without a collective effort with other key stakeholders. The leadership style adopted was known to affect the collective ability of internal and external stakeholders in generating, modifying and finding well targeted and appropriate mediums for securing needed funds. Hence, also affecting the degree to which the companies collaborate activities among internal functions and with all the key stakeholders (e.g. customers, suppliers, distributors, regulators, trading organisations, etc.) across the supply chain. On the issue of adopted leadership style, the operations manager for one of the largest pharmaceutical manufacturers in Ghana indicated:

> *Yes, we should make profit. Yes, companies do publish these things in their reports but unfortunately, we don't do that into detail. This is mainly controlled by the owner of the company, yes one-man Company. Even to the extent that the chief accountant does not know the full size of the elephant. (RES-3)*

To support the raised issue of how adopted leadership style impact firm performance, the supply chain manager for arguably one of the leading pharmaceutical manufacturers in Ghana indicated:

> *Autocratic leadership and structure are also affecting our lack of funding. (RES-6)*

4.3.3 Patient Satisfaction

Most of the companies from the UK and Ghana used *quality* as the main operation's objective to satisfy patients for competitive advantage. The quality of products and services rendered to patients create *reputable brand names* that are used for *competitive advantage*. Especially in Ghana, there is less access to information by patients. Hence patients thrive on brand names as an indicator for quality when purchasing drugs.

> *There will always be issues when it comes to regulators however we focus on the patient and make sure what we give them is safe, effective and efficient. You know the regulators are just like policemen, whatever you do. They will always find an issue. We even have a section where we do packaging for the largest manufacturer in the UK, and before they agree to such collaboration they make sure all requirements are met. Our main competitive advantage is quality and our reputable brand name "C4", it has become so conspicuous. The name has become a household name and people are ready to buy. We have gotten to the point where anything we produce here and we say it is from C4 people are ready to buy. (RES-3)*

To support REF-3 statement:

> *I think I won the government contract because of my consistency in producing premium products for our patients from a facility that is not top-notch. So with our manufacturing, quality, packaging, and delivery are in our hallmark to satisfy our patients. It is my philosophy. (REF-8)*

Although most of the companies from the UK and Ghana focus on quality to achieve customer satisfaction, this further serves as a platform for the firms to engage in additional activities such as the recycling of materials/products. The companies engage in these activities with the direct aim

of satisfying their customers and increasing their economic performance. Nevertheless, these activities were known to also indirectly impact on the companies social and environmental performance although that was not the primary motive.

5. Discussion

The study offers two main contributions to the SCI and SCS literature in terms of the relationship between SCI-SCS.

5.1 SCI-SCS relationship

The study *illustrates the simultaneous impact of SCI on the three (social, economic, environmental) dimensions of SCS*. We argue that, to achieve this outcome, SCI must be operationalised in an effective (achieving perceived output) and efficient (attaining effectiveness with the least possible resource available) way. From our findings, although some of the companies have a positive impact on all the dimensions of SCS through SCI, *none of the sampled companies has 'truly sustainable supply chains'*. Thus, none of the companies has a positive impact on the economic performance with no negative impact on the social and environmental dimensions (Pagell and Shevchenko, 2014). In contrast to our study, most researchers that studied the SCI-performance relationship studied the three dimensions of sustainability in isolation and parts (Ahi and Searcy, 2013: Pagell and Wu, 2009: Wiengarten et al., 2019: Yu, 2015). We however argue that although companies mainly focus on the economic dimension only (Munir et al., 2020: Zhao et al., 2011) there is a high need for companies (especially in the pharmaceutical industry) and researchers to focus on all three dimensions of sustainability (Gimenez et al., 2012: Wiengarten and Longoni, 2015).

From our findings, we argue that the main issues affecting *internal integration* are long-duration for sharing inadequate information, and unsynchronized activities among internal departments. From a dynamic capability theory perspective, these issues negatively affect the ability of the companies to generate the needed resources and modify existing capabilities to impact their performance. In understanding how the companies can create/modify/extend their resources to impact performance, literature supports our argument by indicating that companies that share adequate information at the right time positively affects time delivery (Flynn et al., 2010: Swink et al., 2007), responsiveness (Droge et al., 2004), and product and process development (Rosenzweig et al., 2003). Based on contingency theory, we further argue that contingent to greater funding issues, the identified internal integration issues of high cost of operations and little to no access to funds, results in less effective and efficient integration, which affects operational activities and profit margins. Literature supports our argument by identifying that the majority of pharmaceutical companies in both developed and developing countries face high cost of production with little access to funds (Kanavos and Wouters, 2014). However, our findings further revealed that the aforementioned internal issues were more profound among the sampled Ghana companies. Thus, purchasing sophisticated technology and equipment to generate and modify needed resources for efficient and effective internal integration is a critical issue. The critical funding issue especially in the Ghana setting may be because of Ghana's weak financial system (Aryeetey and Udry, 1997) and constrained financial institutions (Osei-Assibey et al., 2012) as compared to that of the UK. Based on these findings of establishing how internal integration influences performance, the following proposition is formulated:

P1: The internal integration issues, long duration for sharing information, unsynchronised activities, high cost of production, and financial constraints, leads to less effective and efficient integration among internal functions and stakeholders, which influences supply chain sustainability performance in both developed and developing country context.

Externally, our findings further argue that in both the UK and Ghana, companies integrate mostly with suppliers on the same level in the chain which helps to extend the players resources whilst using mainly sales representatives to introduce products and solicit information from customers. The solicited information is used to inform and modify the operational activities of the companies. This was known to mainly impact the flexibility and responsiveness of the companies (Flynn et al., 2010: Narasimhan et al., 2010: Wiengarten et al., 2019: Yu, 2015). From a stakeholder perspective, we further argue that there is less integration with supply chain stakeholders (suppliers and customers) to optimise the majority of the social and environmental activities engaged by the companies within and across their entire supply chain for both the UK and Ghana companies (contingency perspective). Literature supports our argument by indicating that through affective/efficient external integration, conflict of interest can be resolved to improve social relationship among members (Scannell et al., 2000: Wiengarten and Longoni, 2015: Wong et al., 2011). Whilst the needed capabilities can be generated, extended, or modified to ensure companies engage in adequate information sharing (Mora-Monge et al., 2019) and joint planning with partners (Wiengarten and Longoni, 2015), which reduces mistakes and waste (Flynn et al., 2010: Swink et al., 2007). Based on these findings, we formulate the following proposition:

P2: In both developed and developing country context, increased involvement, and collaboration with all key external stakeholders of the supply chain, which includes customers, suppliers, national trading agencies/associations and industry regulators, leads to increased supply chain sustainability performance.

5.2 Proposed SCI-SCS framework

The second contribution lies in *applying dynamic capability theory, stakeholder theory, and contingency theory to propose a framework that illustrates how the identified IECF's enhance or impede SCS through SCI (Figure I).* From our findings, we argue that the key IECFs (Table VIII): EU, leadership style, and patient satisfaction must be collectively considered to achieve SCS through SCI. Although scholars have studied how performance is impacted by EU (Wong et al., 2011), leadership style (Cheng et al., 2004), and patient satisfaction (Dotson and Allenby, 2010: Narayanan et al., 2011: Yu et al., 2013), most of these studies have not considered the IECFs in a holistic manner, as this study does, or how these IECFs collectively influence the impact of SCI (Huang et al., 2014: Wiengarten et al., 2019) on SCS (Wiengarten and Longoni, 2015) from a developing and developed country context. However, from our analysis: firstly, we argue that both the UK and Ghana pharmaceutical industry face many challenges related to globalisation and international trade, as well as to the uncertain operational environment (Wong et al., 2011: Yeung et al., 2013) causing unpredictable drug shortages and unavailability, which affect the sustainability performance of the companies'. This issue was more profound in the UK context. Drawing from the contingency theory, we indicate that this profoundness is contingent on the issue of excessive price cuts from authorities, parallel trade largely due to marginal price differences, and regulatory issues exposed to the UK companies (Kanavos et al., 2011). Hence, the findings from our study extends the contingency theory by not only detailing how and why SCI influence SCS similarly/differently in the context of Ghana and

the UK, but also by detailing how the identified IECF's influence the SCI-SCS in both contexts. Based on stakeholder theory, we note that both the UK and Ghana companies engage in information sharing and collaborating operational activities with a few supply chain stakeholders to generate dynamic capabilities to mitigate the negative effect of unpredictability. However, these integrations are less effectively/efficiently operationalised (largely due to ignoring the collective effort of all supply chain stakeholders) to match up with the high levels of changes and unpredictability in both the UK and Ghana setting. Hence, our study contributes to the stakeholder theory by considering the key stakeholders manufacturers, wholesalers, distributors, retailers, regulators, and trading associations of the pharmaceutical industry in studying the influence of SCI on SCS. Based on this our study gives a collective result of the SCI-SCS relationship.

P3A: *External uncertainty, influences the SCI-SCS performance relationship similarly in terms of high technological changes, high unpredictable regulatory changes, long manufacturing lead times, demand uncertainty, unpredictable markets, price differences and fluctuations, unpredictable product shortages, forecast difficulties, and payment uncertainties in both developed and developing country context.*

P3B: *External uncertainty, influences the SCI-SCS performance relationship differently in terms of currency fluctuations and free zone regulations in both developed and developing country context.*

Secondly, we argue that the autocratic leadership style is highly noted among all the supply chain players in Ghana and the UK. In support of literature, such leadership style (unlike participative leadership style) ignores the collective integrative effort of other key stakeholders (example, co-workers and subordinates) (Farh and Cheng, 2000) to generate and/or modify the needed capabilities and resources to impact sustainability performance (Wolf, 2011). The adopted leadership style by leaders also influences the degree to which leaders of the firms integrate their activities with players within their companies and with stakeholders across the supply chain to impact performance. Lastly, all the companies mainly focused on satisfying the end patient to increase economic gains (Narayanan et al., 2011: Yu et al., 2013). We argue that although the implementation of SCI was mainly aimed at meeting the needs of customers to further increase economic gains and concurrently build a reputable brand name over time, it led to positively influencing the social and environmental performance of the firms in both the UK and Ghana context. Thus, for companies that have their customers stated expectations exceeded simultaneously builds a reputable brand name for themselves, this serves as a platform that pushes/challenges these companies to consistently/further engage with supply chain stakeholders and develop the needed capabilities to rapidly modify products to meet their customers' requirements to consistently stay competitive. The requirements could range from quality, responsiveness, cost, flexibility (Flynn et al., 2011) to ethical operations, use of environmentally friendly materials and processes and selling of products classified as "low carbon products".

Based on the raised arguments concerning the effect of leadership style and patient satisfaction on the SCI–SCS performance relationship, the following propositions are formulated:

P4: *Leadership style, which includes autocratic and participative leadership styles, influences the SCI- SCS performance relationship similarly in both developed and developing country context*

P5: *Patient satisfaction, mainly operationalised through quality and reputable brand name, is the driving force for the SCI- SCS performance relationship in both developed and developing country context*

(**Figure I:** Insert around here)

5.3 Theoretical contribution

Our study- in contrast to literature (Flynn et al., 2010: Pan et al., 2020: Wiengarten et al., 2019: Zaridis et al., 2021), *collectively* considers all key stakeholders (manufacturers, wholesalers, distributors, retailers, regulators, and national trading associations) within and across the chain. These stakeholders *collectively* play vital strategic/operational roles in the effective/efficient operationalisation of SCI to achieve SCS (Wolf, 2011). Hence our study extends the application of the stakeholder theory by not only considering the traditional players (e.g., suppliers, focal firm) of the supply chain but also that of industry regulators and national trading bodies in studying the influence of SCI on SCS. Secondly, from a contingency theory perspective, our study-in contrast to literature (Huang et al., 2014: Pan et al., 2020: Yeung et al., 2013) captures data from different supply chain players/companies, and from two distinct contexts (Ghana- developing country and the UK- developed country) exposed to diverse types/levels of EU, end consumers/patients, and supply chain leaders adopting different styles of leadership (contingency approach). This contributes to the contingency theory by enabling understand how and why the IECF's "EU, patient satisfaction, and leadership style" influence the SCI-SCS relationship similarly/differently from two distinct geographical contexts. Also, in contrast to our study, most studies that adopt the contingency approach in studying the SCI-performance relationship mostly consider the developing (Wong et al., 2011) and developed country context in isolation/parts and do not collectively consider the potential effects of the IECF's in both contexts. Thirdly, from a dynamic capability theory perspective, our findings demonstrate how in Ghana and the UK companies create/extend and use generated resources to manage the impact of diverse types and levels of EU on their SCS through SCI in both the UK and Ghana context, hence extending the use of the dynamic capability theory. In contrast to our study, sparse SCI studies (and supply chain management studies in general) that apply the dynamic capability theory (Mora-Monge et al., 2019: Vanpoucke et al., 2014) mostly limit their study to the SCI-*economic* performance relationship, whilst most do not consider all the key players within and across the entire supply chain (Oh and Rhee, 2008: Pagell and Shevchenko, 2014).

(Table VIII: Insert around here)

5.4 Practical Implications

5.4.1 Guidelines on how to improve SCS

From a practical perspective, practitioners in both developed and developing countries should ensure that *adequate* information shared among all key supply chain players and within firms is done in a *timely* manner. This will ensure the collective effort of effective (achieving perceived output)

and efficient (attaining effectiveness with the least possible resource available) operationalisation of SCI to impact performance. In addition to this, they should synchronize their activities among internal functions through adequate and timely sharing of information and collaboration of activities to positively influence SCS. This research demonstrates the importance for companies to integrate their activities, barter trade, and share authorization and capacity with all their key supply chain players to help create/modify/extend their resources to influence SCS. Thus, through this approach of maintaining high levels of joint planning with all key supply chain players, less resources can be used to do more, whilst reducing mistakes and improving the social relationship among the players. Businesses, especially those in the UK (developed country) are advised to focus more on ensuring and maintaining trust and strong commitment with product suppliers to help reduce the rates of parallel trade which causes product shortages. Practitioners in both developing and developed context should not only follow the right protocols in disposing of waste throughout the supply chain, and not only invest more in different corporate social responsibilities, but these activities must be collectively done with all key stakeholders within and across the supply chain as this will maximise the influence on the environmental and social performance of the firms and that of their supply chain players respectively.

5.4.2 The IECF's: Guidelines on how to improve SCS

Practitioners in both developing and developed context should invest more in producing new innovative drugs and ensure meeting the specific needs of patients, mostly in the form of quality of products through product efficacy and effectiveness to increase patient satisfaction. This is very crucial especially to practitioners in developing countries as customers in these demographics have less access to information and make use of quality and brand names as a decision tool to purchase products. Moreover, due consideration should be given to the type of leadership style (autocratic or non-autocratic) when integrating activities with partners within and across the supply chain as this influences SCI and its impact on SCS. Thus, businesses leaders should avoid adopting solely leadership styles that do not enable the collective participation of all key stakeholders within/across the supply chain. Our research has also highlighted the importance to invest more in internal, supplier and customer integration by strengthening collaboration of activities and sharing of adequate and timely information within and among all key supply chain players to mitigate the negative impact of EU exposed to them. Thus, through this approach, practitioners can gather adequate and timely information to reduce the levels/rates of uncertainties whilst properly understanding the changing dynamics of demands and lead-times which enables putting in rigorous alternative measures ahead of time to reduce the negative effect of EU. Generally, our proposed framework (Figure I) well informs practitioners that the factors leadership style, EU, and patient satisfaction must be collectively considered to achieve SCS through SCI.

6. Conclusion

The paper aimed to propose and confirm a framework which provides insight into the SCS-SCI relationship. Our findings revealed that SCS can be achieved through effective and efficient SCI, although none of the sampled companies have truly sustainable supply chains'. Our study further revealed that the new IECFs: EU, patient satisfaction, and leadership style must be collectively considered to achieve SCS as these factors enhance or hinder SCS through SCI. Therefore, the study offers a twofold contribution to the SCI and SCS literature by; first, demonstrating the simultaneous impact of SCI on the three (social, economic, environmental) dimensions of

sustainability; second, combining the stakeholder theory, contingency theory, and dynamic capability theory as the theoretical lenses to propose a framework that provides insight into the internal and external contextual factors which enhance or impede SCS through SCI (Figure I). As the qualitative approach was used, the findings cannot be generalised but can be used to inform theory (Lincoln and Guba, 1985). We explored a complex phenomenon and therefore the results cannot be judged based on whether they can be generalised. On the contrary, they are judged based on the credibility of the thinking and interpretation used when analysing findings and drawing conclusions. Future research could empirically test the proposed framework using quantitative data from the pharmaceutical industry and/or other industries or countries. This will not only generalise the results but offer practitioners a tested prescriptive framework of how to generate sustainable supply chains.

Appendix A:

(Table A1: Insert around here**)**

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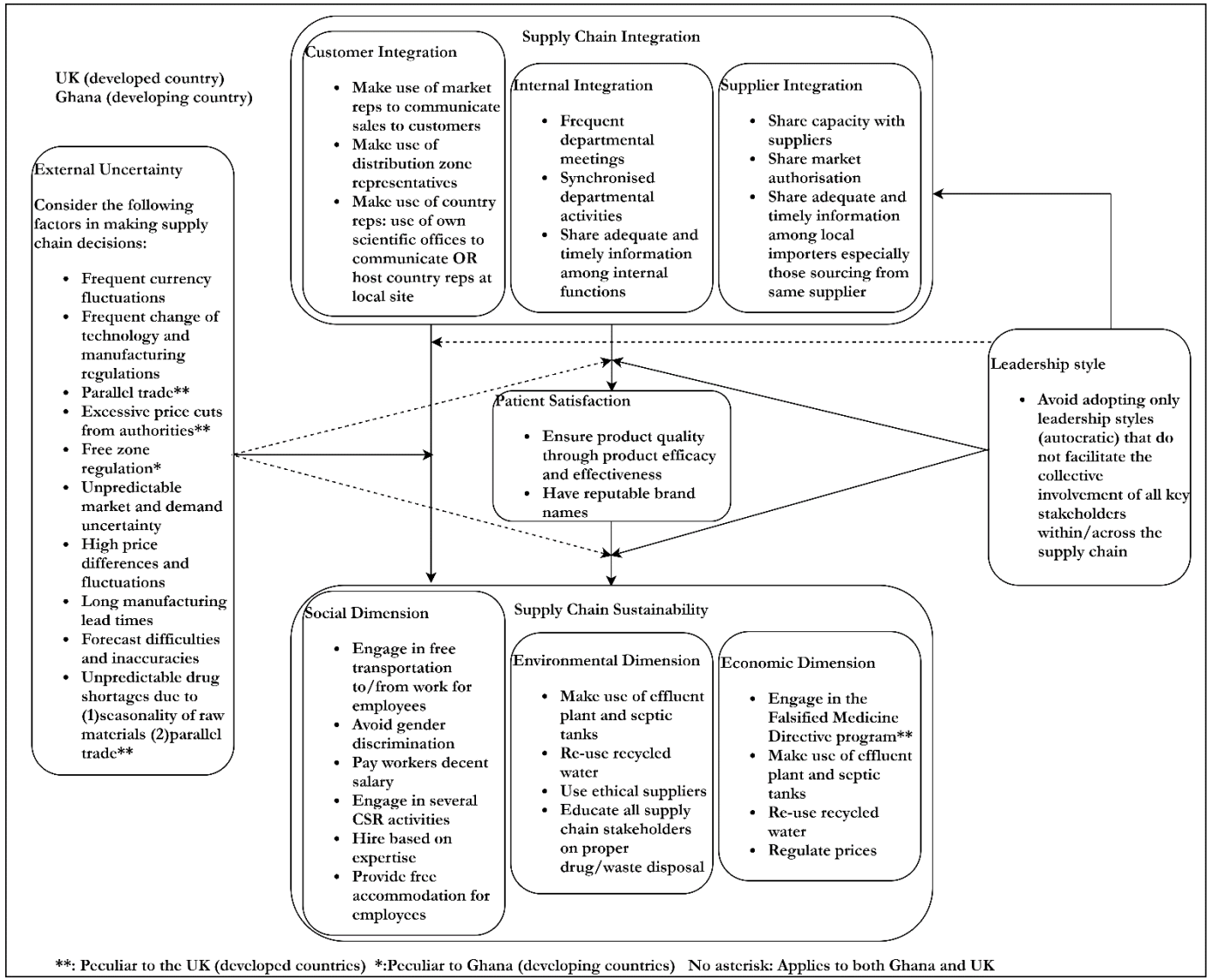

Figure I: Proposed framework for supply chain sustainability through supply chain integration

Table I: Research Question

Research Questions	Theory used
(1) What are the key SCI factors and how do they influence SCS?	We apply dynamic capability theory to explore (i) *how and why* companies *create/extend/modify* resources through effective/efficient SCI to impact SCS. We apply stakeholder theory to consider manufacturers, wholesalers, distributors, retailers, regulators, and national trading associations in studying the SCI- SCS relationship. We apply contingency theory to compare companies in Ghana and the UK.

Table II: Interview Respondents

Respondent code	Company given code	Position/role	Years at current company	Type of player	Company classification	Country
RES-1/	1. C1. 2. C2	1. CEO 2. Registration and License Officer	14years	1. Wholesaler and Retailer 2. Regulator	1. SME 2. Large institution	Ghana
RES-2	C3	Head of Research and Product Development, Pharmacist by profession	6 years	Manufacturer, Wholesaler and Distributor, Retailer	Large company	Ghana
RES-3	C4	Production Manager	16 years	Manufacturer, Wholesaler and Distributor, Retailer	Large company	Ghana
RES-4	C5	Operations Manager	9 years	Wholesaler	Large company	Ghana
RES-5	C6	Deputy Marketing Manager, Pharmacist	4 years	Manufacturer, Wholesaler and Distributor, Retailer	Large company	Ghana
RES-6	C7	Supply Chain Manager	14 years	Manufacturer, Wholesaler and Distributor, Retailer	Large company	Ghana
RES-7	C8	Market Access Manager	N/A	Association for key pharmaceutical players in	Multinational pharmaceutical institution	UK/Europe

				Europe and the UK		
RES-8	C9	Managing Director / Owner, Pharmacist	8 years	Manufacturer	SME	Ghana
RES-9	C10	Public Affairs Manager	N/A	Association for all key community pharmacies in the UK	Large company	UK
RES-10	C11	Customer Service and Distribution Manager	3 years	Wholesaler and Distributor	SME	Ghana
RES-11	C12	Director / Pharmacist	2 years	Manufacturer and Retailer	SME	Ghana
RES-12	C13	Assistant Store Manager	N/A	Retailer	Large company	UK
RES-13	C14	Production Manager	6years	Manufacturer and Wholesaler	Large company	Ghana
RES-14	C15	Pharmacist	6 years	Retailer	Large company	UK
RES-15	C15	Pharmacist	7 years	Retailer	Large company	UK
RES-16	C16	Pharmacist / Supply Chain Expert	N/A	Retailer	SME	UK
RES-17	C17	Pharmacist / Supply Chain Expert	N/A	Retailer	SME	UK
RES-18	C18	VP, Global Head of Medical Writing and Medical Information	N/A	Pharmaceutical research company	Large company	UK

RES: Respondent. C: Company

1. UK context: SME's- Annual turnover of less than £25m, employees less than 250, and gross assets less than £12.5m. Large company: More than £25m turnover, 250 employees and £12.5m gross assets (UKGOV, 2012).
2. Ghana context SME's: Less than 30 employees. Large company: More than 30 employees.

Table III: Generated themes from data analyses

Themes	Key dimensions (where applicable)	Included in semi-structured interview theme	Newly generated theme after interviews
Supply Chain integration	*Internal integration*	✓	
	Customer integration		
	Supplier integration		
Supply chain sustainability	*Economic*	✓	
	Environmental		
	Social		
External uncertainty	*Technology*		✓
	Regulations		
	Demand and Supply		
	Currency		
Leadership style			✓
Patient satisfaction			✓

Table IV: Key Steps for the Analysis

Key Steps	Purpose
Transcribed all recorded interviews	To obtain all the interviews in a single transcription form to enable coding/analysis.
Read the transcription, and read over again	To familiarize with the data and start to identify important issues.
	To Understand the data from the participants perspective.
Coding	To identify key issues, meanings and themes from the data.
1st order coding, using a line-by-line approach	Meanings were identified and key issues were labelled in a descriptive format. This process is data-driven.
2nd order coding (based on 1st codes)	The first codes from the 1st order coding were further coded to generate the categories. This process is also data-driven.
Grouping of all same 1st codes under the 2nd codes	To generate and group all the codes for each category to form the sub-theme.
3rd order coding (based on 2nd coding and theory)	The sub-themes were reviewed and grouped, and the actual themes were generated. Themes relative to a wider conceptual and theoretical context.
Generation of qualitative framework based on themes	To show the direction and relationship of impact among the key themes. The framework shows how to achieve the ultimate output

Table V: Key supply chain integration factors and their impact on supply chain sustainability

SCI Dimension	SCI factors and their impact sign	Impact level rating	Supply Chain Sustainability		
			Economic	Social	Environmental
Internal Integration	Monthly departmental meetings (-)	High	C3	C3	C3
	Inadequate internal communication (-)	High	All companies	C3,C7	NIDI
	Unsynchronized departmental activities (-)	High	C4,C7,C9	NIDI	NIDI
Customer Integration	Use of market reps to communicate sales to customers (+)	Low	C3,C4,C5,C6,C7	C4,C5	NIDI
	Use of country reps: Make use of own scientific offices to communicate OR Host by customer at local site (+)	High	C3,C5,C8	C3,C5, C8	NIDI
	Use of distribution zone reps (+)	Low	C3,C4,C7,C13	C3,C4, C7	NIDI
Supplier Integration	Information sharing among local importers sourcing from same supplier only (+)	Low	C1,C5	C1	NIDI
	Barter trading among importers (+)	High	C1,C5	C1,C5	C1,C5
	Sharing market authorization(+)	Low	C4,C5,C14, C15	C4	NIDI
	Capacity sharing (+)	High	C3,C7,C9,C17	C3,C7, C9	C3,C7,C9
	Companies host major foreign suppliers at local site (+)	High	C5	C5	NIDI
Entire supply chain	Lack of communication across the chain (-)	High	C1,C8,C11, C12,	C8,C11	NIDI
	Less integration among players due to price differences (-)	High	C5,C9,C8,C15,C16,C17, C18	C8	C8

Note: (-): Inhibitor/ Ineffective and or inefficient (+): Enabler/Effective and or efficient
NIDI: No identified direct impact C: Company. E.g. C1 = Company 1

Table VI: Supply chain sustainability factors from cross-case analysis enabling and inhibiting supply chain sustainability

Supply chain sustainability	Supply chain stage	Supply chain sustainability factors	Enabler	Inhibitor	Correspondence of factors to SCI
Economic	Production	High cost for AI importation		✓	II,SI
		High cost for power/energy		✓	II
		High port charges		✓	II, SI, CI
		Frequent technology change is costly		✓	II
		High minimum order points for local importers		✓	II, SI
		Highly expensive testing procedures		✓	II, SI
		Squeeze on manufacturers profit margins		✓	II, CI
		Quality issues		✓	II, SI
		High cost for equipment and facilities to be GMP compliant		✓	II, SI
		High cost for R&D		✓	II, SI
		High number of drug failures		✓	II
		Long lead time for drug model development, testing, and approval		✓	SI
		Cross-contamination of drugs		✓	SI
		Long production and testing cycle resulting in high inventory holdings		✓	II
		High manufacturing cost for locally produced drugs affects the selling price of these drugs		✓	II,SI,CI
		Expensive local manufacturing due to high tariffs *		✓	SI
		Over-reliance on foreign suppliers for raw materials *		✓	II,SI
		Long lead time for most raw materials *		✓	SI
		Good efficacy for locally manufactured drugs *		✓	II
		Inadequate storage capacity to meet high demands		✓	II,SI
		Parallel trade		✓	II,SI
		Counterfeit and Expired drugs		✓	CI,SI
		Limited funds to purchase appropriate vehicles, maintenance, repairs, fuel and driver		✓	II,SI

		salaries			
	Distribution	Long port processing times		✓	II,SI
		High storage cost due to long port processes		✓	II,SI
		High demurrages		✓	SI
		High transportation cost		✓	II
		High cost for raw material importation due to less local input manufacturers		✓	SI
		Road constraints and Traffic constraints in major cities		✓	II,SI
		Competitive pressure and uncertainty: IT advancement, DTP		✓	II,SI,CI
		Squeeze on wholesalers profit margins		✓	II,SI,CI
		Less efficiently designed route systems to balance between low distribution cost and service levels		✓	II
		Squeeze on wholesalers profit margins		✓	II,CI
		Issue of combining the duties of drug importation and distribution even with low capacity		✓	II,SI,CI
		Regulation differences in West Africa incur high cost for transportation activities *		✓	II,CI
		Less efficiently designed route systems to balance low distribution cost and service levels*		✓	II,SI,CI
		Less sophisticated software to optimize distribution*		✓	II
		Issue of combining the duties of drug importation and distribution even with low capacity*		✓	II,SI,CI
		More time and resources for exceptionally long deliveries extending to sparsely populated villages. Affects cost. *		✓	II,CI
		Expired drugs		✓	II
	Retail	high cost and competitive pressure		✓	II,SI,CI
		Saturated market affecting profit margins		✓	II,CI
		High use of MCA's due to high cost of operations and hiring pharmacists *		✓	II
		Lack of funds		✓	II,SI,CI
		Reduction in government funding support		✓	SI

	Entire chain	Long lead times due to lack of funds		✓	II,SI
		Unfavorable credit periods		✓	SI,CI
		Fewer profit margins		✓	II,SI,CI
		Improper forecast leading to shortages and expiries		✓	II,SI,CI
		Weak pharmacovigilance		✓	II,SI,CI
		Drug shortages and unavailability		✓	II,SI,CI
		Proper disposal of waste is costly		✓	II,SI,CI
		Frequent technology changes are costly		✓	II,SI,CI
		The high cost of operations affecting profit margins		✓	II
		Payment delays		✓	II,SI,CI
		Drug counterfeits		✓	II,SI,CI
		High competition affecting profit margins		✓	II,SI,CI
		Limited use of technology, resulting in less flow of information across the supply chain		✓	II,SI,CI
		Fragmented nature of the pharmaceutical supply chain		✓	II,SI,CI
		Unregulated prices *		✓	SI
		Prices are regulated **	✓		***SI***
		Falsified Medicine Directive **	✓		***II,SI***
		Use of Effluent plant and Septic tanks	✓		***II***
		Less internal transparency especially with finance which affect supply chain activities		✓	II
		Re-use of recycled water	✓		***II***
	Production	Use of non-recyclable materials		✓	II,SI
		Use of ethical materials sourced from ethical suppliers	✓		***II,SI***
		Re-called and expired drugs		✓	II,SI
		Improper waste, damaged, wrong and expired drug disposal		✓	II,SI,CI
	Distribution	Gifting customers products termed/perceived ethical		✓	CI
		None found			
		Inadequate supervision of the distribution activities. Leading to falsified drug		✓	SI,CI

		introduction			
Environmental	Retail	Climate change leading to shortages and unavailability		✓	II,SI
	Entire chain	Not environmentally conscious		✓	II,SI,CI
		Been environmentally friendly is not economically viable		✓	II,SI,CI
		Improper waste and expired drugs disposal		✓	II,SI,CI
		Use of non-recyclable materials		✓	II
		Education on proper drug disposal	✓		***II,SI,CI***
		Good environmental practices, not a requirement for selecting suppliers or customers*		✓	II,SI,CI
		Heavy reliance on importations mostly subjected to high uncertainty and vulnerable to the introduction of imitated drugs*		✓	II,SI
Social	Production	Limited funds to purchase appropriate vehicles, maintenance, repairs, fuel and driver salaries		✓	II,SI
	Distribution	Free transport for staff	✓		***II***
		High use of MCA's sometimes results in administering interacting drugs*		✓	II
		Bargaining power of retailers affecting wholesalers		✓	CI
	Retail	Gender discrimination avoidance	✓		***II***
		Pay/Salary is OK	✓		***II***
	Entire chain	Engagement in numerous Corporate Social Responsibility activities	✓		***II,CI***
		Hiring is based on expertise	✓		***II***
		Fragmented nature of the pharmaceutical supply chain		✓	II,SI,CI
		Weak pharmacovigilance *		✓	SI,CI
		Free accommodation for the majority of the employees *	✓		***II***

Note: **: Peculiar Issues to the UK (developed countries) *: Peculiar Issues to Ghana (developing countries). Listed issues with no asterisks apply to both the UK and Ghana companies. II: Internal integration SI: Supplier integration (embodies not only raw material and product suppliers but also regulators and governmental bodies as they issue various licenses and operational regulations for the pharmaceutical companies) CI: Customer integration. II, SI, CI**:** Currently, no integration / no effective and/or efficient integration causing a negative impact. ***II, SI, CI***: Effective and/or efficient causing a positive impact

Table VII: IECF's and their impact on supply chain sustainability

IECFs	Level in Supply Chain (where applicable)	IECFs factors and their impact sign	Impact level ratings	Supply Chain Sustainability			IECFs factors mainly influence the level of
				Economic	Social	Environmental	
External Uncertainty	Upstream	Currency fluctuations* (-)	High	C5,C7,C9,C10, C12	NIDI	NIDI	II,SI,CI
		High technology changes (-)	High	C3,C4	NIDI	C4	II
		Dynamic and unpredictable change of manufacturing regulations (-)	High	C3,C4,C9	NIDI	NIDI	II
		Uncertain and long manufacturing lead time (-)	High	C8, C10	NIDI	NIDI	II
	Downstream	Demand uncertainty (-)	High	C1,C3,C10,C11 ,C13	NIDI	NIDI	II,CI
		Forecast difficulty and inaccuracy (-)	High	C1,C3,C11	NIDI	NIDI	II,SI,CI
		Unpredictable market (-)	High	C1,C4,C8	NIDI	NIDI	CI
		Free zone regulation* (-)	High	C2,C3,C4	C2,C3, C4	NIDI	II,SI,CI
	Entire supply chain	Fund and payment uncertainty (-)	High	C6,C7,C9,C12	NIDI	C1	CI
		Unpredictable drug shortages (-)	High	All companies	C3,C4, C8,C1 0	NIDI	II,SI,CI
		High price differences and fluctuations (-)	High	C7,C8,C10.C14	C1,C4, C5,C1 6	C17	II,SI,CI

	Dynamic regulations (-)	High	C3,C11,C18	NIDI	NIDI	II,SI
Leadership Style	Autocratic (-)	High	C3,C4,C6,C7	C4,C5, C7	NIDI	II
						IECF factors facilitated/impacted by
Patient Satisfaction	Reputable brand names (+)	High	All companies	All companies	C3,C4,C6, C9,C13,C15	II,SI,CI
	Quality (product efficacy and effectiveness) (+)	High	CI,C3,C4,C5,C6, C7,C9,C11,C13,C14 ,C15,C16,C17, C18	All companies	NIDI	II,SI,CI

Note: C: Company. E.g. C1 = Company 1. (-): Inhibitor (+): Enablers NIDI: No identified direct impact II: Internal integration SI: Supplier integration CI: Customer integration

*: Peculiar issues to Ghana

Table VIII: Emergent themes from the study and relative literature

Themes	Key dimensions (where applicable)	Quotes from sampled companies	Literature
Supply Chain integration	*Internal integration*	It is stressful when you demand something from another department and their schedule doesn't fit in with your request which ends up in long hours of wait and delays.	Narasimhan et al., (2010) (s): Swink et al, (2007) (s).
	Customer integration	Beyond that when it gets to the retail level, if you have your sales reps or marketing reps, they solicit and introduce the products and they let them know the companies you importing from. This helps to increase our sales and profit.	Narayanan et al., (2011) (s): Narasimhan and Kim, (2002) (s).
	Supplier integration	There is virtually no competition among wholesalers however they do trade together. Sometimes they do barter trade which reduces cost and improves flexibility.	Flynn et al., (2010) (c): Scannell et al., (2000) (s).
Supply chain sustainability	*Economic*	There are payment issues mostly due to NHIS inconsistencies. The debt affects the product range that the company provides to customers. There is also a high cost for production, rising from high power tariffs and the high cost of labor.	Yu et al., (2014) (s).
	Environmental	We are not conscious of the environment. Most of us use plastics instead of paper bags. I don't think I will gain a competitive advantage when I'm conscious of the environment and use more friendly materials.	Pagell and Wu, (2009) (c).
	Social	The working condition is OK and the pay is comfortable. We use 5% of our annual salary to train personnel. We engage in numerous CSR activities. Yes, we experience counterfeit but FMD is to help eliminate counterfeit from the chain.	Balabanis et al., (1998) (s): EFPIA, (2020) (s).
Additionally identified internal and external contextual factors			
External uncertainty		It is a very dynamic industry. Unfortunately, the market is very erratic. Regulations are uncertain and they change frequently from time to time. What is good today might not be good tomorrow.	Donkor et al., 2020 (s): Donkor et al., 2021 (s) Harper and Gyansa-

		Lutterodt, (2009) (s): Shah (2004) (s).
Leadership style	Day to day management and decisions are mainly made by the owner alone. Financial decision is mainly controlled by the owner of the company, yes one-man company. Even to the extent that the chief accountant does not know the full size of the elephant.	Chen et al., (2004) (c): Farh and Cheng, (2000) (s).
Patient satisfaction	There will always be issues when it comes to regulators. However, we focus on the patient and make sure what we give them is quality, safe, effective and efficient. Satisfying our patients help us to grow as a company.	Dotson and Allenby, (2010) (s): Narayanan et al., (2011) (s).

1. (s): Given reference supports quote 2. (c): Given reference contradicts the quote

Table A1: *Literature review summarizing the perspectives SCI-performance has been widely analysed and the identified gap*

Author(s)	SCI Scope	Industry	Methodology	Moderator	Mediator	Performance	Main arguments
Ataseven and Nair (2017)	SI, CI, II	Mixed industries	Meta-analysis	None	None	Financial and operational performance	The various dimensions of SCI impact financial performance. The study argues that there are existing moderators that moderate the SCI-performance relationship. Hence the SCI-performance needs to be further studied from a contingency perspective to uncover the role of moderating factors.
Boon-itt and Wong (2011)	SI, CI, II	Automotive industry (Suppliers)	Quantitative (survey)	Technological and demand uncertainty	None	Customer Delivery	CI has no direct effect on customer delivery whilst SI and II do. Technological and demand uncertainty moderates the SI-customer delivery, and II- customer delivery relationships
Chaudhuri et al., (2018)	II, EI	International Manufacturing Strategy Survey	Quantitative (survey) hierarchical regression	Supply chain risk management (SCRM)	None	Manufacturing flexibility	No significant relationship between EI-flexibility. However the II-flexibility relationship was known to be positive. SCRM moderates the EI-flexibility relationship.
Danese et al., (2013)	II, EI	Manufacturing	Quantitative (survey)	International supplier network (ISN)	None	Responsiveness	Positive relationship between EI, II, and responsiveness. ISN moderated EI-responsiveness positively but has no moderating effect on the II-responsiveness relationship.
Flynn et al., (2010)	II, SI, CI	Manufacturing	Quantitative (survey)	CI, SI	None	Operational and Business performance	II serves as the foundation for operationalising SCI. II and CI are strongly related to operational and business performance than SI. The SI-operational performance, and EI-business performance relationships are insignificant.
Frohlich and Westbrook (2001)	SI, CI	International Manufacturing Strategy Survey	Quantitative	None	None	Operational performance	Supplier and customer integration increase operational and financial performance.
Gimenez and Ventura (2005)	SI, CI, II	Manufacturing	Quantitative (survey)	None	None	Operational performance	Integration in the logistics-marketing interface does not lead to reductions in costs, stock-outs and lead-times.
He et al., (2017)	SI	Manufacturing (Mix of manufacturing plants)	Quantitative (survey)	Product Complexity; Competition Intensity	None	Operational performance	Positive relationship between SI-operational performance. The aforementioned relationship is moderated by product complexity and competition intensity
Jacobs et al., (2016)	II, EI	Manufacturing (mixed industries)	Quantitative (survey)	None	II, Employee satisfaction	EI	Employee satisfaction mediates in a partial way the internal communication-II relationship. II mediates the employee satisfaction-external integration relationship.

Kang et al., (2018)	II, CI, SI	Manufacturing (mixed industries)	Quantitative (survey)	Sustainability management practices (SMP)	None	Social, environmental, social performance, Sustainability management practices (SMP)	II and CI enables inter and intra organisational SMPs. Inter and intra organisational SMPs are positively associated with SCS whilst inter and intra organisational SMPs jointly interact to influence social and environmental dimensions.
Koufteros et al., (2005)	II, CI, SI	Manufacturing (Mix of manufacturing companies)	Quantitative (survey)	Uncertainty, Equivocality, Platform strategy	None	Quality, Profitability, Product innovation	No direct relationship between supplier process integration and quality. Integration-performance relationship is moderated by equivocality
Leuschner et al., (2013)	information, operational, relational	Mixed industries	Meta-analysis	II, CI, SI	None	Business, relational, and operational performance	The link between SCI and firm performance was identified to be positive and significant. Sub-group analysis indicated that the majority of samples showed a positive relationship between the operationalisation of SCI and firm performance.
Mackelprang et al., 2014	II, CI, SI	Mixed industries	Meta-analysis	None	None	Financial, market and operational performance	Integration is not universally associated with improved performance. The majority of the integration-performance studies are subject to some moderating factors which are unknown. The identification of these unknown moderating factors is paramount to building and refining the theoretical foundations of supply chain integration.
Shashi et al., (2018)	II, EI	Manufacturing (mixed industries)	Quantitative (survey)	None	None	Sustainable procurement (SP), Sustainable design (SD), Environmental and cost performance	External integration influences SP positively whilst II influences SD positively. SP was known to influence environmental and not cost performance whilst SD influence both environmental and cost performance.
Schoenherr and Swink (2012)	II, SI, CI	Manufacturing, distribution and retail firms	Quantitative (survey)	II	None	Operational performance	II increases the impact of external integration delivery and flexibility, but not on quality and cost.
Vanpoucke et al., (2014)	Supplier integrative capabilities	Manufacturing	Quantitative (survey)	Market and technological dynamics	None	Operational performance	Supplier integrative capability improves cost and flexibility performance. The aforementioned relationship is strengthened by market and technological dynamics.
Vanpoucke et al., (2017)	SI, CI	International Manufacturing Strategy Survey	Quantitative (survey)	IT	Operational integration	Operational performance	Operational integration mediates the exchange of information-operational performance relationship. IT improves the impact of SI.

Vereecke and Muylle (2006)	SI, CI	International Manufacturing Strategy Survey	Quantitative (survey)	None	None	Operational performance and procurement	Weak correlation between supplier and customer collaboration and operational performance and procurement. Stronger collaborations leads to stronger performance.
Wang et al., (2018)	Internal and external green practices	High Performance Manufacturing HPM data (Mixed industries)	Quantitative (survey)	Firm size	None	Environmental performance	Internal and external green practices have a positive impact on environmental performance. Firm size moderates the aforementioned relationships.
Wang et al., (2021)	SI (in the form of supplier involvement), II (in the form of sustainable design practices)	Manufacturing	Quantitative (survey)	Supplier Involvement	None	Environmental and Economic performance	SI positively influences the relationship between sustainable design practices and economic and environmental performance.
Wiengarten et al., (2014)		Manufacturing	Quantitative (survey)	EU	None	Operational performance	Both internal and external dimensions increase operational performance.
Wiengarten et al., (2019)	SI, CI	International Manufacturing Strategy Survey	Quantitative (survey)	Delivery, cost, quality, flexibility	None	Operational and financial performance; Competitive priorities	The SCI-financial performance is contingent on company competitive priorities
Wong et al., (2011)	SI, CI, II	Manufacturing (Automotive)	Quantitative (survey)	EU	None	Operational performance	Both internal and external integration has a positive relationship with operational performance.
Yeung et al., (2013)	Supplier partnership	Manufacturing (Electronics)	Quantitative (survey)	EU, specific investment	None	Cost	There is a direct relationship between Supplier partnership-cost. The aforementioned relationship is strengthened by specific investment and not EU
Yu et al., (2013)	SI, CI, II	Manufacturing (mixed industries) (organisational learning theory)	Quantitative (survey)	None	Customer satisfaction	Financial performance	CI has no significant impact on financial performance. II serves as the foundation for operationalising EI. Customer satisfaction mediates the CI-financial performance relationship
Zhu et al., (2018)	SCI	-Young executives in China	Quantitative (survey)	None	Supply chain learning	Customer service performance;	Positive SCI-customer service, and SCI-Innovation performance relationship. Supply chain learning mediates the aforementioned relationships.

						innovation performance.	
This paper	**SI, CI, II**	**Manufacturers, retailers, distributors, suppliers, regulators, national trading bodies**	**Qualitative (interviews)**	**EU, leadership style**	**Patient satisfaction**	**Environmental, Social, and Economic performance**	**We uniquely consider all the dimensions of SCI and SCS and study the direct influence of SCI on SCS, we also consider all the key stakeholders within and across the supply chain, whilst studying the SCI-SCS relationship comparatively from a developed country (UK) and developing (Ghana) country perspective. More crucially, we adopt a qualitative approach to understand the how and why reasons behind the SCI-SCS relationship. Our proposed framework details how the IECF's *external uncertainty (EU)', 'patient satisfaction', and 'leadership style'* influences the SCI-SCS relationship.**

Note: CI- customer Integration, SI- supplier integration, II- internal integration.

Source: Adapted from Donkor et al., 2021