

# Effects of Information Sharing on Cold Pharmaceutical Product Supplies on Operational Performance: The mediated-moderated influence of internal integration and supply chain resilience

**AUTHOR(S):** Kenneth Asiamah Appah, Yee Choy Leong,  
Devika Nadarajah,  
AND  
Ho Jo Ann

## Abstract

**Purpose:** In the past, 1970's, researchers and professionals were fascinated with supply chain management as a demanding plan of action for an organization's resolve and operational performance. Regardless of these, issues relating to persuasive information sharing in the supply chain system to deliver quality pharmaceutical products to clients to prevent deaths remain a challenge. Nevertheless, current literature on information sharing, internal integration and supply chain resilience are insufficient and researchers have complained of its neglect. Accordingly, there is the need for this study to investigate the relationship between information sharing, internal integration, supply chain resilience and operational performance of cold pharmaceutical supplies in Ghana.

**Design/Methodology/ Approach:** A conceptual model on the use of structural equation modelling (SEM) has been suggested which will be used to quiz the relationship amongst information sharing and operational performance. The current study will use Dynamic capabilities theory (DCT) and Resource-based view (RBV) and postulate a mediated-moderated hypothesis pivoted on positivist stance. The study will also use cross-sectional survey with a census approach with self-administered questionnaire given to suppliers and importers of cold pharmaceutical products in Ghana.

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**Findings:** Extant literature empirically states positive links between information sharing and operational performance. Other studies also revealed different results which show that the relationships though positive, was not strong. In this instance, the introduction of internal integration to improve the effect on the operational performance, is key which serves as an innovative stance.

**Originality:** The use of supply chain resilience as a moderator between internal integration and operational performance is very new in the cold supply chain systems which brings a great innovation in the cold pharmaceutical product supplies. The authors intend to test this model underpinned by the RBV and DCT lens.

**KEYWORDS:** Information sharing, operational performance, internal integration, supply chain resilience, cold pharmaceutical products,



**About Author**

**Author(s):**

**1, Kenneth Asiamah Appah,**

**1. \* Putra Business School, Selangor, Malaysia.**

**\* Procurement and Supply Science Department, Koforidua Technical University, Koforidua, Ghana. E-Mail: [kennasiamah@yahoo.com](mailto:kennasiamah@yahoo.com) \*Corresponding author**

**and Co -Author(s):**

**2, Yee Choy Leong,**

**2. \* Faculty of Economics and Management, University Putra Malaysia, Selangor, Malaysia.**

**3, Devika Nadarajah,**

**3. \* Putra Business School, Selangor, Malaysia.**

**4, Ho Jo Ann,**

**4. \* Faculty of Economics and Management, University Putra Malaysia, Selangor, Malaysia.**

## 1. Introduction

The pharmaceutical cold supply chain has been a challenge to the health of many people because of the erratic nature which cause it to be unreliable for consumption (Sobhi & Radu, 2018). This, Bishara (2006) ascertains that, the quality of cold chain products must be between 2°C and 8°C which must be managed through effective control and depository (Kumar & Jha, 2017). Internationally, so many cold pharmaceutical products had their efficacy and quality troubled (Yakum et al., 2015) due to performance threats in the actions and so is the situation in Ghana (Agyekum, 2012).

Information sharing as used in the supply chain structure is considered the enterprising form of practice for the supply chain arrangement (Ipeak et al., 2011) in the management and delivery of merchandise for enriched performance (Yu et al., 2010). This, Lusiantoro et al. (2018) contends that, sharing of information and short-lived produce distribution chain performance still stands disputed.

On top of this, information sharing has helped many firms to initiate acceptable vital agreement as to ordering and production, deliveries and the proposal for goods (Chen et al., 2013). When information is shared totally amongst supply chain (SC) partners, the firm's performance is improved (Samaddar et al., 2006). However, some firms find it uneasy to circulate information for the reason that, it will be used to circumvent their operational performance (Fawcett et al., 2009).

The main objective of this study is to assess how information sharing is used effectively on cold pharmaceutical suppliers in Ghana to improve performance. The study attempts to also explore how internal integration and supply chain resilience could help mediate and moderate the relationship between information sharing and operational performance respectively.

## 2. LITERATURE REVIEW

### 2.1 Theoretical underpinnings

#### 2.1.1 Resource-based view (RBV)

The resource-based view (RBV) theory recognizes the different possessions that organizations have with regards to evaluating their performances (Peteraf & Biney, 2003). The possessions by firms such as human comprehension, abilities, know-how, fundamentals, sufficient conduct and operations as well as computerization materials will enable the organizations to execute their work (Wernefelt, 1984).

Per the RBV, the possessions are urgently important. Information sharing (IS) as an information technology (IT) aspect has the capacity to have an edge over its adversaries when used effectively (Ni, 2015). The RBV of organizations presupposes that, the correct information shared amongst workers within the rightful resources inside the firms will have power over its competitors (Fawcett et al., 2009). When the information shared is properly integrated with the firms, the steady interplay amongst SC actors will improve performance (Sundram et al., 2016). RBV therefore has information sharing as a stimulant since they increase the location, explanation and anticipation of complex settings (Defee et al., 2010) which goes to enrich the integration of the delivery links to improve the performance of the organization (Leuschner et al., 2013).

#### 2.1.2 Dynamic capability theory (DCT)

Dynamic capability theory (DCT) is the advanced form of RBV theory with distinct reference of alteration (Teece, 2012). Arguably, the different outcomes of RBV are not firmly rooted in dynamic transaction points that dwells on obscure boundaries of transaction points, risky environments and different trading partners (Eisenhardt & Martin, 2000). DCT delve into

how firms liaise, organize and enhance the inside and outside procedures and skills to yield superiority over their challenges (Kim et al., 2012).

DCT of firms argues that, critical resources available to firms is needed to come out with the distinctions of firms (Barney, 1991) which involve possessions being supply chain management (SCM) and SCI (Blome et al., 2014), SCI and OP moderated by SCR (Mandal, 2012). Organizations that can improve their information dissemination within and outside their borders will be able to curb associated risks when information is shared completely (Ratnasingam, 2007). In spite of that, when efficient is apportioned amongst partners in the SC, SCM practices is positively augmented to come out with superior performance thereby bettering shipment and value (Zhan & Benton, 2007). Thus, the present study increases literature by using dynamic capabilities circumstances anchored by (Teece, 2012) for assessing a company's resilience literature know-how (Kantur & Iserri-Say, 2015).

## 2.2 Information sharing (IS)

Information sharing has been observed in previous studies to have an edge over competitors when used properly between supply chain members (Ipek et al., 2011). For instance, information that is shared effectively has proven to improve performance amongst buyers, merchants and opponents (Huang et al., 2017).

However, information sharing most at times have been divulged in distracted parts to associates in the SC systems which has ended up in misconception (Bian et al., 2016) resulting in decreased understanding (Boon-itt, 2011) and affecting performance costly (Geunes et al., 2016). Thus, a firm's performance is improved when there is total communication amongst the diverse departments in the firm (Samaddar et al., 2006). It is seen that, when there is the willingness to share information, erratic and silent location inside the organization's SC could be located and improved to augment movement performance (Brusset, 2016) which requires extensive harmony of discussion out-of-doors for operational compliance (Rahimi et al., 2016).

The affectionate alliance over information sharing increased the inventory levels of Toyota's supply chain members (Cai et al., 2016). So, it is argued that, organizations must contribute demanding information to boost their cooperative affiliation (Sunhee et al., 2013). Nevertheless, threats in the sharing of information in the SC structure abounds (Ali et al., 2017) in the forms of different levels of information (Rached et al., 2016) which create supply chain management dilemma costing the firms (Geunes et al., 2016).

## 2.3 Internal Integration (II)

Vikas et al. (2017) defines internal integration as the union and calculated correlation of business actions and schemes inside a firm which is regulated to establish topmost performance achievements by the firm. Internal integration is an aspect of supply chain integration which comprise varying departments and practices tackled inside the firm and as such special consideration must be given to the functional department (Boon-itt, 2011). Ralston et al. (2015) presuppose that, internal integration strengthens the organization performance by lowering cost. Apart from this, some researchers posited that, internal integration through discipline trade had a positive consequence on the degree of exterior participation and organization's determined performance (Flynn et al., 2010; Prajogo & Qlhager, 2012; Zhao et al., 2011).

Past studies have conclusively proved that, internal integration directly or indirectly affect operational performance (Danese et al., 2013). Though Wong et al. (2011b) and Flynn et al. (2010) established a direct positive relationship between internal integration and performance, others found no direct interaction amongst internal integration and operational

performance (Koufteros et al., 2005). These happenings have justified the impression that, internal integration needs a second look if a thoughtful outcome is expected whereby organizations that utilize internal integration very well strengthens their supply chain integration linkage leading to their base grounded to improve performance (Basnet, 2013).

#### **2.4. Supply chain resilience (SCR).**

Supply chain resilience (SCR) has been defined as the power of a network to regain its physical place inside an allowable space after an interruption (Brandon-Jones et al., 2014). Extant literature has said, risk is a difficult task and there is no straight formula to estimate risk arising from uncertain environmental business (Fiksel et al., 2015) hence making the delivery chain risk management not able to organize for any unpleasant circumstance (Petit & Fiksel, 2010). Then arose SCR which has the capacity to clear up condition of reliable and unreliable delivery chain (Fiksel et al., 2010). The performance of freezing chain arrangements relies heavily on the resilience of firms through modifying, maintaining and regulating the delivery links and providing the space and the personal competences (Lengnick-Hall et al., 2011).

According to Wagner and Bode (2008), supplier distribution challenges have a significant negative impact on supply chain performance due to delivery speed and client pressure. Ates and Bititci (2011) contend that, resilience gives the firm the capacity to contain interruptions and allows the linkage in supply chain rebound to its initial condition at a greater speed, hence bearing a positive impact on the organization's performance. The cold pharmaceutical products are complex due to its time- temperature factor and when not handled properly could cause performance challenges (Bishara, 2006).

Therefore, when organizations operate at low performance levels, conscious SCR implemented goes to enhance the performance when used well (Ali et al., 2018). Supply chain resilience could be initiated through infusing repetition actions so that the negative effects of the interruption can be curtailed by executing transactions by holding smaller space so that performance can be withheld (Sheffi & Rice, 2005).

In the study of Zsidisin and Wagner (2010), supply chain resilience as a moderator significantly backed three out of the six linkages. Wherefore, SCR is described as a major skill to solve greater number of both expected and erratic dangers in the supply chain (Fiksel et al., 2015). Thus, SCR not only help an organization to prepare for unexpected disruptions in their activities but also help the organization provide capabilities to return to its original set-up.

#### **2.5 Operational performance**

Enterprises, companies, firms or organizations strive to achieve good performance to remain in business because of the taste of clients. Such enterprises should however value their performance standards which is essential to shape their trade master plan (Chia et al., 2009). Operational performance (OP) as one of the dimensions of supply chain performance (SCP) is seen as a booster of SCP (Yu et al., 2014). Deveraj et al. (2007) examined operational performance under the measures of cost, quality, flexibility and delivery. Truong et al. (2017) however studied OP under no measures. Different authors have different OP measures and this current study intends to measure OP under no specific measures as a result of the complicated cold pharmaceutical supplies.

However, in the supply of cold pharmaceutical, clients look at quality of products and delivery performance which cannot be overlooked. In some studies, tackled in academia, some have conjectured specific effects of the organization's quality management practices on the organization's performance (Kaynak, 2003). For instance, Gulin et al. (2016) in their study

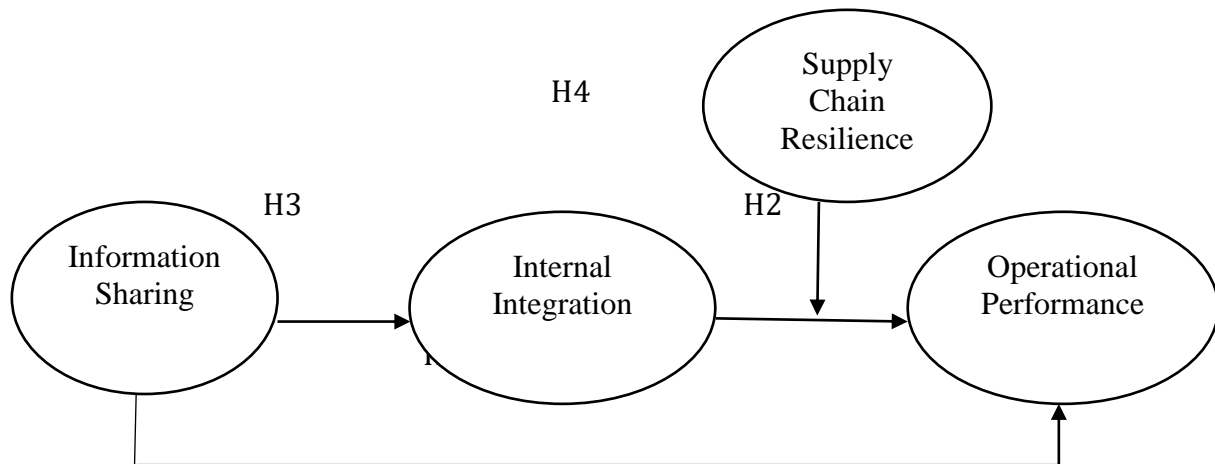
established positive and permanent effect on total quality management but negligible effect on quality performance. Be that as it may, the delivery of quality products to clients will determine the performance level of the firm which must not be overlooked.

## 2.6 Research model and hypothesis

This study is developed under the research model in Figure 1 below.

Figure 1

*Proposed research model*



### 2.6.1 Information sharing and operational performance

Several observed studies have examined the relationship between information sharing and operational performance. In the study of Damingnez et al. (2018), it was established that there was a significant relationship between information sharing and supply chain performance. Veera *et al.* (2016) in their study found supply chain management practices (e.g. Information sharing) to significantly influence performance. Moreover, though great gain is achieved in information sharing in enhancing performance as in extant literature (Shen et al., 2014), an understandable relation between information sharing and destructible products (e.g., cold pharmaceutical) and performance is inconclusive and remains ambiguous (Lusiantoro et al., 2018). The RBV of DCT by Teece (2007) posits that the human skills and the resources provided to people goes to help in the proper positioning of firms to communicate well which goes to improve performance. To comprehend the relationship between information sharing and operational performances in the supply of cold pharmaceutical products supplies in the Ghanaian set-up, it is hypothesized that:

Hypothesis 1(H1): There is a significant relationship between information sharing and operational performance.

### 2.6.2 Internal integration (II) and operational performance.

Internal integration (II) has been defined as the partnership and critical interactions of business pursuits and moves inside an organization that is related to guarantee that the organization achieves greatest performance (Vikas et al., 2017). Internal integration is thus seen as an aspect of supply chain integration (SCI) which brings all the internal departments working together to procure products from upstream partners and supplied (Zahra et al., 2013). This proves that much focus should be placed on the internal usable departments (procuring, logistics, supplies, selling, marketing) (Boon- itt, 2011). Past studies have grounded that, II has either direct or indirect link with operational performance (Danese et al., 2013; Danese & Romano, 2011).

Arguably, researchers established positive links amongst II and operational performance (Flynn et al., 2010; Lofti et al., 2013) Aside this, other researchers established no direct link amongst II and operational performance (Koufteros et al., 2005). It is contended that, organizations that use II actualize their policies and reinforce their integration with other partners to improve performance (Flynn et al., 2010). This study, having operational performance as the final outcome, will continue to be a mirage if the connection between internal integration and operational performance is not established. It is therefore hypothesized that:

Hypothesis 2(H2): There is positive relationship between internal integration and operational performance.

### **2.6.3. Relationship between information sharing and internal integration.**

The supply chain systems have established information as the catalyst that crystalizes the different units and departments in the organization. Ipek et al. (2011) see this implemented amongst the partners. Sunhee et al. (2013) therefore contend that, demanding information is needed to augment the internal alliance of firms. Nevertheless, there are extreme questions in the search of information sharing within the SC structure (Spekman & Davis, 2016) which has made it problematic to grasp a proficient information sharing amongst associates in the chain (Huang & Wang, 2017).

Boon- itt (2011) posited that, the sharing of information as a form of information technology is necessary to minimize waste within departments which go to enhance the quality of product supplied with improved performance. Information sharing is thus a strategic enabler to SCI (e.g., internal integration) with respect to business practices both inside and the external barriers of a firm (Vickery et al., 2010). This assertion is further grounded that, information sharing improves SCI is furthermore fortified by the resource-based view (RBV) theory.

According to the RBV, information sharing is seen as a stimulant since they can augment the recognition, information and prediction of complex positions (Defee et al., 2010) to enhance the integration of the supply chains which eventually improve performance (Leuschner et al., 2013). Factually, RBV argues that, when information is administered well in the SC structure, deserved information can be passed on to internal members in the firm to help them serve efficiently to yield good outcomes (Sundram et al., 2018). DCT as an enhanced form of RBV contends that the capabilities of firms are needed to give definite clues to the variations of organization's performance (Barney, 1991). DCT therefore highlights on the supply link capabilities that a firm has in order to pick out, put into use, and understand the resources or brilliance within and without the organization to showcase the overall supply chain conduct (Wu, 2006). With the needed material and human resources, information can be integrated internally in firms amongst associates in the chain to boost better comprehension (Khan et al., 2016).

This study therefore proposes the following hypothesis:

Hypothesis 3 (H3)

There is significant relationship between information sharing and internal integration.

### **2.6.4. Mediating role of internal integration on the relationship between information sharing and operational performance.**

According to Saunders et al. (2016), a mediator is planted amidst an independent construct and a dependent construct to explain the fallout of the independent construct to the dependent construct. Information sharing has been the kingpin in boosting performance when integrated very effectively. Firms which have challenges with information sharing have



affected their performance levels since cooperation and logistical support have been ignored in its internal integration efforts (Prajogo & Olhager, 2011). The integration of internal members of a firm through potent flow of information will finally propel the organization and complete SC to greater performance (Palson & Johansson, 2009).

Sundram et al. (2016) confirmed indicating that, SCI actually mediates the information processes and performance. Du (2007) also posited that, there is great fulfillment of performance when information shared and performance is medicated with integration. Kembro et al. (2014) buttressed this that, sharing information as a construct of supply chain management practice is required to affect influential SCI to augment performance. The RBV argues that, firms use assets shared amongst them for duration to affirm their activities (Wernerfelt, 1984). As such, firms are required to hold up sufficiently on information assets and the enhancement of the integration efforts in the distribution of exceptional commodities and services (Veera et al., 2018). When information is shared completely amongst SC partners invariably goes to enhance performance to attain high profit margins (Rached et al., 2016).

Hence, this study expects to interrogate the following and thus hypothesize that:

Hypothesis 4 (H4)

Internal integration mediates the relationship between information sharing and operational performance.

#### **2.6.5 Moderating role of supply chain resilience (SCR) on the relationship between internal integration and operational performance.**

Resilience has been seen as a great wherewithal in the supply chain structures which are used by firms when confronted with unmanageable situations (Ali et al., 2018; Mandal, 2017, Zsidisin & Wagner, 2010). The applications of the resilience could however differ from one distributor or firm to another. The unpredicted nature of the supply of cold products and the attendant atmospheric situation with short lifespan has placed firms in an unsafe condition (Ali et al., 2018). SCR contends that, firms which are challenged with disturbances in their supply chain can either return to its original state (Mandal, 2012). Past studies have found insignificant relationship between SCI and performance concealed by demand uncertainty (Huang et al., 2014), competitive intensity (Fynes et al., 2004) and market orientation (Liu et al., 2013). Contrary, others contend that, at low performance levels, firms need to be reactive in resilience by giving out the needed capabilities so that the performance will be boosted (Ali et al., 2018). More so, Zsidisin and Wagner (2010) contend that, when the turmoil is more prevalent, higher scopes of SCR go to impact the relationship thereby reducing the disturbance and augmenting the performance heights.

This is to say that, if the disturbance is immense the resilience has to be immense in order to minimize the effect so that the consequence (performance) is boosted. The researchers of this study see capabilities and assets as key if the firms want to improve the link between internal integration and operational performance. Dynamic capacities enable SC actors to sustain their treasured position even in varying atmospheres between safeguarding performances (Teece, 2007). Rooted on dynamic capability they (DCT), when there is unstable trends in the supply chain link, DCT promotes the transformation of current assets and capacities of the firm to stay ambitions in erratic circumstance (Teece, 2012; Blackhurst et al., 2011). Extant literature has uncovered that, lack of SCR in firms has plagued performance due to dangers and disruptions of movement (Xu et al., 2014). Dwelling on these assumptions and grounded in DCT, it is hypothesized that;

Hypothesis 5 (H5)

Supply chain resilience moderates the relationship between internal integration and operational performance.

### 3 RESEARCH METHODOLOGY

Essentially, information sharing is acclaimed to be used in all spheres of the supply chain management arena on process, service and production. Nonetheless, sharing of information in a firm is confirmed to have an effect on operational performance. Past studies by Veera et al. (2016) and Khan et al. (2016) have indicated positive relationship amongst information sharing and performance. The study will use single firms in the distributing or service sectors specifically cold pharmaceutical supplying firms as the unit of analysis, to minimize heterogeneity in information sharing. Also, cold pharmaceutical distributors will be selected due to the performance evaluation. To achieve the objective of this study, cold pharmaceutical distributors in the supply systems in Ghana will be the sample. The entire suppliers of cold pharmaceutical products will be employed, totaling 204, thus census approach will be used. The authors will use structured questionnaire so that all arguments regarding information sharing, internal integration, supply chain resilience and operational performance will be responded to. The questionnaire will be issued to two groups of people (supply chain managers and general managers) of the suppliers.

### 4 CONCLUSIONS

The current study gives the literature review of information sharing and operational performance being mediated by internal integration and moderated by supply chain resilience. Clients of cold pharmaceutical products are much particular with good delivery performance and quality of their products. To satisfy these conditions, the suppliers of time-temperature health products ought to augment their service delivery by sharing precise and accurate information in the supply chain network so that any challenges along the supply chain systems could be appreciated and resolved.

### 5 RECOMMENDATION FOR FUTURE RESEARCH

As at now, it is challenging to identify past studies that investigate the link amongst information sharing and operational performance with a mediated- moderated effect. This study is anticipated to help academicians and experts in the cold pharmaceutical supply chain distribution network to enhance their comprehension and determine favorable circumstances for reforms in the practices of information sharing to augment operational performance. Precise and concrete information shared amongst supply chain associates in the cold chain networks will also help firms to improve their delivery output by providing quality cold pharmaceutical products to satisfy their clients.

Moreover, the cost of doing business will reduce since concrete information shared timely will prevent interruptions and supply challenges and quality cold products delivered where operational performance will be boosted. The paper is at data collection stage where this conceptual idea will be empirically tested and reported in the future. The researchers also propose the framework for further study to experimentally interrogate in the production industry. Additionally, further studies can also employ information sharing as a supply chain management practice to augment operational performance with external integration as the mediating variable.

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