

RESEARCH PAPER

# Supply Chain Integration and Health Firms' Operational Performance: Implications for Underdeveloped Countries

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## ABSTRACT

*Backed by RBV Theory, this study investigated the effect of Supply Chain Integration (SCI) on Operational Performance (OP) of the medical sector. The data were collected from 307 managers out of 330 managers through questionnaire inspired by previous studies and then, they were refined through experts' interviews and a panel of judges. Statistical techniques such as descriptive statistics, correlation, and SEM were employed. The results of the study indicated a significant positive relationship between SCI and the medical sector's OP. The results also demonstrated that the managers in Medical Sector behaved almost similarly in terms of their preference for customer integration and internal integration indicators. Furthermore, empirical results indicated that the interactions between the two components of SCI affected OP strongly. Moreover, internal integration had the highest effect on OP, followed by customer satisfaction. The research provides theoretical and practical implications. Theoretically, the SCI requires a higher level of internal integration. Thus, for an institution to support the participation of partners, it must ensure proper internal integration. Practically, full collaboration of participants and integration of the firm internally and externally should ensure greater performance. Moreover, the study provided a suggestion for future research.*

**KEYWORDS:** Supply chain integration (SCI); Internal integration (II); Customer integration (CI); Operational performance (OP); (Medical sector).

## 1. Introduction

Nowadays, customer is considered a source of life for organizations and they provide either goods or services. Organizations are required to develop the capacity to withstand their ground in substantial and extreme competitions. According to Hien., Doan and Tam (2020), business globalization and unification of customers' needs and requirements across the globe have accelerated and developed; therefore, customers always need the right products in suitable places at the right time with high quality and suitable cost. Any organization longing to compete in recent hypermarket should align with the new customers' requirements. To satisfy the customers' requirements, organizations should improve the activities and processes in general. Supply chain management is a complex system

that covers some of the primary and supportive activities from suppliers to after-sales services.

[1] stated that integration of supply chains played a dominant role in improving the organization's performance and gaining competitive advantage. [2] maintained that to utilize the supply chain at its maximum performance, organizations should integrate its goals and activities together. [1] mentioned that supply-chain partners need to focus on different factors to ensure competitive advantage: financial factors and collaboration and non-financial matters to ensure an innovative product design. [3] announced that supply chain management required integration and coordination for satisfying and responding to changes in consumer demand. Finally, [4] pointed out that supply chain integration influenced performance.

Therefore, supply chain integration and performance as well as the area of competitiveness and added value need more focus and investigation. This study investigates the impact of supply chain integration on operational performance of the medical sector.

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There are many challenges and obstacles facing the supply chain management, which in turn affected the overall performance of these organizations. First, different departments are concerned with achieving their own objectives separately. Second, different departments without specialized people perform supply chain activities and processes. Third, continuous changes in rules and regulation imposed by the service and medical sectors have other universal regulations and associations which lead to a delay in supplier selection and in preparation of the inputs to the services organization. Finally, continuous variations of customer needs and requirements occur due to tough competitions among organizations. Consequently, this leads to difficulties in integrating supply chain activities and processes, which delay providing products and services to customers at a right place and right time and lose competitive advantage. Most of the studies that have addressed the operational performance in general focused on the manufacturing companies, production companies, and pharmaceutical sector where these studies neglected service companies (Medical Sector), which represent a true foundation of the national economy playing an active role in economic and social growth by providing and diversifying services, achieving developmental goals, and creating job opportunities. Therefore, this research focuses on the study of operational performance in service companies (Medical Sector) and this is what the previous studies have failed to deal with. Thus, this study will explore the relationship between supply chain integration and operational performance. Previous studies ([5] [6], [7] [8], [9] [10] [11] [12] [13] [14]) have studied different types of supply chain integration and this study focuses on two dimensions of supply chain integration: internal integration and customer integration as a dimension of supply chain integration, affecting the operational performance. Internal integration is considered given its significance in meeting the goals when using and sharing organizational information and, thus, it should be significant in the operational performance [15]. Customer integration is considered due to their significance to organizations when satisfying business activities and focusing on effects that are important in operational performance [16]. It attempts to create and use new knowledge to develop new products/services, which should also be critical for operational performance [17]; therefore, there are no previous studies that have investigated the relationship between operational performances

and supply chain integration with dimensions; hence, this study was designed to address the relationships between supply chain integration and operational performance. Finally, previous studies on supply chain integration and operation performance have focused mainly on a specific sector such as manufacturing [18] [19], production [20], pharmaceutical sector [21], and food industry such as [22]. This study covers the medical sector including private hospitals, private medical centers, and private medical services. Thus, this research addresses the gaps and limitations in the literature by investigating the link between supply chain integration and operational performance. Generally, this research will examine the operational performance. In addition, the research will investigate the relationship between supply chain integration and operational performance in the medical sector in Khartoum State. Therefore, the managers believe that it is worth studying the topic of supply chain integration; therefore, the objective of this research is to answer the following question: Does the supply chain integration affect operational performance in the medical sector?

The main objective of this study is to investigate the impact of supply chain integration on operational performance in the medical sector. This research will provide recommendations to the sector and decision-makers. Finally, this study will contribute to the scientific field. The first sub-section represents the theoretical contribution of this research that can be considered in terms of the following areas of knowledge: The research contributes to bridging the knowledge gap that failed in the previous studies, especially in Sudan, on the impact of operation performance in supply chain integration to promote the creative performance of workers. This study is an attempt to build a conceptual framework that will contribute to theories and practice in the field of operational performance. The study will provide scientific guidelines and advices through which the service firms operate in Sudan achieve the efficiency and effectiveness. Therefore, it may be providing a new scientific addition which may combine different variables that diagnose the interaction of their variables, which contribute to the development of new concepts, data and relationships on their subjects. Several practical contributions are expected to emerge from the current research. The results of the study suggest that supply chain integration, creative operation performance, and the possibility of benefiting from the outputs of study in reality can improve

the medical sector. This study brings the significance of user satisfaction into managers' and decision-makers' attention to in the medical sector in order to enhance its role in operation performance, which helps ensure higher performance.

## **2. Literature Review**

Supply chain area is a Richey area with various approaches and theories and many authors define supply chain integration and operational performance in different ways, with each definition being tailored according to the nature of the study, industry, and research objective. Supply chain integration corresponds to collaboration, cooperation, and coordination among different players of supply chain, thus enhancing organization's performance. The following section tackles the concepts of supply chain integration and operational performance as well as the relationship between them.

### **2.1. Supply chain**

The concept of supply chain has evolved over time. [23] argued that supply chain consisted of all parties involved directly or indirectly in fulfilling customer demand and it includes all functions involved in receiving and fulfilling a customer's requests. These functions include manufacturers and suppliers, warehouses, transporters, retailers, and final customers. [24] added that the objective of every supply chain was to maximize the overall value created. [1] stated "Supply chain management is the forming of networks for sourcing raw materials, manufacturing products, or creating services, storing and distributing the goods, and delivering them to customers and consumers". Then, they added that the concept of supply chain was used first to reduce costs and then, to improve customer service and get new products to market faster than others. Finally, [25] defined supply chain as it is the interrelated series of processes within a firm and across different firms that produce a product or service to the satisfaction of customers.

In summary, the concept of supply chain management has been recently introduced that covers all activities carried out by organizations to collaborate with suppliers and customers to satisfy customers' needs, requirements, and preferences.

### **2.2. Supply chain integration**

Due to the intense global competition, organizations create cooperative and mutually

beneficial relationships among supply chain partners [26] [27], [28] pointed out that organizations or companies would need to implement supply chain integration to meet the new challenges of the global competitive environment. [32] described supply chain integration as "the degree to which an organization strategically collaborated with its supply chain partners and managed intra- and inter-organization processes to achieve effective and efficient flows of products, services, information, money, and decisions with the objective of providing maximum value to its customers". [33] defined supply chain integration as "the effective coordination of supply chain processes through the seamless flow of information up and down the supply chain". Supply chain integration can be defined as the process through which all parties are involved in supply chain; supplier, organizations, and customers, are working independently and dependently in a harmony way to achieve a unite objectives such as providing maximum customer value, lowering overall cost. [33]

In this study, supply chain integration is defined as the process of collaboration within supply chain players that manage inter- and intra-organization activities to achieve effective and efficient flow of products, services, and information to provide a maximum value to the customer in the right place with a suitable price and high speed. Internal, supplier, and customer integrations can be considered in measuring the supply chain. [61].

#### **2.3.1. Internal integration**

Internal integration is the center of gravity for both suppliers and customers and it is considered the linchpin that maintains the stability and continuity for all supply chain parties; therefore, the organization could make neither supplier nor customer integration without internal integration.

Many researchers have defined internal integration. Among them, [35] defined internal integration as "the degree to which a manufacturer structures its own strategies, practices, and processes into synchronized, collaborative processes to fulfill its customers' requirements and efficiently interact with suppliers". [32] said that "The internal integration stresses organizational structure, procedures, and practices and, therefore, it must be collaborative and synchronized to fulfill customer requirements".

In this study, internal integration is defined as the process of maintaining cross-functional

cooperation and collaboration within the organization that intends to achieve organizational strategic objectives. It was measured by a group of items that identified the nature of relationship, coordination, and collaboration among organizational departments.

### **2.3.2. Customer integration**

Customers are considering the source of life for organizations whatever they provide either product or service and it is considered the fresh air needed by the organization to grow and to be able to survive in strong and tough competitions. Customer needs and requirements are always transforming while being considered essential and stable in the past; perhaps, it will become complementary in the near future.

Managing the relationship with customer is considered a vital element in supply chain. Customer integration was discussed and defined by different researchers' perspectives. [41] added that customer integration involved core competencies derived from coordination with critical customers. [36] studied the integration with buyers. [37] analyzed supply chain integration from different perspectives: attitudes, pattern, and practices. While other authors have studied integration with customers and suppliers such as [38], [4], [39]. [40] examined supply chain integration as a one-dimensional construct, while [40], [41], [32] considered a broader perspective for supply chain integration as internal integration and external integration. [42] said that both supplier integration and customer integration could be classified as external integration. In summary, customer integration defined as the process of building and maintaining a strong relationship and partnership with the customers. It includes sharing the knowledge, experiences, products, services, and suggestions with customers. Selected items explore the relationship and partnership as well as other related issues measured.

### **2.4. Supply chain operational performance:**

The concept of the operational performance of supply chain has emerged from supply chain strategy, which derived from the overall business strategy. A competitive strategy is defined as "a set of customer needs that seeks to satisfy its products and services" [23] and each organization attempts to adopt a different competitive strategy that fit its strategy; then, it seeks to afford suitable capabilities and resources that help to achieve it. For example, one organization aims to

provide high-quality products with high price; another organization aims to ensure higher availability for a variety of products with reasonable quality at low price, while another organization aims to provide many products and, therefore, its competitive strategy must be established based on providing customer convenience, availability, and responsiveness.

Any company intended to be successful must fit between supply chain strategy and its competitive strategy. [23] commented on the strategic fit that refers to the consistency between customers' priorities that the competitive strategy hopes to satisfy.

Researchers have investigated supply chain performance from many different perspectives. [24] developed supply chain performance measures in terms of efficiency. [25] studied profits, delivery speed, and transportation costs as performance measures. [26] investigated a firm's supply performance in terms of flexibility, cost, relationship, and responsiveness.

[27],[28] stated that eliminating non-added value activities, decreasing variance of orders, and speeding product flows affect organizations' performance. [29] mentioned that IT and process innovation could contribute significantly to operational performance. [30] held that organizations must recognize the nature of trade-offs between customer services and costs. The organizations attempt to gain competitive advantages by aligning supply chain processes and decisions with their business strategy. [31] proposed that supply chain strategy should ensure that supply chain provides a superior value to the end-user in an efficient manner. [31] emphasized that organization success would be dependent heavily on the success of supply chain in which the organization participates as a partner. [1] reviewed Porter's competitive strategies (lower cost, focus, and differentiation) and argued that business strategy would be focused on improving the competitive position of a business unit, products and/or services in a specific industry or market segment. [1] indicated that supplier network resources had a significant impact on the firm's performance. [43] concluded that logistic integration had a mediating effect on operational performance.

[44],[45] were of the opinion that the use of external linkage performance metrics would lead to the creation of end-customer value by integrating activities and communicating with other member firms along the supply chain. [46] pointed out the importance of operational performance metrics as a standard framework to

assess operational performance, which includes internal and external firm links. [1] presented the criteria for performance evaluation: cost, customer service, productivity, asset measurement, quality, time, innovativeness, price, flexibility/adaptability, ability to collaborate, supplier profile, and marketing measures.

This study considers the operational performance as a group of standards and benchmarks that are adopted and used by the organizations to achieve competitive advantage, customer satisfaction, and maximum level of profitability. In this study, the following dimensions were employed to measure chain operational performance: service performance, quality performance, and cost performance because they are considered the most common dimensions that were investigated between previous studies.

#### **Service performance:**

Behaviors of employees serve and help their customers. [47] contended that employee job performance consisted of three components: in-role, extra-role toward customers, and extra-role toward the organization. The in-role component refers to the main tasks included in the job description such as being well informed of the delivered service, conducting proper product displays, and handling client orders. Extra-role toward customers is employee discretionary behaviors that indirectly affect the value of the chain of delivering the product such as providing extra service to the clients. Extra-role behavior toward the organization refers to employee willingness to promote the organization's welfare. In the retail context, the employee initiatives to increase the quality of his or her service delivery comprise an element of extra-role behavior toward the organization [48]

[49] maintained that for employees to properly serve the customer exceptionally, the firm must motivate and satisfy the employees so that they can deliver services without difficulties. Further, Liao and [50] suggested that employee service performance had three antecedents: individual level, store level, and service climate. The individual level is the personality of the employee consisting of continuousness, neuroticism, extroversion, and agreeableness. The store level is human resources practice including employee involvement, service training, and performance incentive. Service climate refers to the shared views among employees concerning the procedures, policies, and practices.

#### **2.4.1. Cost performance:**

Building a strategy based on reducing the overall costs entails considering the following factors: reducing inventories, maximum utilization of resources, work- in- process inventory turnover, and eliminating non-added value activities.

It is likely that the most common and important measure of evaluating the operational supply chain is cost. [44] defined the cost as the total cost incurred to accomplish specific operations. Organizations attempt to decrease prices and maximizing profit. [1] defined cost as a summation of all costs that include inbound and outbound freight, warehouse cost, third-party storage cost, order processing cost, direct labor cost, and administrative and service costs. [51] defined the cost as "the total costs of operating the supply chain". In this research, the author defined the cost as the total costs and expenses that are incurred by completing all/and or specific activities and operations within a supply chain. Selected items that reflect the total incurred costs and expenses measured it.

Referring to the above previous studies as well as based on the importance of supply chain management and the results of substantial benefits as a result of integration, the researcher investigated the supply chain integration as an independent variable represented by internal, customer integration, the operational performance as a dependent variable represented by service performance and cost performance.

#### **Relationship between supply chain integration and operational performance:**

In the literature reviews, it was shown that there was a strong relationship between supply chain integration and performance. Some studies claimed that there was a strong relationship between supplier and customer integration and organizational performance, while other studies commented on the presence of a relationship between upstream and downstream interactions and operational performance. Moreover, another group of studies ensured the inevitability of a relationship among supplier, internal, and customer integration with the overall organizational performance.

Almost all studies concluded that the supply chain integration was considered a vital process that affects operational performance and, consequently, organizations' overall business performance.

[52] concluded that supply chain practices were positively associated with aggregation measures of cost and flexibility. [53],[4], [54] found a



positive and direct relationship between information technology integration and supply chain integration. [55] mentioned that internal integration of different departments within a firm should act as an integrated process ([56],[57]); and [58] demonstrated the importance of downstream integration. [59] maintained that supply chain integration affected operational performance and the degree of integration influenced the cost and efficiency. [60],[61] pointed out that external integration emphasized the importance of cooperation and collaboration with suppliers and customers.

Therefore, this study assumes that there is a positive relationship between supply chain integration with their dimensions (internal integration, customer integration) and operational performance with their dimensions (service and cost performances) in the service sector (medical sector) including private hospitals, private medical centers, and private medical institutions in Khartoum state.

### 3. RBV Theory:

Resource-Based View, Resource Dependence Theory emphasizes the term "resource" as an important feature in the context of the formulation and implementation of corporate strategy in order to generate persistent competitive advantages. However, unlike the Resource-Based View, Resource Dependence Theory investigates a company from an external perspective. Thus, the dependence of a company on external resources allows it to acquire new businesses to create co-operations and strategic alliances and merge with other companies. Resource-based view seeks the sources of competitive advantage from within the organization, thus analyzing its strengths and weaknesses. According to this view, companies can gain competitive advantage if they are able to achieve superior resources and capabilities that are valuable, rare, inimitable, and non-substitutable. Thus, the objective is to identify, develop, and deploy key resources to maximize returns and the relational view finds the source of competitive advantage in the collaboration between firms and, more specifically, it identifies four sources of inter-organizational competitive advantage: relation specific assets, knowledge sharing routines, complementary resources/abilities, and effective governance [62]. RBV further suggests that the value of SCI as resources lies in its ability to create organizational processes that drive firms to prioritize supply chain relationships. SCI as an

intangible capability allows managers to use both formal and informal relationship mechanisms among supply chain members to facilitate a long-term approach to SCM. The more interactions or negotiations the company undertakes with its external environment, the more assured it would be in response to its access to resources and the more dependent it becomes on the groups [84]. The company is being constantly watched by external groups which controlling its resources and are therefore able to influence the entire resource allocation process. From a theoretical point of view, this study will develop testable hypotheses.

Firm resources can be internal (or inside out) and external (or outside in) to the firm. Internal resources are the assets owned and controlled by the firm such as financial, human, physical, and technological resources, whereas external resources are the assets that may be earned and controlled to a certain extent depending on various factors like industry attractiveness and structural autonomy, but not necessarily owned by the firm such as customers, competitors, and suppliers, among others (Anggraeni, 2014; Dierickx & Cool, 1989; Hulland et al., 2007; Wade & Hulland, 2004). It is suggested that SCI is an internal firm resource because the acquisition, integration, and usage of its interrelated components are owned and controlled by firms.

### 4. Hypotheses Development:

Based on the problem statement and its elements, the following hypotheses can be derived:

#### The relationship between supply chain integration and operational performance.

In the literature, a number of scholars such as [5],[6],[7],[8], [9] and others have discussed the significance of supply chain integration concept in developing supply chain aiming to enhance the organizational performance. [63] [64], [17] indicated a positive relationship between supply chain integration and firm performance. However, [65], [66], [67]), [68] [22] demonstrated a positive relationship between supply chain integration and performance. Based on the above discussions, the following hypotheses are generated:

# H1. There is a relationship between supply chain integration and operational performance.

## Conceptual Framework:

Based on previous studies of supply chain integration and depending on different models, the current study chooses to set the study model that shows the impact of supply chain integration with its all elements (internal and customer integration) on operational performance (cost performance and service performance). Based on the above discussions, the following hypotheses are generated:

H1.1 There is a positive relationship between supply chain integration and service performance  
Developed sub-hypotheses of the first hypothesis as as follows:

**H1.1a** There is positive relationship between internal integration and service performance

**H1.1c** there is positive relationship between customer integration and service performance

**H1.2** There is a positive relationship between Supply chain integration and cost performance

**H1.2a** There is a positive relationship between internal integration and cost performance

**H1.2c** There is a positive relationship between customer integration and cost performance

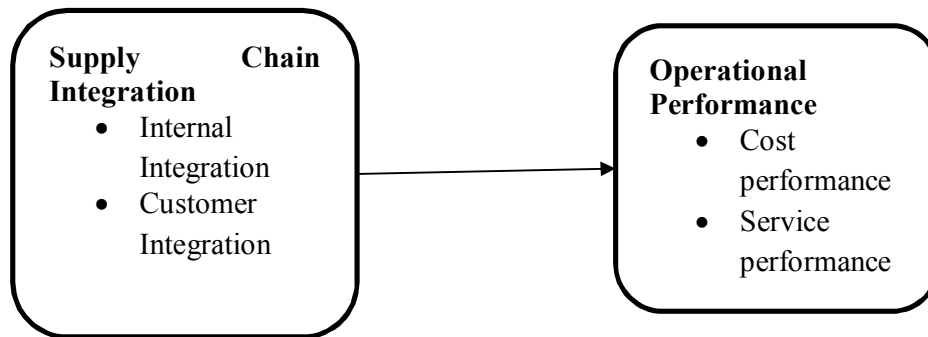


Fig. 1. Research Frameworks

Source: prepared By Researcher.

## 5. Methodology

When deciding upon employing a research approach for a study, the researcher can choose among several research approaches, all characterized by specific strengths and weaknesses. The most important condition for choosing an appropriate approach is to identify the type of research questions that should be answered. Yin (2003) presented five different types of questions: "who", "what", "where", "how", and "why"- questions, to which different approaches are suitable. Due to the nature of this dissertation, they are three main characteristics that distinguish a survey approach from other approaches such as case studies or experimental studies. First, collection of information is done by asking people in a structured manner. Collection methods in a survey approach could be mailed questionnaires, face to face interviews, or telephone calls. Second, a survey approach is a quantitative method that demands standardized information from and/or about the studied subject, e.g., individuals, groups or organizations. Third, information is generally gathered from a sample, which is a fraction of a specific population. The sample should be chosen in such a manner that the answers from the sample could

be generalized to the whole population. (Malhotra and Grover, 1998; Pinsonneault and Kraemer, 1993).

Consistent with the purpose of this study to investigate the effects of Supply Chain Integration (SCI) on Operation Performance (OP) in the service sector (Medical Sector) in Khartoum state, the quantitative method was used, involving the collection of primary data from a large number of individuals, frequently with the aim of projecting the results to the larger black population (1999); for this purpose, the study used the descriptive method (use of survey).

### 5.1. Data collection:

#### 5.1.1. Primary data collection tool:

The collection of the data will be done using structured questionnaire including closed answers.

#### 5.1.2. Secondary data collection:

The secondary data will be collected using the following:

- ❖ Scientific books, references, and international journals
- ❖ Previous related studies

❖ Internet web sources.

**Research philosophy and approach:** Philosophy guides research and philosophy of science aims to respond to what the truth of science is and what depends on it as a science.

**The philosophy of positivism:** Building upon what has been observed and confirmed from previous studies through the development and testing of hypotheses through theoretical testing (Saunders et al., 2009). The study is based on the descriptive analytical approach. It is characterized by its comprehensive view. It aims at studying the phenomenon as it exists in reality. It is concerned as a precise description and expresses it in qualitative and quantitative terms. It works to gather facts and information about them and analyze them. (Saunders et al., 2009) .

## 6. Population and Sample:

There are several reasons behind selecting the medical sector. It is an important and visible service for Sudan and world economies. The medical sector as the largest service activity in the world is also one of the most complex and diverse service activities in the world. The target respondents for the survey will be the middle-level managers at the medical service level. Middle-level managers (supply chain managers, logistics managers, procurement and marketing, and operations managers) are best fitted to answer the questions of this survey because of their experience, expertise, and access to operational and performance data which would be the most appropriate to meet the objective of the study, since the nature of the study requires knowledge about management policies as well as detailed operational performances, and the individuals in the middle management are in the position. This study is focused on the medical sector that includes private hospitals, private medical services, and private service institutions. In addition, the good performance of the medical sector could be a model for other service sectors. Ismail et al. (1998) found that from the perspective of competitive advantage, large firms enjoy better management than small ones.

The Study Respondents shows in table (1)

The study population refers to the total population in the study area and the results can be generalized to the whole community.

The study population includes top managers and supply chain managers in Sudanese service firms (Medical Sector) operating in Khartoum State and those represented in the sectors (private hospitals, private medical centers, and private medical services) totaling (162) medical sectors. A complete enumeration method was used. This study chose this sector (Medical Sector) in service because it is the largest and important and provides sensitive services to customers when attending to the health of patients; therefore, the study concerned about the supply chain management as it is one of the best managerial practice in organizations.

### 6.1. Measurements of the variables:

There are two main types of variables: independent (supply chain integration) and dependent variables (operational performance). Measures for all dimensions of constructs were taken from the existing literature. To measure the dimensions of variables, this study used the five-point Likert scale type ranging from strong agreement with the question to strong disagreement (Sekaran, 2003). The Likert scale is designed to examine how strongly subjects agree or disagree with statements on a 5-point scale.

Moreover, the questionnaire items were adopted from different sources to suit the service firms (Medical Sector). **Supply chain integration** was measured using three dimensions: the items of internal integration are measured using four-point scales adopted from the study of Flynn et al. (2010). Moreover, customer integration is measured using five-point scales adopted from the study of Lii et al. (2015). **Operational performances** were measured using three dimensions. The service performance is measured using five-point scales adopted from the study of Baea (2017), while cost performance is measured using four-point scales adopted the study of Baea (2017).

**Tab. 1. Response rate of questionnaire**

Total distributed questionnaires	330
Total questionnaires received from respondents	307
Valid questionnaires received from respondents	0
Invalid questionnaires	0
Questionnaires not received	23
Overall response rate	307
Useable response rate	307

Source: prepared by researcher from data (2018)



The response bias was assessed by comparing the means of the responses in the last quartile of respondents by this design, a Chi-square and DF of all the variables used in the study revealed significant differences between the groups. Therefore, a control test is conducted for the variables (competitors, suppliers, company age, job title, and company ownership). Structural Equation Modeling (SEM) was conducted using AMOS version 22 for testing the measurement and structural model requires large samples. [106] suggested that a minimum of 100 to 150 observations should be sufficient. Based on these definitions, the samples of this study satisfy the requirement of using CFA to test the full measurement model simultaneously.

## 7. Analysis and Results

The framework is tested by Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) in SEM in order to evaluate the consistency OF scale items [107]. In this study, EFA and CFA are used to test the measurement model of the structural SCI and operational performance. To validate the constructed model, the following tools use convergence and discriminate validity, reliability, and common method biases. Moreover, to test the inter-relationships between the variables, the direct relationships between structural SCI and operational performance as well as between structural SCI and operational performance modeling are investigated. All these tests are elaborated in the following sections.

### 6.1. Confirmatory factor analysis

CFA tests the measurement model of variables. Therefore, SCI, operational performances were tested using the first-order confirmatory factor model to evaluate the construct validity. The confirmatory analysis results confirm the required structures for SCI and operational performance.

The values for the model fit indices  $\chi^2=1262.195$  with  $DF=71$ ;  $CFI=0.941$ ;  $CMIN=102.024$ ;  $SRMR=0.05$ ;  $RMSEA=0.054$ .

The above correlation was tested by comparing the squared correlation between the latent constructs to their Average Variance Extracted (AVE) estimates. Accordingly, discriminant validity exists if the items share more common variance with their respective construct than any variance the construct shares with other constructs. Therefore, the correlations between each couple of variables in the model construct need to be less than the AVE of each variable construct. Based on the correlation coefficients given in (Table 2), it can be concluded that none of the squared correlations is greater than the AVE for each variable construct. These outputs indicate strong evidence for discriminant validity between the theoretical constructs. Reliability was assessed using internal consistency method via Cronbach's alpha [109]. All variables and dimensions have a Cronbach's alpha greater than 0.70. This result establishes the reliability of all the theoretical constructs.

Moreover, the AVE values for all dimensions exceed 0.50. Taken together, these results imply that the instrument constructs exhibit good psychometric properties (table 3).

**Tab. 2. Discriminate validity of all variables in dataset.**

	Technological	Service	Cost	internal	customer
Service	0.500***				
Cost	0.490***	0.524***			
Internal	0.437***	0.559***	0.720		
Customer	0.457***	0.522***	0.471***	0.567	

Source: prepared by researcher from data (2018)

**Tab. 3. Cronbach's Alpha for Study Variables**

Construct	Variable	Number of items	Cronbach's alpha
Supply chain integration	Internal	4	.638
	Customer	2	.715
Operational performance	Cost	3	.761
	Services	5	.771

Source: prepared by the researchers from data (2018)

## 6.2. Hypothesis testing

The hypothesized structural equations model (Figure. 2) was tested using LISREL [110] with variance-covariance matrices for the latent variables and residuals used as input. Given the satisfactory measurement results, we used summated scores to measure the latent constructs of the model. The use of summated scores reduces the model complexity, identification problems, and the variable-to-sample ratio [110] in the hypothesized structural model; in addition, the measurement coefficients were constrained to one and the corresponding error coefficients to

zero. The model parameters were estimated using the method of maximum likelihood [111].

To assess the impact of supply chain integration such as internal integration and customer integration on operational performance such as service performance and cost performance, structural equation modeling was employed and a measurement model of these constructs was assessed. Figure (2) reveals that reflective indicators have been used to measure latent constructs and non-causal relationship was studied among different constructs.

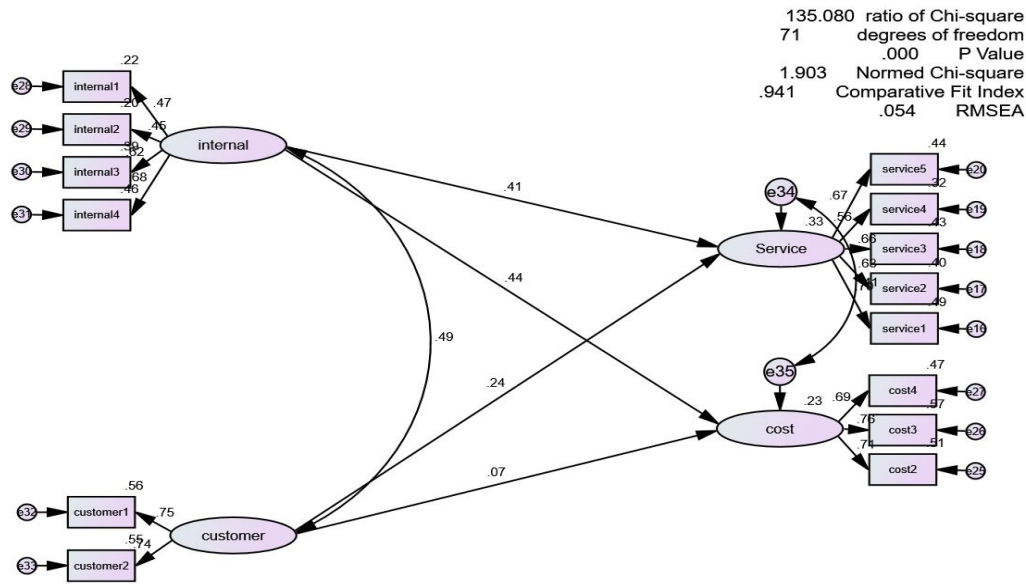


Fig. 2. Structural equations model

The structural model reveals the same value of model fit shown in Figure (2). All the model fit indices for the structural model were not only significant but remained the same as in the

measurement model. The low index of R-square (i.e., 0.22) justifies the underlying theoretical model.

Tab. 4. Regression weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Result
Service	<---	Internal	.517	.134	3.856	***	Supported
Service	<---	Customer	.234	.088	2.656	.008	Supported
Cost	<---	Internal	.692	.178	3.877	***	Supported
Cost	<---	Customer	.081	.112	.724	.469	Not Supported

Source: prepared by the researcher from data (2018)

Table (4) shows the probability of reaching a critical ratio as large as 3.856 in absolute value which is less than 0.001. In other words, the regression weight for internal integration in the

prediction of service is significantly different from zero at a 0.001 level, while the probability of reaching a critical ratio as large as 2.656 in absolute value is .008. In other words, the

regression weight for customer in the prediction of service is significantly different from zero at a 0.01 level. In addition, the probability of getting a critical ratio as large as 3.877 in absolute value is less than 0.001. In other words, the regression weight for internal integration in the prediction of

cost is significantly different from zero at the 0.001 level. Finally, the probability of getting a critical ratio as large as 0.724 in absolute value is .469. In other words, the regression weight for customers in the prediction of cost is not significantly different from zero at a 0.05 level.

**Tab. 5. testing hypotheses**

			Estimate	S.E.	C.R.	P	Result
Service	<---	Internal	.517	.134	3.856	***	Supported
Service	<---	Customer	.234	.088	2.656	.008	Supported
Cost	<---	Internal	.692	.178	3.877	***	Supported
Cost	<---	Customer	.081	.112	.724	.469	Not supported

*Source: prepared by researcher from data (2018)*

Table (5) summarizes the findings of testing hypotheses concerning the relationships between supply chain integration and operational performance.

The table shows that two of the hypotheses are fully consistent (service, cost) with internal integration, meaning that the medical institutions were integrated internally, ensuring delivery of good services to customers. Supporting services for customers means that some of the customers may not be satisfied of the services provided by medical institutions; moreover, lack of support for cost effectiveness which may correspond to the high costs of the services in the medical institutions, thanks to the deplorable economic situation in the Sudan, e.g., no medicine manufacturing or medical materials manufacturing. These findings imply that internal integration shows a significant positive relationship between two dimensions of operational performance (service and cost performance). However, the results showed that cost performance had no significant positive relationship with one dimension of supply chain integration (customer integration). Thus, some of hypotheses are fully supported.

## **8. Discussion**

In this section, the study results will be presented and discussed in the light of previous studies.

1- Result of the current study shows that there is significant importance attached to the supply chain integration among Medical Sector institutions. Accordingly, the researcher recommending raising the awareness of the managers, supervisors, and other employees who work at medical institutions about the importance of supply chain integration and its effect on the overall operational performance. Some of independent variables have high degree of

integration (internal); customers are not significantly satisfied with the performance of services due to their high cost in medical institutions, with the most important reason being no medical material manufacturing. The first and highest levels of integration correspond to customer integration, which is actually the most important variable in supply chain integration because customer satisfaction is the ultimate goal that all organizations seek to achieve. Then, internal integration is ranked the second as it is the linchpin between supplier integration and customer integration and it is impossible to achieve either supplier integration or customer integration without internal integration.

2- The study showed that there were strong inter-relationships and interactions between the two components of SCI and between them and OP. Finally, the results revealed that the respondents believed that there was a strong relationship between SCI and OP.

3- Results indicated that the internal integration had the highest effect on OP, followed by customer integration. These results were in line with most of the findings of previous studies, such as [69] who showed that there was a positive relationship between supply chain integration dimensions and operational performance dimensions, as well. [70] found that the integration positively related to operational performance and firm performance, primarily through its influence on productivity and customer service. [71] showed that trusting customers significantly influenced supply chain integration. Customer integration significantly improved financial performance and [72], [32] [73], [74] showed that internal and customer integration affected the competitive performance related to the firm's performance.

4- The study result shows that the supply chain integration has an impact on operational performance at Medical Sector institutions and organizations. This result is in line with different previous studies; for instance, [75] showed that there was a positive impact of supply chain strategies (outward strategies) on competitive advantage, while [76] [77], [78] found that there was a significant impact of supply chain integration on business and organizational performance as well.

4.1- The study shows that internal integration has an role in operational performance at Medical Sector institutions. This result is supported by [79], and [78] [80] showed that aligning marketing strategies of partners throughout the supply chain improved operational performance, and [71] showed that internal integration enhanced the external integration and also, internal and external integrations directly and indirectly enhanced the company's performance and which directly affected the study result about the most important role of internal integration.

4.2- The study showed that customer integration affected operational performance at Medical Sector institutions. This result agrees with the result of [81], showing that that there was a positive impact of supply chain strategies (outward strategies) on competitive advantage. Some studies have discussed several factors that affect supply chain integration; for example, [82] showed that information technology supported supplier integration and customer integration, as well. [83] showed that top management support and information technology were two vital enablers of supply chain integration, while [84] indicated that logistics/supply chain strategy was the main driver of logistics and supply chain integration and logistics decisions. In addition, [71] demonstrated that that trust in customers significantly influenced supply chain integration.

### **8.1.Theoretical and managerial implication**

#### **8.1.1.Theoretical**

Conceptually, in this study and based on the SCI, two factors (internal integration, customer integration) were found. It can be observed that the most significant factor is using SCI in Sudanese services institutions (Medical Sector). Indeed, it is suggested that the SCI construct could be considered in the future operationalization of SCI in Sudan context. This study extended the existing research on the performance and supply chain integration relationship. In addition to the study contribution, operational performance is proposed in the

context of supply chain integration in service sector, especially in Medical Sector. Besides, the present study confirms the proposition that SCI will have a strong positive effect on operational performance.

These studies support the findings of earlier studies, which emphasized that SCI required a higher level of internal integration. Thus, for an institution to support the participation of partners, it must create suitable internal integration. Furthermore, the direct effect of SCI (internally) with the effect of operational performance is significant and stronger than its direct impact. Although many studies have investigated the effect of SCI on business outcomes or any other related kinds of performance, this study indicated the importance of SCI in detecting the impact on operational performance. Specifically, although the supply chain management concept is predicated on SCI (integration), the existing research has yet to explicitly consider the implications of SC about supply chain integration efforts. The overarching theoretical contribution relating to the role of SCI demonstrates that SCI is responsible for external environment behaviors that are unattainable via integrative mechanisms.

#### **8.1.2. Managerial implication**

From a practical perspective, this study provides a number of insights into how institutions can utilize the Internal Integration (SCI) more strongly to improve operational performance. Specifically, managers can use it to expand one's understanding of the role of SCI in operational performance and develop specific integration that helps meet customer needs. SCI is in full collaboration with participation and the institutions are integrated internally and externally which should lead to high performance, becoming difficult for competitors to replicate and the institutions gain competitive advantage as a result. Moreover, the developed conceptual model of the study provides better highlight of the interplay between SCI and operational performance of the medical sector. In addition, it is an important factor for firms to turn competitive advantage.

#### **8.2. Limitation and suggestion for future research**

According to previous studies, this study is subject to some limitations which encourages future research of cross-sectional study to provide some evidences about the relationship between SCI and operation performance. So, a longitudinal study would have to be undertaken

to assure the effect of SCI and operation performance. Furthermore, this study mainly tests SCI and operational performance that may represent a less holistic view for supply chain management. Plus, future research may consider another factor for supply chain integration. The sample included medical sector services and its performance should be tested against another service sector; it should be tested in all Sudan areas, while this study investigated Khartoum state with a broad range of firm sizes and industries which may differ in terms of the level of adopting SCI and operation performance; thus, future research can test these variables in this sector. This study examined SCI by two dimensions (internal and customer). Constructs consider trust as one of dimensions of SCI; therefore, future research can measure supplier as part of SCI. In this study, we used operation performance measures by two dimensions (service and cost); any future research would have to expand the dimensions or should test them against another performance such as institutional performance or financial performance.

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