

Exploring the Nexus between Demand and Supply Side Competence, Supply Chain Agility, Process Compliances and Operational Performance

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Abstract- The main objective of the current study is to explore the nexus between demand and supply side competence, supply chain agility, process compliances and operational performance. Firstly, the study has examined the direct relationships among the supply side competence, demand side competence, supply chain agility, and operational performance. Secondly, the study has examined the mediating role of the supply chain agility in the relationship between demand and supply side competence and operational performance. Lastly, the moderating role of process compliances in the relationship between demand and supply side competence and supply chain agility is examined. The current study has used SEM-PLS as statistical tool to answer the research questions raised in this study and research objectives envisaged in the current study. The findings of the study have provided support to the theoretical foundation and proposed hypothesis of the current study. Current study will be helpful for policymakers and practitioners in understanding the issues demand and supply side competence, supply chain agility, process compliances and operational performance.

Keywords: *Demand and Supply Competence, Supply Chain Agility, Process Compliances and Operational Performance*

1. Introduction

Supply chain agility leads to competitive differentiation as well as sustainability for long terms, when the environment is exposed to constant change. There is need for the firms to analyze the environment and respond to the needs of customer through transformation of supply environment. The disturbances in the supply chain and its potential are required to be considered by the organizations. The ability of a firm to react and respond to the environmental changes in relation to its customers and key suppliers is called supply chain agility [1]. The flexibility of a firm is also involved in this

concept for using resources in a way to remain competitive.

There is need to explore more keeping in consideration the crucial concept of supply chain agility [1, 2]. Several researches have worked on the importance and benefits of supply chain agility but there is need to work on identifying the antecedents of supply chain agility and the impacts, which can lead to its development or restriction [3]. In the changing business environment of this era, the importance of agility is increasing constantly [4]. It is required to explore the ways in which this capability can be developed. This research study aims at extending the literature by theory development and practical implications.

Initially, it is considered that there are two basic factors of supply chain agility i.e. demand and supply side competence. The supply side competence is referred as the proficiency of a firm in managing the supply activities. The demand side competency is related to the management of demand side activities. Both the supply and demand side competences are important aspects as the firm highly depends on its supply chain partners. This also increases the power of customers and vulnerability of supply chain [5]. The importance of these aspects contributes to the supply chain agility, which is never reflected. According to resource-based view, the capabilities of a firm change in response to the environment. This research is based on these arguments and both the competencies of supply chain agility of a firm have been theorized and tested.

The idea of operational performance of a firm to be positively influenced by the dynamic capability of supply chain agility is explored in this study. The operational performance is referred as the competitiveness of a firm because of customer service and supply chain cost effectiveness, flexibility of supply chain and performance level of

services. The firm by offering right quality and quantity within time achieves competitiveness [6, 7]. The ability of a firm to align its resource utilization and activities according to the changing needs of market and customers is referred as supply chain agility. This enables the company to maintain its competitive position in the market. Moreover, the study explores the basic role of supply chain agility, its importance as a mediator in the association of supply and demand side competence and organizational performance.

Secondly, the contingency of process compliance as a moderator is considered in influencing the relation of demand and supply side competence as well as supply chain agility. The adherence and implementation of certain supply chain activities related to production and distribution are referred as process compliance. There is need for suitable infrastructure for effective influence of competencies on supply chain agility. The relation improves when the process compliance is high.

2. Theoretical Foundation

2.1. *The resource-based view of the firm and the dynamic capabilities perspective*

The previous researches on resource-based view were based on heterogeneity of resources. The research studies focused on the configuration of resources [8]. Competitive disparity is not just influenced through the possession of heterogeneous resources rather their development, utilization is also important in achieving competitiveness [9]. The concept of changing capabilities is developed through the realization of this concept [10].

The ability of a firm to identify, develop, and utilize the internal as well as external competencies to respond towards changing business environment is regarded as Dynamic Capabilities. These capabilities are hard to replicate and required technological opportunities and changing needs of customers [10]. The resources are renewed into newly developed competencies through certain routines and processes with the changes in market [8]. Dynamic capabilities are produced with the passage of time and these are developed through the tangible and intangible resources of organizations and decision-making process [8]. The competitive advantage of a firm is contributed through effective dynamic capabilities, which support a firm to perform ahead of its rivals and sustain competitive advantage [8, 10].

A firm needs to develop new products and processes by incorporating new business models in order to perform superior than the competitors [10]. The supply chain of firm is speedily reconfigured through the possession of changing capabilities. This ensures great potential in the changing business environment [11]. Therefore, supply chain

agility can be considered as a source of generating competitive advantage.

2.2. *Relation between Supply- and Demand-side Competence and Supply Chain Agility*

Both the supply and demand side competence is important resource for increasing agility of supply chain. Supply chain agility makes a firm able to achieve competitive differentiation. Competencies and capabilities are differentiated empirically and conceptually as per the literature of strategic management [10, 12]. The focus of competencies is on internal aspects rather than the external environment. Similarly, the focus of capabilities is on the external environment rather than internal organization. Expertise at distinct points across the value chain is referred as competencies. However, capabilities are broad and visible externally as well as revolve along the entire supply chain. The demand and supply proficiencies are internal competencies of a firm. However, supply chain agility is the main and broader ability, which involves both the demand and supply side competence. The foundation for supply chain agility is served by demand and supply side competence. In this dynamic environment, the demand and supply competence are very crucial because of increased dependence of a firm on its supply chain partners and consumer power [5, 13]. Increased reliance has been of firms on their supply chain because of the focus on basic competencies and sourcing of several activities along with optimization of supply chain [5]. Supply chains across several countries and continents make it complex and the logistics aspects become disrupted. The earthquake and tsunami, which hit in March 2011 to Japan, evidenced this. The incident resulted in huge loss of human lives along with disruptions in supply chain and the plants, which were dependent on Japan for their parts, were closed. No doubt, there are several complexities along the supply side. The customers' demand has become increasing as well. The time has become faster and the product cycles shorter with severity in the disenchanting repercussions of customers.

When a customer is not satisfied, he is likely to influence the purchasing decision of others through word of mouth and the substantial power of social media apps. Online reviews on social media networks create a strong impact on the intention to purchase of customers [14]. This research study is motivated by the work of Vinodh et al. (in press), which is based on several drivers influencing the importance of agility. The demand and supply side realities present in the markets these days emphasize the need for firms to develop capabilities for responding to these changes. Previous research studies have proposed that

physical infrastructure develops agility. Therefore, the focus of this research is on the aspects of supply and demand competence, which are intangible.

The demand and supply side competence are required by a firm to act in response to the changing environment. These aspects enable a firm to develop a capability, which is dynamic, under the resource-based view. When these competencies are available to a firm, it is able to respond to market changes. These competences can be combined as required for effective results. This notion is in line with the fact that firms are able to accumulate knowledge, skills in the form of bundle to implement in organizational processes for optimal utilization of organizational resources [15]. This is a success factor for the organizations. The researcher has described the capabilities as the glue, which brings closer the assets for effective utilization [15]. All together, the supply chain agility is formed including the demand and supply competence. The first set of hypotheses is developed based on these facts.

H1: supply side competency is in significant relationship with supply chain agility

H2: Demand side competency is in significant relationship with supply chain agility

2.3. Relation between Supply Chain Agility and Operational Performance

The resources are deployed as per the market changes through supply chain agility, which is a dynamic capability. The efforts of a firm to avail opportunities and avoid the risk of threats from the external environment is supported through this capability [16]. This results in the achievement and sustaining of competitive advantage [8, 10]. Precisely, the sustainable competitive advantage is based on the capabilities of organizations. This competitive advantage is because the capabilities are not exchangeable in strategic factor markets. These are developed over a long time and based on history and path dependent. The complex relationships with the society are involved in these capabilities with other resources of organizations. These characteristics are possessed by supply chain agility that is a unique resource. The supply chain agility of a firm is based on the specific demand and supply side competencies, which are unique. Therefore, the agility is extended for a long period and it includes both the up and downside of supply chain entities. Agility is constituted as an important strategic resource based on RBV. With higher operational performance, competitive advantage can be shown.

In this era of unstable market environment, firms are supported to react to the disruptions in supply chain with agility. The safety stock of a firm can handle the disruptions, which are time constraint.

The disruptions broader in scope can lead to the stop of production. Such disruptions can be avoided through supply chain agility that results in cost optimization of supply chain. The disruptions in supply chain reflect a significant cost factor for firms; therefore, the supply chain agility is crucial [17]. Moreover, the firm can improve its performance by acting in a responsive way towards the external disruptions across supply through supply chain agility. Agility in supply chain can offer considerable benefits for internal mechanisms of the firm. In order to respond the external changes, the designs or orders can be changed or modified. A comprehensive set of advantages of agility in manufacturing has been provided by Vinodh et al. (in press) that can result in several outcomes of performance such as better delivery, cost effectiveness, and quality. The positive influence of supply chain on firm's operational performance has been incorporated in the hypotheses.

H3: Supply chain agility has significant impact on operational performance

2.4. Role of Supply Chain Agility as a Mediator

It has been suggested through the integration of resource-based view with the perspective of dynamic capabilities that supply chain agility is built through demand and supply side competence. The possession of heterogeneous resources is not just required to build the capability of supply chain agility but their configuration and way of utilization matters as well [10]. Supply chain agility is a higher order capability, which is derived through the integration of lower order resources or capabilities. Resources, which are harder to imitate, are provided through these capabilities of higher order [18]. In this research, it has been assumed that the performance is directly influenced through the demand and supply side competence. This relation can involved the role of supply chain agility as a mediator. Related studies support this contention. According to agility has a mediating impact on the relation of supply chain antecedents such as supply chain initiatives and information technology with firm performance. Swafford, et al. [19] studied the role of agility as a mediator in the relation of integrating supply chain and competitive performance of business. Unforeseen changes can occur in this changing business environment of every industry including manufacturing and retail markets. The effective operational performance cannot be achieved through supply chain competencies only. The building blocks of supply chain agility are the demand and supply competencies. When an organization is successful in transforming the competencies into capabilities, they are able to achieve success in operational

performance [19, 20]. The competencies in supply chain enable a firm to respond to the external environmental changes and achieve improved performance through supply chain agility [19].

In order to achieve competitive advantage, supply chain agility plays a significant role as per literature. The factors developing supply chain agility have not been studied much in the studies. This research gap has been addressed through the study. The role of supply change being a dynamic capability has been signified in this research. The mediating role of supply chain agility has been studied on the association of operational performance and supply chain competences. The moderating effect of process compliance has been determined on the relation of supply chain agility and supply and demand competence.

This has lead to exploitation-exploration debate. This research study makes significant contributions to the literature on supply chain management and production by defining supply chain agility as a dynamic capability, significant variables, and practical implications for improving performance. This research has provided interesting insight from the perspective of dynamic capabilities into the role of supply chain agility. However, there are several limitations as well. It was assumed that the responses of survey queries were valid, effective, and reflected best approaches for task completion. Because of the unavailability of data, it was not tested formally but assumed. The researcher was confident about the representation of high performance of firms in the sample. The collaboration was made with the supply chain association of Germany to target the high-performance firms. The respondents were carefully selected. A proactive approach of a firm to supply chain strategic is indicated through its membership in the professional association of supply chain management. Moreover, the overall performance of a firm in supply chain was determined through the above average value of survey questions. Another limitation of the study is related to the contextual administration of the constructed survey. It is expected that the results will be similar in the countries with same industrialization and level of development. However, this fact cannot be ascertained. Further, the supply chain information of the firm was gathered from a single respondent that is a common limitation in the research studies [3].

There are areas for future studies. Research can be conducted by working on the above state's limitations. Secondary information or data can be used in analyzing the overall effects of firm. This research study is based on the assessment of operational performance only. It is difficult to determine supply chain agility through objective data. Therefore, there is need of data based on the notion of agility. Further potential for research can

be provided by extending the research of. The areas of research can include the interaction influence of agility, alignment, and adaptability on the performance of a corporation. These areas of study are yet unidentified. This research study is a source of motivation for future research in the field of supply chain agility.

H4: Supply side competency is in significant relationship with operational performance.

H5: Demand side competency is in significant relationship with operational performance.

Supply chain management success requires both demand and supply competences. The role of supply chain agility as a mediator can be different in terms of magnitude for the two developed models with the mediating factor. For transforming advantages into the operational performance, supply chain agility can play a crucial role. Awareness regarding the disruptions in upstream supply chain is increasing among the firms, the profitability of a firm is highly dependent on the demand side i.e. customers. This is because of the purchasing decision to be made by the customers. The example of automotive industry is experience decrease in demand from customers that has resulted in bankruptcies, insolvencies, and financial crisis [21]. The demand side competence of a firm is linked with the customers and it contributes more in the development of supply chain agility. The operational performance can be improved through increased focus on the needs and changing expectations of customers. Therefore, the demand side is regarded as a bottleneck for decision-making. Therefore, the relation between demand side competence and firms' operational performance should be mediated by supply chain agility. The following set of hypotheses has been developed based on these facts.

H6: Supply chain agility mediates the relationship between supply side competence and operational performance.

H7: Supply chain agility mediates the relationship between demand side competence and operational performance.

2.5. The role of Process Compliance as a Mediator

The demand and supply competence can be developed and implicated into the supply chain agility through process compliance. Relating resource based view with the concept of dynamic capabilities, process compliance provides a guidance or structure for the transformation of demand and supply competences into supply chain agility. This is supported by the literature on process compliance. The performance of a firm and Supply chain capabilities can be improved through controlled and well-defined processes. This is reflected through the demand and supply side [13].

According to Bendoly and Schoenherr [22], an ERP system leads to positive product advantages and a significant influence of process on the performance of a firm through the implementation of ERP.

In different situations, process compliance can be advantageous. The firm may be able to respond faster when there is disruption in supply chain. The focus of the firm is on responding to the disruption with required amendments in the internal processes. The resources can be utilized in an effective manner through process compliance for the creation of supply chain agility to respond towards disruptions.

The theoretical perspective of information processing also signifies the role of Process Compliance as a mediator. The organizational behavior can be explained by information processing theory in terms of information that is collected, interpreted, and utilized for effective decision-making. Usually, logical rules, processes, structures, and strategies for the processing of information are used by the managers [23]. At this point, the role of process compliance can be included. The association between demand and supply side competence can be absorbed internally through Process Compliance. Direct benefits of this can be realized.

The similarities can be made to the absorptive capacity concept. Effective absorption in information identification, evaluation, and application can be done for supply and demand aspects through process compliance. This will increase the influence on supply chain agility [24]. Greater agility can be achieved by the firm with effective process compliance. Information can be accessed and shared effectively through procedures, systems, and rules by the employees [23]. A greater sense of sharing and coordination can emerge through complying with processes. Moreover, opportunities can be identified with process compliance, which can enable in accessing relevant information and utilizing it suitably [25]. Greater process compliance can be increased through use of information technologies i.e. enterprise resource planning systems [22]. Firms can be constrained with outdated processes or rigid policies. Based on the theoretical aspects, this research views the process compliance as a crucial factor supporting the development of supply chain agility from demand and supply side competence.

Following are the research hypotheses developed:

H8: Process compliance moderates the relationship between supply side competence and supply chain agility.

H9: Process compliance moderates the relationship between Demand side competence and supply chain agility.

3. Methodology

The nature of the research study was correlational and descriptive. The exporter's profile, ratings related to subject made it descriptive in nature while the relation between export performance and marketing program made it correlational. The method of hypothetico-deductive as a scientific approach was used in this research. There are seven steps involved in the hypothetico-deductive method. These steps involve the identification of the problem, definition of problem identified or problem statement, development of hypotheses, determination of estimates, collection of data, analysis, and result interpretation.

The main part of this method is deductive approach in which a theoretical framework is used and implement in a specific case. The use of previous research studies is made in developing theoretical framework. A quantitative survey research method has been used in this study. The research objectives were set for the study, research was designed, a reliable instrument was adopted, survey was conducted, and data was collected and analyzed. In the end, the results were interpreted. The use of cross-sectional data was made in the research for a specific time. There is time constraint involved in academic research. The questionnaire survey was conducted through e-mail and data was collected for testing statistically with the developed hypotheses. There are certain advantages of using survey approach. It involves less cost and time as well as target wide geographical region. Moreover, this approach collected information in a natural setting from the people. A natural environment setting is referred where events are not controlled and left to happen in a normal way without any interruption. The purpose of the survey was to make the results general to population and it included a high validity because questions were linked with the items of a dimension in a direct way. The measurement of the variables used in the current study are taken from the previous studies. The measure of supply chain agility is adopted from the study of Swafford, et al. [3], of supply and demand side competency and process compliances from Blome and Schoenherr [21], and of operational performance from the study of Gunasekaran, et al. [7].

4. Results

SEM (Structural Equation Modelling) was used in this research because of a number of advantages. This approach is equally effective as compared with linear and multiple regressions in the assumption of variables having no errors. The steps of factor analyses and multiple regressions are involved in SEM. The instrument can be estimated for several separate multiple regression equations

that are concurrently evaluated. The cluster sampling was used for the target sample. The five-technique method proposed by Gay [26] has been used for the estimation of sample size in this research study. The initial step is to calculate the total population and then the sample size is estimated by the using the table proposed by Krejcie and Morgan [27]. The calculated size of population was 310. SEM approach is widely implemented in social science studies as it can estimate several relationships among variables at a time [28]. Emphasis has been made on AMOS, which is used an approach of co-variance. PLS-SEM can be used as an alternative method against CB-SEM because it has distinct features of methodology.

SEM is a suitable method for several reasons. It is latest, robust, and appropriate because of its unique

features among all the available techniques. It provides effective solutions for the research problems that cannot be obtained from the method of multiple regressions. When the purpose of adopting structural modeling is to make forecasting of the developed constructs, PLS method is highly effective [28]. It is assumed while using PLS-SEM technique that it is highly flexible method and involves small sample size. Moreover, it has the capability of estimating multiple structural models. Formative and reflective constructs are involved in the model. The aim of the study is to make prediction among the constructs. According Hair Jr, et al. [28], the method of Partial Least Square is effective. There are two models involve in SEM-PLS approach, which include the measurement model and structural model.

Table 1. Outer loading

	DSC	OP	PC	SCA	SCC
DSC1	0.924				
DSC2	0.886				
DSC3	0.929				
DSC4	0.909				
OP1		0.910			
OP2		0.869			
OP4		0.920			
PC1			0.932		
PC2			0.903		
PC3			0.893		
PC4			0.904		
SCA1				0.879	
SCA2				0.836	
SCA3				0.903	
SCA4				0.909	
SCA5				0.867	
SCC2					0.908
SCC3					0.902
SCC4					0.892
SCC1					0.898

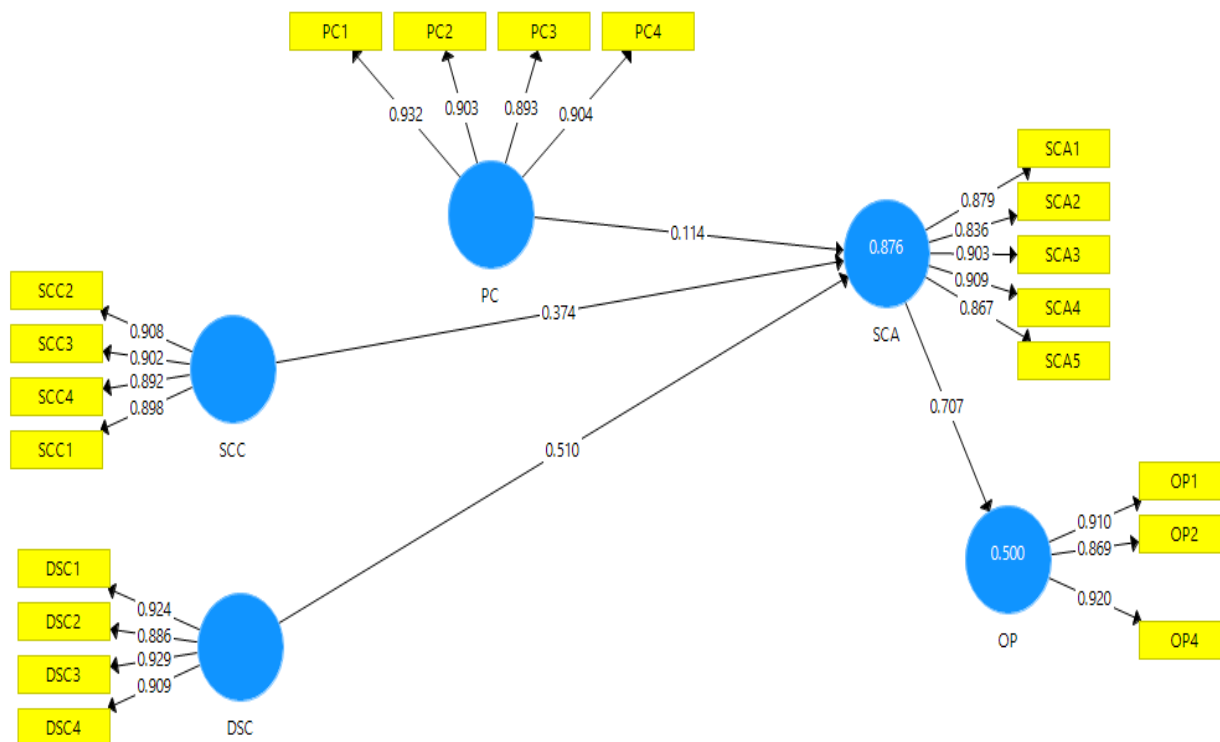


Figure 1. Measurement Model

Two steps are involved in SEM approach. The initial step is to estimate the inner model and the later step is the estimation of the outer model. The measurement of models is followed with estimation of different criterion including validity, reliability, and variance of the structural models. The nature of items is dynamic in nature. It is expected that there

exists a strong relation among the variables, which are combined for the construct. The confirmatory factor analysis has been used for the estimation of measurement validity. Each item is analyzed separately through structural, formative, and reflective modeling during the estimation.

Table 2. Reliability

	Cronbach's Alpha	rho_A	CR	(AVE)
DSC	0.933	0.934	0.952	0.832
OP	0.883	0.887	0.927	0.810
PC	0.929	0.929	0.950	0.825
SCA	0.926	0.928	0.944	0.773
SCC	0.922	0.922	0.945	0.810

The consistency of estimates among the same test items is measured in internal consistency. It is estimated that how the items proposed for the construct measure the similar scores [29]. Through the examination of CR, reliability of internal consistency has been determined [168]. It is not used by CR that there is equal loading indicator of construct as assumed in Cronbach's alpha [29]. The value of CR lies in the range of 0 and 1. According to Henseler, et al. [30], the standard value is not less than 0.60. The value equal to 0.7 or greater than it is considered sufficient [31]. The next step is to estimate the convergent validity. This is related to the level of relation among the similar constructs that are not related theoretically [30]. The level of correction between the same

constructs measures is reflected by this. The standard value of AVE as 0.50 or greater is used to identify the convergent element in the estimation of the construct [30]. It is indicated by the 0.50 value of AVE that there is sufficient convergent validity. Half of the variance is explained by the latent construct and it reflects sufficient level of convergent validity. It is expected for the reliability value to be 0.70 or greater. The similar values are estimated for cross-loadings and outer-loadings. The existence of association among the constructs is analyzed through cross loadings. Therefore, this research determines the discriminate validity among the constructs and variables as depicted in the table 3.

Table 3. Discriminate Validity

	DSC	OP	PC	SCA	SCC
DSC	0.912				
OP	0.648	0.900			
PC	0.640	0.911	0.908		
SCA	0.909	0.707	0.691	0.879	
SCC	0.872	0.645	0.673	0.895	0.900

The reliability estimation and validity estimate is involved in the assessment of measurement model. The structural model has been examined through estimation of structural paths among the dependent, independent, and mediating variables. All the constructed variables are estimated simultaneously

through SEM-PLS, which makes is distinct from other techniques. The direct as well as indirect influences of variables are analyzed for structural model. The structural model has been shown as below:

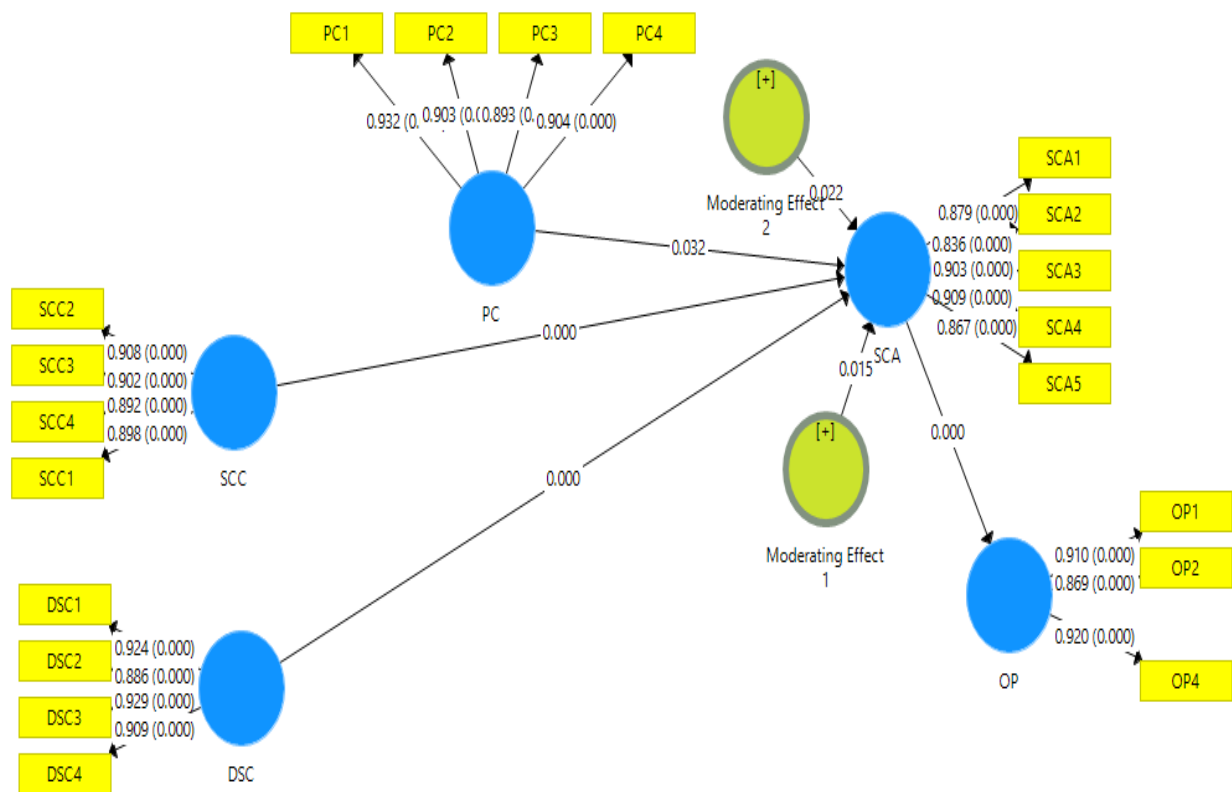


Figure 2. Structural Model

Table 4. Direct relationships

	(O)	(M)	(STDEV)	(O/STDEV)	P Values
DSC -> OP	0.403	0.876	0.060	6.663	0.000
DSC -> SCA	0.570	0.567	0.074	7.650	0.000
PC -> OP	0.075	0.080	0.039	3.892	0.000
PC -> SCA	0.106	0.111	0.049	2.151	0.032
SCA -> OP	0.707	0.709	0.064	3.047	0.000
SCC -> OP	0.242	0.239	0.056	4.301	0.000
SCC -> SCA	0.342	0.338	0.079	4.311	0.000

The moderation and mediation level is measured in order to analyze the direct and indirect influences

of the variables or mediating factors. Moreover, the relationship significance is specified in this

research. The method of bootstrap has been used based on 5000 observations. The level of significance is less than 0.05 to be acceptable. The p-value for all the formulated hypotheses is less than 0.05, which means these are accepted. The

results of moderation show that the values for p and t are significant for the hypotheses. The value of t is more than 1.96 and p value is less than 0.05. This leads to the acceptance of third hypothesis.

Table 5. Medication

	(O)	(M)	(STDEV)	(O/STDEV)	P Values
DSC -> SCA -> OP	0.403	0.401	0.060	6.663	0.000
PC -> SCA -> OP	0.075	0.080	0.039	3.892	0.000
SCC -> SCA -> OP	0.242	0.239	0.056	4.301	0.000

Table 6. Moderation

	(O)	(M)	(STDEV)	(O/STDEV)	P Values
Moderating Effect 1 -> SCA	-0.265	-0.252	0.109	2.423	0.015
Moderating Effect 2 -> SCA	0.235	0.222	0.103	2.285	0.022

R² is the coefficient of determination, which measures the total variation in the dependent variable caused by the independent variables. When the value of R² is close to 0, it means the coefficients are insignificant. The value usually lies

in the range of 0-1. When it is closer to 1, it shows high significance of coefficients. When the value is 0.5, 0.25 and 0.75, the predictive power is moderate, weak and strong respectively.

Table 6. R-Square

	R Square
OP	0.500
SCA	0.876

5. Conclusion

The ability of a firm to align its resource utilization and activities according to the changing needs of market and customers is referred as supply chain agility. This enables the company to maintain its competitive position in the market. Moreover, the study explores the basic role of supply chain agility, its importance as a mediator in the association of supply and demand side competence and organizational performance [32]. Secondly, the contingency of process compliance as a moderator is considered in influencing the relation of demand and supply side competence as well as supply chain agility. The adherence and implementation of certain supply chain activities related to production and distribution are referred as process compliance. There is need for suitable infrastructure for effective influence of competencies on supply chain agility. The relation improves when the process compliance is high. The main objective of the current study is to explore the nexus between demand and supply side competence, supply chain agility, process compliances and operational performance. Firstly, the study has examined the direct relationships among the supply side competence, demand side competence, supply chain agility, and operational performance.

Secondly, the study has examined the mediating role of the supply chain agility in the relationship between demand and supply side competence and operational performance. Lastly, the moderating role of process compliances in the relationship between demand and supply side competence and supply chain agility is examined. The research model has been developed. The supply and demand side competences are linked with the supply chain agility and impact has been identified on operational performance of the firm in initial set of hypotheses. The supply chain agility acts as a mediator in the association. It is concluded that the relation between supply and demand competence and supply chain agility is enhanced through the mediating factor.

The current study has used SEM-PLS as statistical tool to answer the research questions raised in this study and research objectives envisaged in the current study. The findings of the study have provided support to the theoretical foundation and proposed hypothesis of the current study. Current study will be helpful for policymakers and practitioners in understanding the issues demand and supply side competence, supply chain agility, process compliances and operational performance.

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