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THE INTEGRATION OF THE SUPPLY CHAIN IN THE CORE COMPANY STRATEGY: THE MODERATING ROLE OF SUPPLY CHAIN UNCERTAINTY

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Abstract

A theoretical framework, tested in this research, proposes to define the strategy implications of Core Company strategy on SCI dimensions. To implement a strategy by developing collaboration within and across the firm, there is need for developing processes and structures, that support the effective flow of material and information, to achieve the set objectives and goals. It is clear from the theoretical discussion of SCI that the use of resources and capacities of external partners, generates supplier integration, to complement internal resources and capacities, for the achievement of set goals. Firms, with expanded and diverse product lines, emphasize this need because of the gap incapacity, which is developed in the process of the product. Moreover, with the implemented new product ideas, new gaps in resources and capacity may be generated.

Keywords: *Supply Chain (SC), Strategy and SCI*

JEL Code : *L1, L11 and L23,*

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1. Introduction

The dimensions of supply chain integration (SCI) are broken down into two types of integration, by some researchers. These types are referred to as EI (external integration) and II (internal integration). However, some researchers have classified the concept of SCI into supply (upstream) and demand (downstream) side integration (Ponduri, Ahmed, & Argaw, 2016). Some researchers have categorized it into supply chain internal integration (SCII) and customer and supplier integration **(Handfield, et al., 2015; Ponduri et al., 2016).**There are significant benefits of SCI but focal firms do not adopt SCI, which is beyond first-tier partners in the supply chain.

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This is because of increased complexity **(Prajogo, et al., 2016; Wiengarten, et al., 2016).** When firms adopt SCI, it is limited to the number of processes, related to first-tier suppliers and customers because of scarce resources **(Teller, et al., 2016)**. Therefore, immediate external partners such as customers and suppliers were considered in the SCI study, along with internal units. The SC concept is better reflected in separate constructs, for customer and supplier integration, as compared to generic EI. Three dimensions have been considered by this study, which included customer, supplier, and internal integration. Both long and short-term benefits are offered by SCI. Short term benefits are revealed in terms of the financial performance of firm and value is created for customers in long-term benefits **(Basheer, et al., 2018)**. The long-term benefits also add to the financial performance of the focal firm **(Healy, et al., 2018).** Attention is required by the interaction of strategy and SCI because the firm, through the formulation and execution of a suitable strategy, can achieve the objectives and goals. The strategy typology by **Feyissa et al., 2019,** is a comprehensive approach, which involves various practices and parameters such as market and product domain, dynamics of the industry, choice of technology, structure, and strategy of the organization. The adaptation cycle of the organization is addressed through the formulation of the strategy of an organization, along with structure and processes, to deal with the changes in the environment. The issues of SMC are covered by this because of its ability to deal with the domain choice of product market. Therefore, it is appropriate for studies, related to SCM. Several research studies have been conducted on SCI. It has been argued by **Tarafdar** and **Qrunfleh , 2017** that the influence of alignment between information system and business strategy, on the performance of firm, is distinct from one type of strategy to another.

2. Review of Literature

The focus of the typology by **Feyissa et al., 2019,** was on three major issues, including innovation in the product market, organizational structure, and domain breadth. The rate of change in the product by a firm, is referred to as product innovation. Innovativeness is referred to as novelty products, that are recently introduced and make their entry into new markets. It is the main dimension **(Houqe, et al., 2015)**. The diversification level of the markets and products of the firm is referred to as domain breadth. The dimension of organizational structure is referred to as the pattern of relationships and interaction in units of organizations. Following **Bozhilov** and **Ozuem, 2016**, this can be split into subcategories. SCM and strategy have a strong connection. It has been argued that SCI is a crucial tool for the execution of the product strategy of innovation. Three crucial strategic decisions are involved in SCM, such as crafting relationships, synchronization of demand-supply **(Feyissa et al., 2019).** There is a need for a suitable structure for the implementation of strategy, which can guide the relations between different units of the organization. For instance, at the early stage of innovation such as the generation of an idea, solving problem, and planning, there is a need for loosening the structure for facilitating free communication between units of organizations. However, restructuring is required at the implementation stage for strong association **(Voegtlin** and **Scherer, 2017).** Functional structure is adopted with extensive labor division, a simple mechanism of coordination, and centralized decision making, along with hierarchical communication **(Gregory, et al., 2018)**. Complicated mechanisms of coordination are implemented with a horizontal flow of information, decentralized control and less formal pattern of communication. Hybrid characteristics are exhibited by analyzers as they work like prospectors in changing domain and defenders in a consistent domain **(Anwar** and **Hasnu, 2016).** The researchers adopt a loose structure matrix, with product groups and functional divisions with a centralized system. The vertical and horizontal flow of information and communication is employed. **(Xu, et al., 2018).** A framework is provided by SCM, for implementing a strategy, which is well-conceived. Alternatively, the broad domain of product of prospectors needs close and broad integration of external supply chain **(Carr, 2018)**. The supply market in recent times suffers from unpredictability, and unreliability of supply quantity, quality and timeliness **(Arantes, et al., 2017).** These uncertainties give rise to the need for supply market scanning, information collection, and transformation of this information into useful insights, that may assist firms to reduce the supply market's unreliability and unpredictability **(Zhu, et al., 2018)**. In order to achieve a certain level of performance, information-processing capabilities must be enhanced so that these could appropriately satisfy the information processing requirements. The SCA capabilities application, enables continuous and efficient monitor supply market conditions, by integrating automated processes **(Kovács** and **Kot, 2016)**. It also helps to consider each process, i.e. make, source, and deliver and also observe the uncertainty and then transform it into useful insights. Contrarily, a reduction in SU provides those suppliers, which can offer quantity, delivery and quality performance. Regardless of any changes, the supplier side is largely predictable. Thus, it is proposed that more value is produced by SCA, for higher SU-facing organization.

3. Statement of the Problem

It has been argued that product innovation can be improved through EI and II. However, a positive influence is created by customer integration on the innovation of products **(Ponduri et al., 2016).** Moreover, suppliers' collaboration helps in the innovation of products, as suppliers supply the input for the manufacturing of products. Supplier, internal and customer integration is required, for the innovation of product strategy. There is a need to consider inter-organizational compatibility in the implementation of SCI projects rather than inter-organizational cooperation. Both customer and supplier integration are positively influenced by II. Therefore, II must be enhanced before EI **(Van Donk** and **van Doorne, 2016; Wu, et al., 2016).** It has been argued that there is positive association between product innovation and II, that improves customer and supplier integration. Prospectors are obliged to implement strong customer and supplier integration as compared with defenders **(Tarafdar** and **Qrunfleh, 2017).**

4. Need of the Study

A theoretical framework was tested in this research, to define the strategy implications of Core Company, on SCI dimensions. The SCM literature has been extended by giving important insight into the relation between SCI and organizational strategy

5. Objectives of the Study

The relationship between strategy types (**Feyissa et al., 2019)** and SCI strength, has not been examined by any research study until now. Therefore, this research addresses the identified gap, by analyzing how (**Feyissa et al., 2019)** business strategy interacts with three SCI dimensions (customer, supplier, and internal integration). The SC relations, strategy, and collaborations are adopted by a firm because changes in business environment are captured by it. The changing process is not captured because of its occurrence with time. The organizational information coordination, collaboration, behaviors, and processes within a firm, are referred to by II. The coordination of behaviors, processes, and inter-organizational information with key customers and suppliers, is referred to as customer and supplier integration.

6. Hypotheses of the Study

H-1: Product market innovation strategy (PMIS) has significant impact on the customer integration (CIN)

H-2: Product market innovation strategy (PMIS) has significant impact on the supply chain internal integration (SCII)

H-3: Product market innovation strategy (PMIS) has significant impact on the SCIN.

H-4: Supply chain internal integration (SCII) has significant impact on the customer integration (CIN)

H-5: Supply chain internal integration (SCII) has significant impact on the supplier integration (SCIN)

H-6: Supply chain uncertainty (SU) has significant impact on the supply chain internal integration (SCIN)

H-7: Supply chain internal integration (SCII) mediates between the product market innovation strategy (PMIS) and the supplier integration (SCIN)

H-8: Supply chain internal integration (SCII) mediates between the product market innovation strategy (PMIS) and the customer integration (CIN)

7. Methodology of the Study

7.1 Sample Selection

To classify firms into strategy types (**Feyissa et al., 2019)**, several approaches have been advanced. It has been suggested by **Butler** and **Wilson, 2015** that external assessment, investigator inference, self-typing, and objective indicators are four different approaches. Firms are placed in a continuum by the typology, by **Feyissa et al., 2019,** ranging from ideal prospectors to ideal defenders. However, hybrid strategy types are formulated by intermediate values such as analyzer **(Lii** and **Kuo, 2016)**. Similarly, SCI dimensions' strength can determine one scale from low to high. SCI has been operationalized by several studies, by using multiple-item scales **(Handfield et al., 2015).** A survey method was employed in this study, using a seven-point Likert scale, with a structured questionnaire for every construct. Therefore, 333 questionnaires were collected from the participants. The response rate was 66 percent, which was sufficient as per the standard, set by **Mir** and **Shah, 2016.** However, 53 out of 333 questionnaires were unusable and they were eliminated. The response rate declined to 56 percent, which was sufficient for further analysis. A minimum of 30 percent response rate is considered sufficient by **Hassan, et al., 2017,** for studies based on survey.

7.2 Sources of Data

The questionnaire survey was conducted, at fifteen manufacturing firms of Saudi Arabia. Almost 500 questionnaires were distributed among the respondents. The manufacturing firms were located in the northern area of Saudi Arabia. To get high rate of response, manual distribution was done by the Researcher, to ensure the validity and reliability of data collected **(Janadari, et al., 2016)**.

7.3 Period of the Study

The period of the study was from 2018 to 2019.

7.4 Tools used in the Study

PLS-SEM, also known as component-based technique, based on iterative technique, was employed to explain the variance among the variables **(Hair, et al., 2017).**

8. Data Analysis

The works of **Tzempelikos a**nd **Gounaris, 2017** and **Hair et al., 2017** were used. Multiple approaches are involved in PLS-SEM method such as differentiation analysis, variance analysis, cluster, and regression analysis **(Hair, et al., 2014).** It was suggested by Henseler, **Ringle** and **Sarstedt, 2015** that goodness of fit index is not appropriate for validation of model **(Hair et al., 2014)**. Valid and invalid models cannot be separated in goodness of fit index, by using models of PLS path coefficients, with simulated data. A two-step method was used in this research because of recent developments in suitability of path coefficient model of PLS **(Henseler et al., 2015). Table-1** represents item loading of five constructs i.e. CIN, PMIS, SCII, SCIN, SU. The first step involved the determining of measurement or outer model. The second step involves the determining of structural or inner model. The outer model determination included the assessment of internal consistency reliability, reliability of individual items and validity of content. The content validity included the assessment of discriminant and convergent validity **(Hair et al., 2017; Henseler et al., 2015).**The outer loadings, for every construct, were tested for determining reliability of individual item **(Davcik** and **Sharma, 2016; Hair et al., 2017; Shah** and **Rahim, 2019).** The rule of think was used, according to which the standard values lie in the range of 0.40-0.70 **(Hair et al., 2014).**

The level with which the item of a specific construct, measures similar concept, is referred as internal consistency **(Ng, 2018).** Cronbach's alpha coefficient and composite reliability measures were used for determining internal consistency reliability **(An, et al., 2019). Table-2** shows the composite reliability (CR) i.e**., CIN=0.944, PMIS=0.945, SCII=0.963, SCIN=0.937, SU=0.912.** The Cronbach's alpha coefficient assumes that contribution is made by every item, without considering the real contribution of individual loadings **(Amaro** and **Duarte, 2016; Voegtlin** and **Scherer, 2017).** It is considered in composite reliability that indicators, which can be defined similar to Cronbach's alpha, possess various loadings. **Table-2** shows internal consistent reliability i.e**. CIN=0.911, PMIS=0.922, SCII=0.956, SCIN=0.899, SU=0.808.** The standard value, which is greater than 0.70, is considered sufficient. Any value lower than 0.6, is regarded insufficient, irrespective of the coefficient of reliability. However, composite reliability coefficient, based on standard rule, can be used. Similarly, it was recommended by **Hair et al., 2014** that the value of composite reliability coefficient should be equal to or greater than 0.70. **Table-2** shows the Average variance extracted (AVE) value of **CIN=0.850, PMIS=0.810, SCII=0.767, SCIN=0.833, SU=0.839,** which were greater than 0.50, for every unobserved construct. In other words, there was suitable level of convergent validity.

The level of difference, among the latent constructs, is referred to as discriminant validity **(Shah** and **Rahim, 2019)**. The correlations between unobserved constructs can be compared, for testing the discriminant validity, by taking AVE square roots. However, the standard approach given by **Tzempelikos** and **Gounaris (2017)**, was used. It was ensured that the AVE value was equal to or greater than 0.50. **Table-3** represents discriminant validity (**CIN=0.922, PMIS=0.900, SCII=0.876, SCIN=0.913, SU=0.916),** which recorded greater value than the correlations with other latent constructs. **Figure-1** and **Table-4** rely on a nonparametric bootstrap procedure, to test coefficients for their significance. The study determined the structural model. For this, a bootstrap sample of 500 on 254 cases was used to determine the path coefficient significance **(Hair et al., 2017; Henseler et al., 2015).** The process of variables influencing the relation of other variables, is known as mediation **(Nitzl, et al., 2016).**

Table-4 represents SC responsiveness, resilience, and competitive advantage of the firm, that can be improved by aligning with the product design. The significance of crucial SCM practices, is indicated in the implementation of product design and relevant improvements (**Basheer, et al. 2019**). **Table-4** shows that under hypothesis-1, P=0.000 indicated that Product market innovation strategy (PMIS) exercised significant impact on the customer integration (CIN). Under Hypothesis-2, P=0.000 indicated that Product market innovation strategy (PMIS) exercised significant impact on the supply chain internal integration (SCII). Under Hypothesis-3, P=0.000 indicated that market innovation strategy (PMIS) product recorded significant impact on the SCIN. Under Hypothesis-4, P=0.000 showed that Supply chain internal integration (SCII) reported significant impact on the customer integration (CIN). Under Hypothesis-6, P=0.000 revealed Supply chain internal integration (SCII) to have significant impact on the supplier integration (SCIN). Under Hypothesis-6, P=0.011 indicated that Supply chain uncertainty (SU) exercised significant impact on the supply chain internal integration (SCIN). In other words, hypotheses 1, 2,3,4,5 & 6 were accepted because p value was less than 0.05.

The positive influence of customer integration and strategy of product innovation was mediated by SCII. The opinion of customers can be monitored, to generate new innovative ideas and change requirements. The customers, in relation to alternative products, can provide the assessment of the product. Therefore, product innovation strategy can give advantage to the firm by supporting the integration of customers **(Hameed, et al, 2018)**. The coefficient of the direct path recorded a strong and positive coefficient. According to the results in the **Table-5** (Mediation), Hypothesis-7 and hypothesis-8 highlighted that the SCII mediated the relationship between the PMIS and SCIN and between PMIS and CIN, and both the path i.e. PMIS -> SCII -> CIN, and PMIS ->SCII-> SCIN were significant, as p value was less than 0.05. The monitoring of economic trends in the environment helped in this realization. Evaluation of customer needs and their satisfaction require coordination of internal units of firm and external partners in SC, through development of strong strategic relations. Prospectors reported volatile demand of products and needs of customers as compared with defenders.**Table-6** represents R^2, which measured the variance, explained in each of the endogenous constructs and it is, therefore, a measure of the model explanatory power (**Shumeli** and **Kpooius, 2011**). CIN was 0.436, which was considered as moderate and SCII (0.846) and SCIN (.848) were considered substantial for the study.

9. Findings of the Study

It is found from mediation analysis that there was indirect relationship between the dependent and independent variable through an intervening variable **(Nitzl et al., 2016).** It has been revealed by this study that there was positive association between SCI strength and product innovation, across various dimensions. The findings of the study were in line with the findings of **Feyissa et al., 2019**, who argued that the strategy types differ in the level of dynamics. Prospectors run the business in a dynamic business. However, defenders, in a stable environment, operate business. Therefore, prospectors are more adaptive compared to defenders. The changes in business process are included in such adaptations, to deal with required changes in product / service, demanded by customers, including the ones in mature markets.

10. Suggestions

For prospectors, the development of new product and diversity of product lines are common compared to defenders. Therefore, the prospectors should create strong strategic collaborative relations with suppliers. For instance, some production parts can be outsourced, to implement the new development plans in an efficient manner. Sensitive information of design, should be shared with the important suppliers. Therefore, there is need for a strong and strategic relation, to ensure a high trust level. The high information sharing level, with the suppliers, should be complemented with high flexibility of production **(Feyissa et al., 2019; Houqe et al., 2015)**.

11. Conclusion

The adaptive cycle of organization constitutes a major component of SCI, as it facilitates the implementation of strategy through the development of processes and structure **(Fath, et al., 2015)**. The positive association between external integration and product innovation is mediated by II. This finding led to two important implications. Firstly, it shows that firm is urged to support II because of the implementation of product strategy of innovation. The organizational structure and processes of management include II, which are used to work on desired strategic orientations. Therefore, II is an important part of the organizational adaptive cycle. Further, it has been confirmed by the findings that EI was positively influenced by II. The adaptive cycle also included customer and supplier integration as they supported effective coordination with external partners, to achieve competitive advantage in the challenging business environment. The role of product strategy of innovation has been highlighted in the adaptive cycle of organization.

12. Limitations for the Study

The scope of the study was limited to the Saudi Arabia and authors considered only supply chain internal integration, the product market innovation strategy, and supply chain uncertainty as antecedents to the external supply chain integrations, namely, supplier integration, and customer integration.

13. Scope for Further Research

However, the study, due to time limitation, did not discuss the role of many internal and external resources such product modularity, supply chain information, partnership management on the relationship between product market innovation strategy, internal integration and external integration. Therefore, another study, conceptualizing a broader set of variables, i.e., product modularity, supply chain information, partnership management, could be taken up in future.

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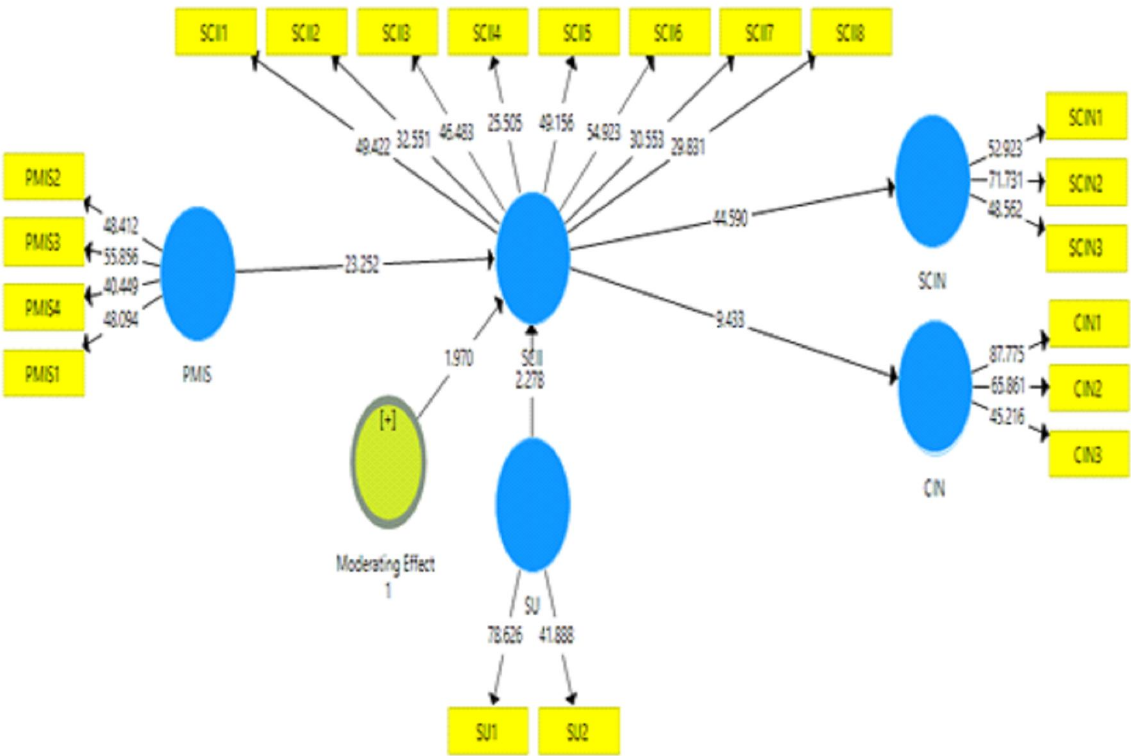
Figure-1: Structural Model



Source: Primary Data computed using PLS-SEM

Table-1: Item Loading Representing Five Constructs i.e. CIN, PMIS, SCII, SCIN, SU

	CIN	PMIS	SCII	SCIN	SU
CIN1	0.937				
CIN2	0.919				
CIN3	0.909				
PMIS2		0.907			
PMIS3		0.903			
PMIS4		0.891			
SCII1			0.897		
SCII2			0.862		
SCII3			0.904		
SCII4			0.847		
SCII5			0.895		
SCII6			0.907		
SCII7			0.849		
SCII8			0.841		
SCIN1				0.922	
SCIN2				0.916	
SCIN3				0.900	
SU1					0.927
SU2					0.905
PMIS1		0.900			

Source: Primary Data computed using PLS-SEM

Table-2: Composite Reliability Measures used for Determining Internal Consistency Reliability

	Cronbach's Alpha	rho_A	CR	(AVE)
CIN	0.911	0.912	0.944	0.850
PMIS	0.922	0.922	0.945	0.810
SCII	0.956	0.957	0.963	0.767
SCIN	0.899	0.900	0.937	0.833
SU	0.808	0.817	0.912	0.839

Source: Primary Data computed using PLS-SEM

Table-3: Discriminant Validity Taking AVE Square Roots

	CIN	PMIS	SCII	SCIN	SU
CIN	0.922				
PMIS	0.660	0.900			
SCII	0.661	0.917	0.876		
SCIN	0.673	0.880	0.921	0.913	
SU	0.861	0.647	0.650	0.667	0.916

Source: Primary Data computed using PLS-SEM

Table 4: Direct and moderation- Nonparametric Bootstrap Procedure to Test Coefficients

	(O)	(M)	(STDEV)	|O/STDEV|	P Values
Moderating Effect 1 -> SCII	0.035	0.036	0.018	1.970	**0.024**
PMIS -> CIN	0.573	0.569	0.053	10.907	**0.000**
PMIS -> SCII	0.868	0.862	0.037	23.252	**0.000**
PMIS -> SCIN	0.799	0.794	0.041	19.293	**0.000**
SCII -> CIN	0.661	0.661	0.070	9.433	**0.000**
SCII -> SCIN	0.921	0.921	0.021	44.590	**0.000**
SU -> SCIN	0.097	0.103	0.043	2.283	**0.011**

Source: Primary Data computed using PLS-SEM

Table-5: Mediation of SCII in Relationship between the PMIS and SCIN and between PMIS and CIN

	(O)	(M)	(STDEV)	(O/STDEV|)	P Values
PMIS -> SCII -> CIN	0.573	0.569	0.053	10.907	**0.000**
PMIS -> SCII -> SCIN	0.799	0.794	0.041	19.293	**0.000**

Source: Primary Data computed using PLS-SEM

Table-6: R-Square Measures the Variance, explained in each of the Endogenous Constructs

	R Square
CIN	0.436
SCII	0.846
SCIN	0.848

Source: Primary Data computed using PLS-SEM