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The Role of Big Data Analytics in the Relationship among the Collaboration Types, Supply Chain Management and Market Performance of Thai Manufacturing Firms

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Abstract-**The current study is carried out to explore role of big data analytics in the relationship among the collaboration types, supply chain management and market performance of Thai manufacturing firms. It has been revealed through literature review that collaboration among the firms is more than just coordination. It is referred as inter-firm interaction with key focus on strategies. This type of collaboration can be witnessed in two different ways, which include STRC and SYSCL [1] . The concepts of STRC and SYSCL have not been recognized separately in literature as they create difference influences on the performance of firm. The study has employed the SEM-PLS to analyze the data. The study broached an argument that the system collaboration includes coordination, sharing of information, and activities management for planning and forecasting of demand. The next level of inter-firm interaction is the STRC. In this advanced level, achievements are more than just SYSCL. The level with which the partners in supply chain plan different business activities with the shared vision to improve the performance of each other is referred as STRC.**

Keywords: *Supply Chain, STRCs, Big data analytics, Thailand*

1. Background

Intermediaries have been recognized by several firms over the last two decades as strategic partners these can support firms in improving the competitiveness and responsiveness in the external environment [2]. For instance, Toyota, Nokia and Zara have achieved certain competitive advantages in contrast to their competitors through coordinating with the partners in global SC. The business activities have been extended by these firms across their boundaries and relations have been established with other firms in the SC. This is referred as SCM (SC management) [1]. It has been suggested by the recent research that it is required by the firms to coordinate with their SC in terms of business models to improve their performance [49]. The integration of various resources for the firm and partners should be increased [3, 4].

Several firms have started to achieve the benefits of increased collaboration with the partners for developing a responsive SC[1]. The concepts of strategic collaboration (STRC) and SYSCL have not been recognized separately in literature as they create difference influences on the performance of firm. The level with the partners in SC communicate with each other and make planning and inter-firm forecasting is referred as SYSCL [5].

The integration efforts of a firm have been described by some researchers [6]. However, no study has made a difference between the STRCs and SYSCL. In this way, their difference in roles and influences on the performance of firm cannot be understood. In order to achieve success, it is important to collaborate with the partners in SC. The I-FCL is assumed by the managers crucial for the firm's improved performance. However, it was found that the performance of firm is not directly linked with the I-FCL. The future research can be provoked to explore the collaboration implications and its influences. In the similar way, it has been revealed by researchers that firms can improve performance and responsiveness through collaboration in SC[7]. It is crucial to understand the difference between the level of information and strategic systems in the I-FCLs (I-FCL) for understanding the influence of I-FCL in improve the performance and responsiveness of firm. Moreover, in order to ensure sharing of information and coordination in the SC, there is need for I-FCL, which need highly integrated IT (information technology) [8].

One of the emerging areas of digital technologies is BDA. According to [9], there is need for the retailers to increase their market share, revenue and sales. This can be

done by using optimization models of price and these can be calculated through demand variations (with the increase or decrease in prices). The profits or revenue can be maximized in this way. Thus, the role of BDA is an important area to study.

2. Literature review

2.1 I-FCL and IT Competency (ITC)

The ITC of the firm within its SCCS (SC communication systems) has been analyzed as an enabling factor for I-FCL. The purpose of SCCS is to support communication between firms to increase collaboration among the partners in SC by cost reduction and material holdings [10]. Information is collected from different systems in a specific SCM system. It allows the firm to collaborate with the partners within and across SC to support the use of joint activities [10]. An interface for relating the corporate systems with other SCM systems elements is offered by SCCS with the partners in SC. This research has used the concept of ITC as a construct of second order based on the previous research studies. A dual view has been adopted by this study, which involves IT appropriation and IT adoption. The adoption of IT is separated from the other strategies and processes of IT in line with the literature on IT. The two dimensions of IT i.e. capabilities and resources are differentiated by this study. The level of firm using the advanced SCCS technology is referred as IT adoption [11]. Several IT technologies are available, which can be employed by different firms. Therefore, it is expected that the firm will achieve higher returns when it adopts advanced SCCS in contrast to the competitors [12]. This makes SCCS a valuable resource for the firm. On the other hand, the level with which a firm uses its SCCS to full capacity is referred as *IT appropriation.*

The SYSCL can be improved by ITC as suggested by literature review [13]. Different SC systems can be adopted by partners in SC. The ITC of a firm can support the firm in recognizing the advantages and differences from the shared systems. At different levels, EDI can be implemented such as EDI based on internet on non-internet based, non-proprietary EDI or proprietary, automated EDI or non-automated, and EDI, which is internally integrated. Through use of internal corporate systems including the management of warehouse systems, execution systems of transportation, and internal corporate systems including ERP and CRM, the integration of technological systems can be done in SCM systems [10]. The gaps in different systems of information can be bridged through use of latest infrastructure technology and adding new features to the SCM system of the firm. This enables the firm to coordinate at different levels of the information system.

The STRC can be enhanced through IT competence as in case of SYSCL. In STRC, the long-term commitment of the top management and its involvement in the inter-firm integration is involved. The SC partner should be considered by a firm as a long-term relation and combined efforts should be put in demand forecasting, planning and setting goals. The probability of miscommunication among the partners is reduced with the IT competence. It enables the firm to assess information and process along with effective decision-making. The firm can coordinate with its partners for projecting the demands in future [14]. Moreover, it is crucial for improving the STRC and SYSCL to use ITC.

H1: ITC ha significant impact on the SYCL

H2: ITC ha significant impact on the STRCL

3. Responsiveness in SC as a Process Outcome

The demands of customers are high, and competition is intention in this competitive global market situation. Firms have trouble in responding to the changes in market and improving its performance. The responsiveness of SC can be improved through increased collaboration of the firm with its partners [1]. The dynamic capabilities are developed through strategic foresights and joint efforts in the SC. Joint efforts are more beneficial in contrast to the firm along using its resources and dealing with the market challenges [15].

It is implied by the responsiveness of SC that the ability of the firm to respond to the uncertain environment comes from the partners in SC. Better performance can be delivered by a set of firms without using additional resources. Resources can be used effectively through increased coordination with the partners in SC. Therefore, rather than an individual efforts of a firm, there is need for the entire SC to react to the challenges of environment and demands in an effective way [16]. It has been revealed by a research that the competition has shifted across the SCs rather than among the firms. It has been revealed by previous research studies that lack of integration of information systems with the main partners in SC can enable a firm for sharing of information. In this way, firm cannot sustain competitiveness in the long run. The entire SC becomes responsive to the external environment when the information system is collaborative. It can efficiently deal with competitors and threats from the customers. The partners in SC become able to share information regarding the partners of logistics, customers, and manufacturers through SYSCL. This makes the SC responsive in terms of fulfilling demands, processing order, and inventory status. The communication and coordination between the partners of SC can be effectively enhanced through I-FCL at system-level. This ultimately enhances the responsiveness of SC[17, 18].

In the similar way, STRC can result in responsiveness of SC. It is indicated by strategic level collaboration that activities between the partners of SC show high commitment towards the achievement of success. It results in SC responsiveness [19]. The sharing of knowledge for effective decision-making results in STRC. It is referred as the collaboration of different firms for making mutual strategies, planning and shared goals for decision-making. The increased understanding of each other's objectives and strategic roles helps reduce role ambiguities. The belief of the firm is developed in the strategic SC direction and value as a whole rather than the individual firm. The entire SC becomes able to respond towards the competition challenges through cohesive relationship [20]. Based on these arguments, the following research hypothesis has been developed:

H3: SYCL has significant impact on the SCR
H4: STRCL has significant impact on the SCR

4. Market Performance as the Main Outcome

It has been suggested by the literature that ITC includes the elements of IT appropriation and IT adoption, which becomes a source of competitive edge [11]. By achieving competitive edge, the firm can improve its market performance in terms of market share, market development, and sales of growth. The use of infrastructures and information systems is related with IT adoption in order to enhance the activities of SC within and across the organizations. Competitive advantage can be generated by the use of latest IT systems. Combining the use of IT adoption and appropriation can result in higher benefits. This is because the ability of a firm to implement IT to learn and create knowledge with the partners in SC in contrast to its competitors is referred as IT appropriation.

The market performance is positively enhanced through the combination of IT resources and the firm's capability to use its benefits.

H5: ITC ha significant impact on the market performance (MP)

It has been suggested by the extant research that the firm can outperform its competitors by combining and shifting its resources in SC as per the needs of customers and strategies of the competitors. Moreover, the firm may introduce innovative products in the market to improve its performance over the competitors. The responsiveness of SC can be process outcome that shows the abilities of a firm to use resources in combination from different firms within the SC to respond to the external environment. The significance of the shared efforts cannot be denied between the partners and the firm for reacting to the external environmental challenges. The individual market responsiveness of the firm directly adds to the performance of the firm and so the SC responsiveness of the firm and its partners [21, 22]. The market performance of the firm can be improved in terms of market share, market goals, growth in sales and market development through increase in SC responsiveness.

[20]. Based on these arguments, the following research hypothesis has been developed:

H6: SYCL has significant impact on the market performance (MP)

Moreover, it is suggested that the capabilities of the firm to respond towards the external challenges is reflected through SC responsiveness, which is a process outcome. Therefore, it plays the role of a mediator, which influences the relation of I-FCL and market performance. It is advised by some studies that there is need to incorporate more factors to establish this relation [23]. According to [24], there is no direct influence of I-FCL on the performance of firm. However, the positive performance can be achieved through intra-firm collaboration. In the same way, the relationship has not been supported between the market performance and I-FCL. There is need for exploring the undefined association between performance and I-FCL. It is believed that the responsiveness of SC has a key role. The ability of a firm to use resources for responding to the changes in market is referred as SC responsiveness. This relation is missing the previous research studies. The tradition studies suggest that the ability of the SC to react to the external market changes is important for improving the market performance of the firm and its partners. Therefore, by converting the strategic and SYSCL into the responsiveness of SC, the firm can achieve higher market performance. In this way, the following research hypothesis has been developed:

H7: STRCL has significant impact on the market performance (MP).

In literature, big data has been defined as 5Vs, which refer to variety, velocity, value, veracity, and volume [25]. The real value is shown by the data analysis and in this regard, value and veracity are of great importance. The knowledge is extracted from big amount of data through BDA, which supports decision making. Merchandise is shipped by Pharmapacks, which is expected to be available in the drug store. The pricing software used by Pharmapacks is called 'Master Mind'. This is used to increase the revenue and market share. The prices are updated after 45 minutes, and sale forecasts and inventory are managed by it. Moreover, cylinder heads are produced at the manufacturing plant located at Untertürkheim, Germany. Predictive analytics are used by Mercedes-Benz to analyze about 600 parameters, which can influence the quality of products. The role of the big data in SC is shown in the figure 1
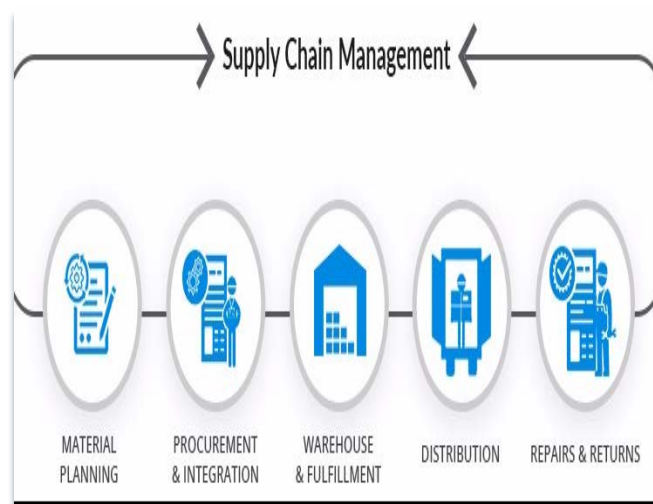
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Figure 1. The simplified SC

The most signified area of digital technologies is BDA. According to [9], there is need for the retailers to increase their market share, revenue and sales. This can be done by using optimization models of price and these can be calculated through demand variations (with the increase or decrease in prices). The profits or revenue can be maximized in this way. This can be combined with the inventory data or relevant cost to suggest prices, which can maximize the profits. The optimization was shown as the most popular technique in the application of prescriptive analytics and area of transportation. In the process of procurement, the application of BPA to SCM can be seen along with actions of promotions, manufacturing of floors in the omnichannel model. This has resulted in monitoring of traffic operation and management of proactive safety optimization [26, 27]. Some areas were identified in which BDA can be used in SCM. The identified areas include the routing of dynamic vehicle, quality control, inventory management, inventory control, and order picking. It was pointed by [28] that disaster prevention and risk management can be done through BDA. The textual analysis supported by computer was analyzed by [29] within BDA in the applications to systems of logistics transportation. Based on the literature the study has broached the following hypothesis.

H8: BDA has significant impact on the market performance (MP)
H9: ITC has significant impact on the BDA
H10: BDA mediates the relationship between ITC and the market performance (MP)

5. Methods and measures

In this section we will discuss about study's nature and statistical methodology which have employed in our study and discussions about results of research. The current study is cross sectional and have used deductive hypothetic method. Which involves finding and interpreting of research, empirical analysis, collection of data, determination of measures and formulation of hypothesis. Whereas the focal research component is the deductive method which have accounted for the developing and implementing the theoretic framework. So, we have developed a hypothetical framework with the help of existing literature. For the achievement of research objectives and obtaining the required responses we have developed the questionnaire and we have employed a 5-point Likert scale. The achievements of operational and account managers of Thai firms are chosen and the sampling technique witch we have used is cluster sampling. Additionally, for data collection purpose we had developed an email questionnaire, and obtained data further go through from a statistical testing process. Therefore, we had tested purposed hypothesis by using statistical measures. Meanwhile the cross sectional takes minimum time and reduced cost for the collection of data from extensive regions. So, for the generalization the outcomes of research we had conducted a survey. The items were addressed properly and subsequently items of questionnaire were related. So, it was expected for all the items to be valid. The total population size is 310, the sample size also based on the size of population. Most of the time we use he PLS -SEM in the research of social sciences because its powerful for carrying out immediate testing for multiple relationships. In the previous studies researchers usually accustomed applying a co variance-based approach. Though for the CB-SEM approach, the possible alternative approach is PLS-SEM. Therefore, based on the survey received the response rate is 63.2%.

6. Measures

The measures have been taken from the literature for developing the survey instrument in this study. The already developed procedures have been used for developing new measures for the new constructs [30]. For every construct, multiple items have been used to increase the reliability of construct [31]. Within the context of SCCS, the IT adoption has been established based on the multi-item scale developed by [32]. The level of using IT for SCCS has been used for IT appropriation, which is a new construct. A multi-item scale has been developed for measuring this. The level with which the information systems of a firm are used among the partners in SC for I-FCL is referred as SYSCL. The scale developed by [33] was used for SYSCL. The integrative activities such as demand forecasting and planning are reflected by the STRC, which is a new construct.

To capture it, a multi-item scale has been developed. The ability of a firm to respond to the changing partners in the external environment with its partners is referred as responsiveness of SC[34, 35]. In SC responsiveness, the focus is on the establishing long-term relationships. The market performance has been conceptualized based on the

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study of Salunke, Weerawardena [36], which includes development of product, development of market, market share, and growth of sales for measuring the construct. A 7-point likert scale was used for all the measures.

7. Results

The nature of research study leads to the adoption of a suitable research approach. In this study, PLS-SEM has been adopted for analysis. Initially, the data is analyzed through screening and descriptive statistics are determined. After this, the measured model is subjected to analysis. Researchers most of the time experience the non-normality issue of data. In this regard, the PLS-SEM approach is considered suitable as it deals with the non-normal data. PLS-SEM method is appropriate in using a small sample size with non-normality issue. CB-SEM approach is not suitable due to the non-normality issue and small sample size. There are some similar attributes shared by CB-SEM and PLS-SEM. However, PLS-SEM is superior to CB-SEM based on its unique characteristics. Based on these characteristics, the approach has been selected for hypotheses testing in this research. The sample size of 130 has been selected in this research, which can be analyzed through PLS-SEM approach). However, the MM is assessed initially in the PLS-SEM method and later the significance of path coefficients is determined. In assessing the MM, the measurement of the elements in the model is done. In this way, the measurement model (MM) is subjected to further analysis. The MM is determined by using convergent, construct, discriminant validity along with the internal reliability consistency. In the initial step, the MM is assessed in the method of PLS-SEM. The reliability is determined in the evaluation of MM along with the validity [37].
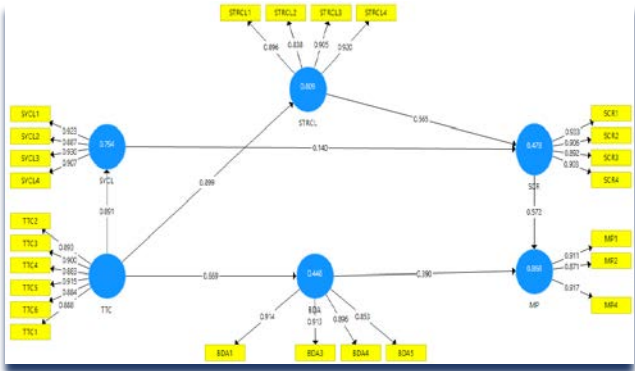

Figure 2 measurement model (MM)

Table 1. Outer loadings

	BDA	MP	SCR	STRCL	SYCL	TTC
BDA1	0.914					
BDA3	0.913					
BDA4	0.896					
BDA5	0.853					
MP1		0.911				
MP2		0.871				
MP4		0.917				
SCR1			0.933			
SCR2			0.906			
SCR3			0.892			
SCR4			0.903			
STRCL1				0.896		
STRCL2				0.838		
STRCL3				0.905		
STRCL4				0.920		
SYCL1					0.923	
SYCL2					0.887	
SYCL3					0.930	
SYCL4					0.907	
TTC2						0.893
TTC3						0.900
TTC4						0.883
TTC5						0.915
TTC6						0.884
TTC1						0.888

It has been recommended by researchers that each item loadings should determine the reliability of each item [38]. The standard of item loadings is 0.70 and the value should not be less than 0.70. In case, the item loading is less than 0.70, it should be omitted to improve the overall value. In PLS method, composite reliability is adopted for determining the internal reliability of the model [39]. The Cronbach's α is used in ensuring reliability. The value should be greater than 0.70 in order to ensure reliability. In case, the value of composite reliability is less than 0.70, it is not acceptable. In this research, the value of composite reliability is in the range of 0.844-0.985 and these are acceptable. According to [37], convergent validity is referred as the level of determining an item with different items. The AVE value has been used to assess the convergent validity in this research (The AVE value must be higher than 0.5 for acceptance. In case, the value is less than 0.5, it is omitted to improve the overall value.

Table 2. Reliability

	Cronbach's Alpha	rho_A	CR	(AVE)
BDA	0.916	0.920	0.941	0.799
MP	0.883	0.885	0.927	0.810
SCR	0.929	0.930	0.950	0.825
STRCL	0.913	0.915	0.939	0.793
SYCL	0.933	0.934	0.952	0.832
TTC	0.950	0.950	0.960	0.799

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The difference level of items between the constructs is regarded as discriminant validity. According to Henseler, Hubona [40], it is the difference of one item from the other items in the model. Two measures are usually adopted for ensuring discriminant validity, which include AVE value square root and Fornell-Larcker criterion [41]. The AVE value must be greater than the value of correlation between the variables in the criterion of Fornell-Larcker [41].

Table 3. validity

	BDA	MP	SCR	STRCL	SYCL	TTC
BDA	0.894					
MP	0.888	0.900				
SCR	0.871	0.912	0.908			
STRCL	0.701	0.714	0.788	0.891		
SYCL	0.778	0.748	0.740	0.886	0.912	
TTC	0.769	0.768	0.786	0.899	0.891	0.894

After ensuring discriminant validity, the next step is to determine the outer model.
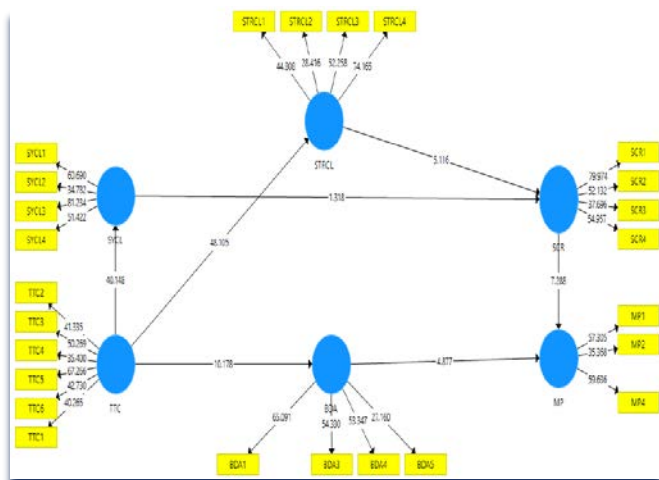

Figure 3. Structural model

It has been recommended by [42], that the structural model should be assessed using the value of regression coefficient, path coefficient, effect size, predictive relevance and the effect of moderators. A sample of 5000 bootstraps was used to determine the t-values. This method has been recommended by [37]. The samples used in the bootstrap method ensure that every parameter has distribution of empirical sample. The value of standard deviation can be used as a substitute value for parameter of empirical standard error [37, 38, 42]. The level of significance is determined using values of one-tail test. The results of the study indicate that the critical values are 2.33 at 1% significance level, 1.28 at 10% significance level and 1.65 at 5% significance level.

Table 4. Direct results

	(O)	(M)	(STDEV)	T Statistics	P Values
BDA -> MP	0.390	0.394	0.080	4.877	0.000
SCR -> MP	0.572	0.568	0.078	7.288	0.000
STRCL -> SCR	0.565	0.558	0.110	5.116	0.000
STRCL -> MP	0.342	0.548	0.110	3.116	0.000
SYCL -> MP	0.323	0.347	0.106	3.318	0.000
SYCL -> SCR	0.140	0.147	0.106	1.818	0.094
TTC -> BDA	0.669	0.671	0.066	10.178	0.000
TTC -> STRCL	0.899	0.899	0.019	48.105	0.000
TTC -> SYCL	0.891	0.891	0.022	40.148	0.000

Table 5. Mediation

	(O)	(M)	(STDEV)	T Statistics	P Values
TTC -> BDA -> MP	0.261	0.265	0.061	4.287	0.000

In PLS-SEM method, structural model is mainly assessed through R2 value [37]. The coefficient of determination (R2) explains the variations in the dependent variable due to the exogenous variables in the model. The R2 value shows greater variations in the dependent variable because of the exogenous variable when the value is closer to 1 [39]. The model is weak, when the value of R2 is closer to 0. The range of R2 is 0-1. The bootstrapping method has been used for assessment of the path coefficients significance [43].

Table 6. R-Square

	R Square
BDA	0.448
MP	0.868
SCR	0.478
STRCL	0.809
SYCL	0.794

The process of blinding folding has been done by using the Stone-Geisser's test. The goodness of model's fit has been determined through this test [44] The dependent unobserved variables are estimated through the process of blindfolding when the model has various dimensions.
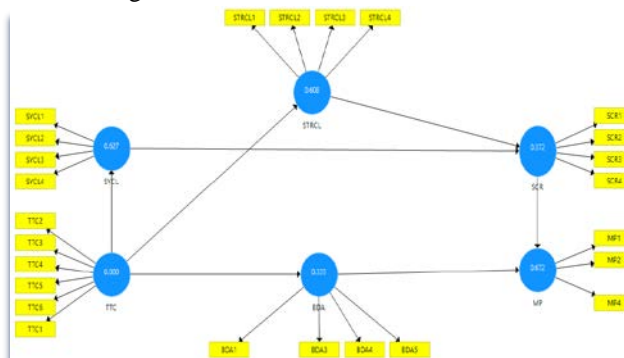

Figure 4. blindfolding

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The analytical significance (Q²) of the model has been determined through the measure of cross-validity redundancy [45].

Table 7. Q-square

	SSO	SSE	Q² (=1-SSE/SSO)
BDA	868.000	576.949	0.335
MP	651.000	213.307	0.672
SCR	868.000	545.484	0.372
STRCL	868.000	340.177	0.608
SYCL	868.000	323.513	0.627
TTC	1,302.000	1,302.000	

8. Conclusion and discussion

There is need for more research on different forms of inter-firm integration as highlighted by recent research studies [23, 46]. The STRC has been distinguished from SYSCL in this study, which is a new addition to the existing literature. The relation between the variables has been empirically tested. It has been revealed by the results that for STRC, there is need for SYSCL. Moreover, the consequences and antecedents of I-FCL were analyzed with reference to the relationships in SC[23]. It shows the distinctive roles of STRC and SYSCL with reference to SC responsiveness, ITC, and market performance. Several implications have been provided by the research findings for managers and practitioners. The literature shows that there is need to explore the role of IT in improving the productivity of firm [47]. The responsiveness of SC can be improved through I-FCL by IT competence. This ultimately improves the market performance of the firm.

The findings of the study indicate the fact that the information is collected from different systems in a specific SCM system. It allows the firm to collaborate with the partners within and across SC to support the use of joint activities [10]. An interface for relating the corporate systems with other SCM systems elements is offered by SCCS with the partners in SC. This research has used the concept of ITC as a construct of second order based on the previous research studies. A dual view has been adopted by this study, which involves IT appropriation and IT adoption. The adoption of IT is separated from the other strategies and processes of IT in line with the literature on IT. The two dimensions of IT i.e. capabilities and resources are differentiated by this study. The level of firm using the advanced SCCS technology is referred as IT adoption Several IT technologies are available, which can be employed by different firms. Therefore, it is expected that the firm will achieve higher returns when it adopts advanced SCCS in contrast to the competitors [12]. This makes SCCS a valuable resource for the firm. On the other hand, the level with which a firm uses its SCCS to full capacity is

referred as *IT appropriation*.it is also argued that the optimization was shown as the most popular technique in the application of prescriptive analytics and area of transportation. In the process of procurement, the application of BPA to SCM can be seen along with actions of promotions, manufacturing of floors in the omnichannel model. This has resulted in monitoring of traffic operation and management of proactive safety optimization

The STRC is not directly influenced by IT competence. It is likely to influence the STRC through the role of SYSCL, which is an important pre-requisite for STRC. An alternative explanation has been provided by understanding the outcomes between market performance and IT competence for evaluating the IT role, which is unexplained in literature. Moreover, IT appropriation and IT adoption has been identified as two different constructs of IT in literature [48]. Based on the literature, this study considers IT appropriation and IT adoption as the factors of ITC and not two different capabilities or resources. It is precise approach, which differs from the un-dimensional perspective highlighted in some research studies [24].

References

[1] S.Y.P.C.P. Castro, G.M. Guzmán, and G.C.L. Torres, "*Collaboration and supply chain in Mexican manufacturing SMEs,*" Red Internacional de Investigadores en Competitividad, Vol. 9, No. 1, pp. 604-619, 2016.

[2] S. Ambulkar, J.V. Blackhurst, and D.E. Cantor, "*Supply chain risk mitigation competency: An individual-level knowledge-based perspective,*" International Journal of Production Research, Vol. 54, No. 5, pp. 1398-1411, 2016.

[3] K. Möller and A. Halinen, "*IMP thinking and IMM: Co-creating value for business marketing,*" Industrial Marketing Management, Vol. 69, pp. 18-31, 2018.

[4] D. Palacios-Marqués, J.M. Merigó and P. Soto-Acosta, "*Online social networks as an enabler of innovation in organizations,*" Management Decision, Vol. 53, No. 9, pp. 1906-1920, 2015.

[5] S.H. Kim, S.Y. Jang and K.H. Yang, "*Analysis of the determinants of Software-as-a-Service adoption in small businesses: Risks, benefits, and organizational and environmental factors,*" Journal of Small Business Management, Vol. 55, No. 2, pp. 303-325, 2017.

[6] C.C. Bienstock, M.R. Stafford and T.F. Stafford, *The role of technology in industrial customers' perceptions of logistics service quality and their future purchase intentions*, in *Revolution in marketing: Market driving changes*. Springer. pp. 122-122, 2015.

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[7] S. Yeniyurt, "*Information technology resources, innovativeness, and supply chain capabilities as drivers of business performance: A retrospective and future research directions,*" Industrial Marketing Management, Vol. 79, pp. 46-52, 2019.

[8] A.K. Tarofder, S.F. Azam and A.N. Jalal, "*Operational or strategic benefits: Empirical investigation of internet adoption in supply chain management,*" Management Research Review, Vol. 40, No. 1, pp. 28-52, 2017.

[9] D. Simchi-Levi and M.X. Wu, "*Powering retailers' digitization through analytics and automation,*" International Journal of Production Research, Vol. 56, No. 1-2, pp. 809-816, 2018.

[10] F.L. Oliveira, A.d.R.O. Junior and L.M.B. Rebelo, "*Adapting transport modes to supply chains classified by the uncertainty supply chain model: A case study at Manaus Industrial Pole,*" International Journal of Production Management and Engineering, Vol. 5, No. 1, pp. 39-43, 2017.

[11] S. Bresciani, A. Ferraris and M. Del Giudice, "*The management of organizational ambidexterity through alliances in a new context of analysis: Internet of Things , No. IoT) smart city projects,*" Technological Forecasting and Social Change, Vol. 136, pp. 331-338, 2018.

[12] K. Kiil, "*Sustainable food supply chains: The impact of automatic replenishment in grocery stores,*" Production Planning & Control, Vol. 29, No. 2, pp. 106-116, 2018.

[13] W.H. DeLone and E.R. McLean, "*Information systems success measurement,*" Foundations and Trends® in Information Systems, Vol. 2, No. 1, pp. 1-116, 2016.

[14] W. Ul-Hameed, "*Remedies of low performance among Pakistani e-logistic companies: The role of firm's IT capability and information communication technology , No. ICT),*" Uncertain Supply Chain Management, Vol. 7, No. 2, pp. 369-380, 2019.

[15] L.B. Orlandi, "*Organizational capabilities in the digital era: Reframing strategic orientation,*" Journal of Innovation & Knowledge, Vol. 1, No. 3, pp. 156-161, 2016.

[16] A. Arora, A.S. Arora and K. Sivakumar, "*Relationships among supply chain strategies, organizational performance, and technological and market turbulences,*" The International Journal of Logistics Management, Vol. 27, No. 1, pp. 206-232, 2016.

[17] A. M. Ametorwo, "*Managing work family conflict among female entrepreneurs in Ghana for development,*" International Journal of Economics, Business and Management Studies, Vol. 3, No. 1, pp. 21-35, 2016.

[18] G. Bowrey and M. Clements, "*Supply chain legitimation through CSR reporting,*" Australasian Accounting, Business and Finance Journal, Vol. 13, No. 1, pp. 27-43, 2019.

[19] B.T. Hazen, "*Big Data and predictive analytics for supply chain sustainability: A theory-driven research agenda,*" Computers & Industrial Engineering, Vol. 101, pp. 592-598, 2016.

[20] D.I. Popescu, "*Analysis of MSEs in ICT Domain from Bucharest-Ilfov County by Using Nonaka-Takeuchi model,*" Studies in Informatics and Control, Vol. 27, No. 1, pp. 107-116, 2018.

[21] V. Jocquet, "*Product iterations in venture capital funded technology-based start-ups: Pivoting as critical success factor?,*" The Journal of Private Equity, pp. 53-62, 2015.

[22] E. Raguseo and C. Vitari, "*Investments in big data analytics and firm performance: An empirical investigation of direct and mediating effects,*" International Journal of Production Research, Vol. 56, No. 15, pp. 5206-5221, 2018.

[23] P.M. Ralston, "*A structure–conduct–performance perspective of how strategic supply chain integration affects firm performance,*" Journal of Supply Chain Management, Vol. 51, No. 2, pp. 47-64, 2015.

[24] T. Kang, M.C. Taylor and H.-C. Chen, "*Effects of employee satisfaction on the relationship between IT capability and firm performance,*" Journal of Research in Business, Economics and Management, Vol. 9, No. 3, pp. 1692-1697, 2017.

[25] S.F. Wamba, "*How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study*" International Journal of Production Economics, Vol. 165, pp. 234-246, 2015.

[26] R. Addo-Tenkorang and P.T. Helo, "*Big data applications in operations/supply-chain management: A literature review,*" Computers & Industrial Engineering, Vol. 101, pp. 528-543, 2016.

[27] L. Zhong, S.J. Wayne and R.C. Liden, "*Job engagement, perceived organizational support, high-performance human resource practices, and cultural value orientations: A cross-level investigation,*" Journal of Organizational Behavior, Vol. 37, No. 6, pp. 823-844, 2016.

[28] T. Papadopoulos, "*The role of Big Data in explaining disaster resilience in supply chains for sustainability,*" Journal of Cleaner Production, Vol. 142, pp. 1108-1118, 2017.

[29] A. Kinra, R.R. Mukkamala and R. Vatrapu, "*Methodological demonstration of a text analytics approach to country logistics system assessments*, in *Dynamics in Logistics*. Springer. p. 119-129, 2017.

[30] S.F. Jahanmir and L.F. Lages, "*The late-adopter scale: A measure of late adopters of technological*

innovations," Journal of Business Research, Vol. 69, No. 5, pp. 1701-1706, 2016.

[31] M.S. Aliyu, "*Influence of knowledge management on performance in small manufacturing firms,*" International Journal of Business, Economics and Law, Vol. 8, No. 2, pp. 63-67, 2016.

[32] S. Hao and M. Song, "*Technology-driven strategy and firm performance: Are strategic capabilities missing links?,*" Journal of Business Research, Vol. 69, No. 2, pp. 751-759, 2016.

[33] W. Yu, "*The impacts of IT capability and marketing capability on supply chain integration: A resource-based perspective,*" International Journal of Production Research, Vol. 55, No. 14, pp. 4196-4211, 2017.

[34] H.S. Bae, "*The effect of environmental capabilities on environmental strategy and environmental performance of korean exporters for green supply chain management,*" The Asian Journal of Shipping and Logistics, Vol. 33, No. 3, pp. 167-176, 2017.

[35] H. Sachdev and M. Sachdev, "*Sustaining specialty retailers through customer involvement: Female millennials' perspective,*" i-Manager's Journal on Management, Vol. 13, No. 4, pp. 1, 2019.

[36] S. Salunke, J. Weerawardena and J.R. McColl-Kennedy, "*The central role of knowledge integration capability in service innovation-based competitive strategy,*" Industrial Marketing Management, Vol. 76, pp. 144-156, 2019.

[37] Hair, "*Partial least squares structural equation modeling , No. PLS-SEM) An emerging tool in business research,*" European Business Review, Vol 26, No. 2, pp. 106-121, 2014.

[38] Hair, *A primer on partial least squares structural equation modeling , No. PLS-SEM).* Sage Publications, 2016.

[39] G. Shmueli, "*Predictive model assessment in PLS-SEM: guidelines for using PLSpredict,*" European Journal of Marketing, 2019.

[40] J. Henseler, G. Hubona and P.A. Ray, "*Using PLS path modeling in new technology research: Updated guidelines,*" Industrial Management & Data Systems, Vol. 116, No. 1, pp. 2-20, 2016.

[41] N. Tzempelikos and S. Gounaris, *A conceptual and empirical examination of key account management orientation and its implications–the role of trust*, in *The Customer is NOT Always Right? Marketing Orientationsin a Dynamic Business World*. Springer. pp. 673-681, 2017.

[42] M. Sarstedt, "*Estimation issues with PLS and CBSEM: Where the bias lies!*" Journal of Business Research, Vol. 69, No. 10, pp. 3998-4010, 2016.

[43] Shah and N.A. Rahim, "*Effect of ethical climate on corporate financial performance in Pakistan: An application of confirmatory tetrad analysis , No. CTA-PLS) approach,*" Journal of Studies in Social Sciences and Humanities, Vol. 5, No. 2, pp. 53-67, 2019.

[44] M. Anthony, G. S. Osho and L. Sen, "*An econometric planning model of urban forestry as a measure of sustainability: A matrix of action and change,*" International Journal of Sustainable Development, Vol. 6, No. 1, pp. 9-32, 2017.

[45] K.K.-K. Wong, *Mediation analysis, categorical moderation analysis, and higher-order constructs modeling in Partial Least Squares Structural Equation Modeling , No. PLS-SEM): A B2B Example using SmartPLS.* Marketing Bulletin, 26, 2016.

[46] C. Ataseven and A. Nair, "*Assessment of supply chain integration and performance relationships: A meta-analytic investigation of the literature,*" International Journal of Production Economics, Vol. 185, pp. 252-265, 2017.

[47] J. Peng, "*Mediation effect of business process and supply chain management capabilities on the impact of IT on firm performance: Evidence from Chinese firms,*" International Journal of Information Management, Vol. 36, No. 1, pp. 89-96, 2016, 2016.

[48] M.D. Bahlmann, M.H. Huysman, and T. Elfring, *Epistemic proximity and knowledge exchange among IT entrepreneurs*, in *Entrepreneurship and cluster dynamics*. Routledge. pp. 162-185, 2016.

[49] E. O. Anwana, A. B. Udo and S. E. Affia, "*Agricultural value added, governance and insecurity in Nigeria: An empirical analysis,*" Asian Business Research Journal, Vol. 4, pp. 1-9, 2019.