Does Strategic Supply Chain Information System Leads To Efficient Supply Chain and Improved Performance in Indonesian Firms

Syamsiah Badruddin[*1], Zulkarnain Hamson[#2], Suparman Mekka[#3], Ahmad Muktamar B[#4], Zulkarnain[#5]

[*1] *Departmen of Sociology Faculty of Social and Political Science, Universitas Nasional, Jakarta, Indonesia*
[#2,3] *Universitas Indonesia Timur, Makassar, Indonesia*
[#4] *Institut Agama Islam As'adiyah, Sengkang, Indonesia*
[#5] *Departmen of International Relations Faculty of Social and Political Science, Universitas Nasional, Jakarta, Indonesia*
Corresponding author: [1]syamsiah_badruddin@civitas.unas.ac.id
[2]zulkarnain.hamson@uit.ac.id
[4]ahmadmuktamar69@gmail.com
[5]zulkarnainunas@gmail.com

Abstract- **The goal of this study is to explore the association among supply chain strategy (SCS) and supply chain information systems (SCIS) strategy and also its influence on efficient supply chain and firm performance (FP). Based on information processing theory (IPT), established hypotheses presenting moderating impact of two supply chain information system strategies (SCIS), information system for efficiency and information system for flexibility. These hypotheses are based on the separate relationship among the two SC approaches i.e. Lean and Agile, and SC efficiency and FP. On the basis of data gathered from top management working in procurement, logistics and SC departments of 250 Indonesian firms, for the survey. The gathered data were analysed by using tools like confirmatory analysis and structural equation modelling (SEM), validated our hypotheses. The result shows that IS for efficiency and flexibility, IS strategy strengthen the association among Lean (Agile) SC strategy and SC efficiency. Moreover, there is positively significant association was revealed among SC efficiency and FP and moderating association among SC efficiency on the association among SC strategy and FP was also found. This research offers novel addition in available research by offering theoretical foundation and supportive results that SC efficiency can be enhanced if SC and IS strategies are implemented simultaneously.**

Keywords; Supply Chain Information, Improved Performance, Firms

1. Introduction

To accomplish a smooth and successful SC it is important to measure and record the vital operational processes such as stock management, lead time and delivery planning [4]. Hence, it's necessary for an organisation to implement a SCIS which is aligned with its SC operational requirements. It is observed that such alignments are not successful all the times, it does fail in some cases. An example is of General Motors, its SCIS failed due to business process change, central and regional control, underestimation of the planning process, inadequate data conversion and testing and overreliance on the system [4]. It raises the concern that what is the reason for these unsuccessful alignments? One of the most critical reasons behind these failures is a paucity of competent analysis to determine the advantages of implementing particular SCIS [34]. For example, if the of the SC is to reduce the inventory or accomplish lean approach then what sort of computer software should be used in the supply chain department? So, a deep analysis of data and information is necessary to identify which kind of SCIS fulfils the requirements of specific SC strategy.

In this study, the investigation is conducted regarding the moderating association among the SCS and SCIS. This investigation is based on the key factors such as, which SC strategy needs which type of specific SCIS to accomplish efficient SC and its impact on the SC and FP. Specifically, supposing from the SC and IS literature, the hypotheses are established suggesting a positive moderation among two different supply chain strategy (Lean and Agile) and two relevant SCIS strategy (IS for Flexibility and IS for Efficiency) related with improved SC and FP. Based on findings it is evident that IS (efficiency) and IS (Flexibility) plays the role of moderator among Lean and Agile SC strategies and also SC efficiency. Early literature primarily has shortcomings in providing academic knowledge of how specific IS can support the needs of the process of information and processes associated with specific kind of SC, and the reasons of the compatibility of specific SC strategies with respective IS strategies. This research addresses this gap in the theory through the offering the deeper understandings of the theory with empirical evidence on the of IS application to various kinds of SC techniques that helps improving SC efficiency and FP.

This paper broadens the existing available knowledge in the current literature by considering the more extensive process of the SC and IS strategy that would improve SC efficiency. In light of these arguments, we present that this study adds to the literature by proposing that proper fits between SC and SCIS leads to an improved SC efficiency and FP. This study shows the significance of the design and adoption of these IS technology that suit a specific kind of SC businesses. Moreover, a direction is given by this study, which IS applications ought to be engineered and executed, for particular SC by offering a framework by which SC and operational administrators can take financial decisions with respect to the implementation of IS in SC system.

2. Literary Review

2.1. SC and SCIS Strategy

The strategy of SC illustrates how SC is shaped and sets its particular targets and goals [7, 19]. SC strategy defines the relationship and combination of activities and functions throughout the SC, in order to provide the value to customers in a marketplace. There are several types of SC strategies [11], cost efficient, responsive, lean and agile [20]. In our study, we will be considering two strategies of SC i.e. Lean and Agile strategy. A ‘‘Lean’’ SC strategy focuses on low-cost quick SC with an aim of decreasing inventory lead times and waste [7]. This strategy is useful where demand is relatively stable and predictable, and product variety is low [8]. SC strategy for ‘‘Agile’’ is focused to achieve adaptability and flexibility in sourcing and logistics with the continual response [27]. Figure 1, 2 and 3 below support to understand these two SC strategies.

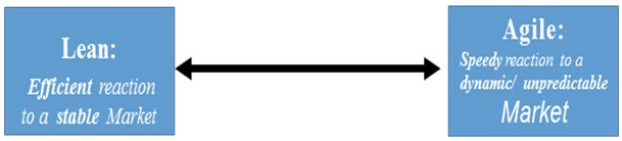

Figure 1. Supply Chain Strategies

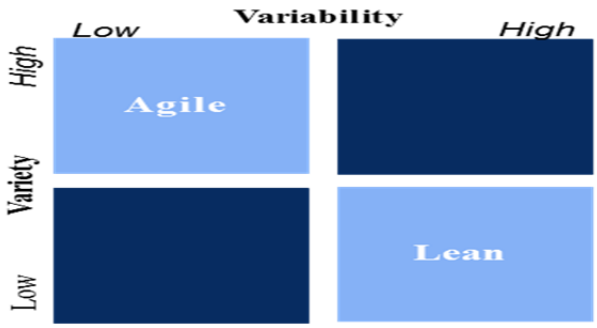

Figure 2. Variability

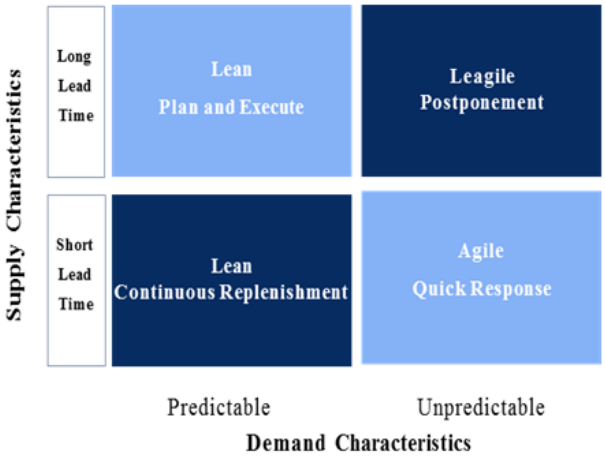

Figure 3. Supply and Demand Characteristics

Implementing efficient and reliable SCIS can lead to the point that can help organisations to achieve success and compete with the global marketplace [36]. The performance of an SC is based on the extent of its capability of managing the flow of materials, information, and money. The SCIS provides expertise in managing these flows [21]. The implementation of SCIM gives two vital benefits: Cost reduction and increase customer’s satisfaction [22]. This study emphasizes on the fact that with the implementation of SCIM results in improving SC efficiency [1].

2.2. Association Among SC and IS strategy

Contemporary researches are purposeful on the impacts associated with the use of IS in SC. Studies show that SC communication and incorporation are supported by the exercise of integrated IS [37], and helps in achieving better FP. SC practices like as SC integration, and actions like establishing long term strategic relations with suppliers, requires wide utilization of electronic data interchange (EDI) and thus the abutment of IS within the organization [6, 28]. Considering that SC at multiple levels of communication and incorporation needs altered technology incorporation level, this develops an understanding of a theoretical foundation that a high (low) level of supplier incorporation should meet the high (low) level of SCIS implementation to get the goal of highly efficient CS [9].

Hence, it’s learned that the structure of SC must include understanding of communication and information processing needs and additional recommendations to implement specific SCIS. This is generally specified as ‘‘The strategic program of IS in SC’’ [4, 26]. However, SC research till now is mostly not ample to support such analysis. Likewise, there is a great amount of research and concept of IS alignment business strategies IS strategy alignment is there [15, 25] but there is lack of notable work available on the understanding of IS strategy alignment and SC strategy. In the study, particularly, we

suggest that which specific SCIS should be implemented for given a SC strategy that would successfully be as a moderator on the association among SC strategy and SC efficiency. Taking note of that improved SC execution is related with enhanced FP.

2.3. Hypotheses Development

The relationships among IS strategy, SC strategies, SC performance, and FP, based on our hypothesis, is reflected in Figure 4. Particularly, it is suggested that the association among a specific strategy in SC and SC efficiency should be strengthen by relevant strategy of IS. It is (a) IS for Efficiency would play the role of moderator on the association among an SC strategy and Lean SC strategy and (b) IS for Flexibility should would play the role of moderator on the association among Agile SC strategy and SC efficiency. We likewise propose the SC performance should lead to enhanced FP as outlined in Table 1.

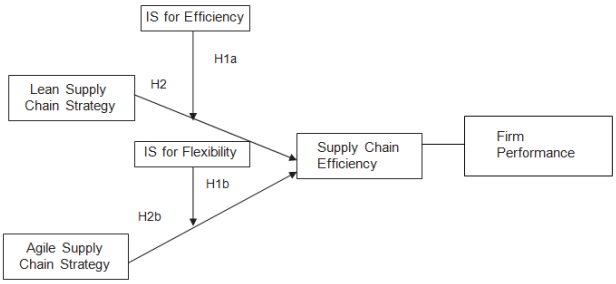

Figure 4. Conceptual Framework

The Lean SC strategy needs proper and in time inter-organizational correspondence of data about stocks, capabilities, delivery schedule based on the structure of JIT ideology. The IS for efficient strategy upgrades the internal and inter-organizational operational efficiencies by using operations that facilitate routine correspondence within the organization, and outside, with clients and suppliers.

For instance, utilizing ERP empowered workflows to organize supply orders between buying and manufacturing process that can bring about the less raw material stock. ERP is commonly intended to manage workflows along with SC process, for example, purchasing and manufacturing forecasting. The study presents that the utilization of ERP is increasingly beneficial and free of error execution because of enhanced accessibility of operational information that is necessary for everyday handling of tasks. Additionally, it prompts lesser procuring expenses for maintenance-repair-order (MRO) [3]. Moreover, it can enable the workflow that imply low-waste processes [33]. So also, the manufacturing forecasting of firm with the orders of suppliers based on B2B or with EDI improves the prompt knowledge of stock and deliveries, lessening the stock in operation. The existence of functioning and internal organizational applications as demonstrated by the IS for Efficiency and IS strategy is subsequently, as portrayed in Figure three, likely to additionally complement effect of Lean SC strategy on SC efficiency, through expanding the degree of inclusion of data and harmony in organizational decision making that reflect the Lean SC strategy's information management requirements. These arguments lead to following hypothesis:

H1a. The lean SC strategy and the SC efficiency is moderated by IS strategy for efficiency.

The thought of agility in SC may be perceived as a strategy for growing flexibility in manufacturing and distribution operations. As far as IP backing, the agile SC strategy needs organization to process the information on client demands, opponent activity, and product market strategic alternatives. [17] describe the way of IS for flexibility strategy be able to reinforce the needs of an agile SC. The IS, for instance, can reinforce SC agility by promoting instantaneous examination, analysis and feedback with regards to changing client and market request. Strategic decision support systems expedite communication and exit decisions for novel or available product-markets. Furthermore, the presence of internal organizational system expedites information sharing for association with partners and for the co-ordination of reaction strategies and activities [23]. Therefore, it is anticipated that the IS for Flexibility IS strategy will improve the affirmative relationship among the Agile SC strategy and SC efficiency. These arguments lead to following hypothesis:

H1b. The agile SC strategy and the SC efficiency is moderated by IS strategy for flexibility.

The Lean SC strategy emphasises on appropriately administrating the SC, eradicating misuse and focusing on betterment philosophy, hence getting better the quality of output, dropping the delivery timing and curtailing stock. This strategy implicates that the organization should work in a synergetic way with suppliers on vital operating mechanism, like, stock and lead times, and to deploy processes such as huge-production and JIT [31, 35]. By removing extra inventory and getting a better quality of output, the SC can reduce deployment cycle, enhance efficiency, the better quality of the product and rapidly react to client's needs. Accordingly, SC efficiency is improved. A great degree of leanness is essentially required to achieve improved SC efficiency. The agile SC has a superior ability to efficiently complying with diversified client demands and choices [31, 35]. It does through, for instance, executing capability cushion to manage market vulnerabilities, which expands its reaction. These arguments lead to following hypothesis:

H2a. The Lean SC strategy leads to an improved SC efficiency.

H2b. The Agile SC strategy leads to an improved SC efficiency.

There are three recommended for the measurement of SC efficiencies, such as managing capital (efficiency), measuring the production (client's satisfaction), and flexibility [2, 12]. Likewise, [2] recommends that SC performance must be analysed in a way of production and stock costs, reaction to transformation in delivery needs and incorporation with collaborators. Based on this, we explain SC efficiency as its flexibility, integration, and client reactions. SC flexibility is the degree to which SC collaborators viably and rapidly adjust to transformations in the market [37]. SC integration is the degree of actions, correspondence, and taking decisions in the SC are corresponded mutually [14, 29]. Responsiveness to clients is the degree to which SC collaborators react rapidly to client's requirements [5, 29].

FP attributes to how an organization attains its business targets. On the basis of prior researches associated with FP, we compute FP by revenue, revenue share of total market by a firm and rivalry in the market [24]. The positively significant relationship among SC efficiency and FP is established in prior studies. For example, SC integration improves the performance with which data is co-ordinated in the SC [21], hence getting better FP by decreasing stock levels and costs and with improving timely delivery [18]. Likewise, there is a huge association between SC flexibility and FP for the reason that the capability of the SC to adjust the changes that will affirmatively affect the organization's capability to propose and deliver goods that are probable to meet dynamic demand [37]. Plenty of research has depicted that capability of the SC to manufacture and distribute goods in response to clients' desire leads to greater efficiency for SC that leads to higher FP [37, 5]. These arguments lead to following hypothesis:

H3. SC efficiency is positively associated with FP.

3. Methodology

3.1. Survey Instrument and Data Collection

We introduced instruments for calculating the two forms of SCM and IS strategies, based on prior literature [25]. Previous work has adopted the instruments for calculating SC efficiency and FP [24]. The validity of content in two steps has been achieved. Initially, four academics and three experts reviewed it. We have adapted them for the pilot study on the basis of their response. Afterwards, the pilot study was performed to validate the instruments [30]. All items of questionnaire were assessed with a response choice of 1 (strongly agreed) to 6 (not applicable) in the Likert scale. The analysis unit is a single organization. Top management (directors and senior personals) from buying/manufacturing/SC departments were selected as the respondents. Initially, 3526 personals were used from above mentioned departments, and the selections was random form the manufacturing organizations in Indonesia based on at least 300 employees and having Indonesian Rupiah 11 million revenue. 250 completed surveys were obtained with a 7.01% response rate comparable to priors researches [24]. Annexure, 1, 2 and 3 offered the attributes of the respondents.

3.2. Reliability, Convergent Validity and Discriminant Validity

3.2.1. Non-Response Bias

The Chi-square test was applied to measure non-response bias among the two rounds of respondents to calculate differences in the organization employees, annual revenue and position in the firm. No significant difference was found among the two groups that indicate the non-presence of non- response bias. 75 and 125 are the responses from the first and second group respectively.

3.3. Assessing Convergent Validity and Reliability

To carry out item's purification for each construct, CITC analysis was applied as shown in Table 1. After two rounds of CITC, two items were removed and after one round, one item was removed, For the Agile SC strategy and IS for Flexibility respectively. All scores are greater than the threshold of 0.5 for the rest. Post purification, reliability (Cronbach Alpha), standard deviation; mean and constituent items of all the constructs are presented in Table 1. Suggesting good reliability [10], as values are higher than the standard i.e. 0.7.

Table 1. Items, corrected item-total correlation, alpha, mean, and standard deviation for each construct

Item	code	Survey item	CITC	Alpha	Mean	Standard deviation
Lean supply chain (LSC)						
LSC1	Our supply chain	Manages inventory by delivering what we need	0.52	0.79	2.27	0.69
LSC2		Provides standardized products	0.55			
LSC3		Reduces any	0.54			

		kind of waste				
LS C4		Adopts quality practices as per our requirements	0.66			
LS C5		Manages quality as per our requirements	0.70			
LS C6		Inspects products frequently	0.58			
Agile supply chain (ASC)				0.83	2.59	0.74
AS C1	Our supply chain	Responds effectively to changing requirements of design	0.60			
AS C2		Responds quickly to customization requirements	0.66			
AS C3		Can handle changes in product design	0.77			
AS C4		Customizes our products by adding	0.74			
		feature models as per our requirements				
AS C5		Maintains a higher-capacity buffer to respond to volatile market	0.72			
Information systems strategy for efficiency (ISSE)			0.00	0.88	2.65	1.03
ISS E1	The Information Systems (IS) applications we acquire/ develop help us to	Improve the efficiency of operation between our suppliers and us	0.00			
			0.74			
ISS E2		Manage inventory between our suppliers and us	0.75			
ISS E3		Manage material requirements planning of our facility	0.67			

ISS E4		Manage production control between our suppliers and us	0.78			
ISS E5		Coordinate (production and information) efficiently across suppliers and product lines	0.78			
Information systems strategy for flexibility (ISSF)				0.87	3.07	1.07
ISS F1		Introduce new product(s) and/or service(s) in our market(s)	0.80			
ISS F2		applications we acquire / Monitor changes in our market condition	0.69			
ISS F3		develop help us to Respond to changes in the market	0.82			
ISS F4		Change the design of our product(s)	0.66			
Supply chain performance (SCP)				0.85	2.62	0.96
SCP 1	Our supply chain	Can handle nonstandard orders	0.65			
SCP 2		Can meet special customer specification requirements	0.69			
SCP 3		Can produce products characterized by	0.61			

		numerous features options, sizes and colours				
SCP 4		Can rapidly adjust capacity so as to accelerate or decelerate production in response to changes in customer demand	0.74			
SCP 5		Can rapidly introduce large numbers of product improvements /variation	0.61			
SCP 6		Can handle the rapid introduction of new products	0.61			
SCP 7		Has fast customer response time	0.74			
SCP 8		Is characterized by a great amount of cross-over of the activities of our firm and our trading partners	0.69			
SCP 9		Is characterized by a high level of integration of information systems in our firm	0.74			
SCP 10		Has short order-to-delivery cycle time	0.72			
Firm performance (FP)				0.94	3.76	0.91
On a scale of 1–6, please indicate the choice that accurately reflects your firm's overall performance						
FP1		Market share	0.80			
FP2		Return on	0.81			

		investment				
FP3		The growth of market share	0.77			
FP4		Growth in return on investment	0.83			
FP5		The profit margin on sales	0.72			
FP6		Overall competitive position	0.82			

3.4. Assessing Discriminant Validity

The Annexure 4 presents the findings of discriminating validity done based on PLS. For all constructs showing good discriminant validity, the factor loading for every component is greater than it's cross-loading. Annexure 5, explains the inter construct correlations and AVE and also square root of AVE that further offers robust evidence of discriminating validity [16].

3.5. Assessing Common Method Bias

This study also performed Harman factor test to detect common method bias, as the data was obtained by a single respondent from each organization (Fornell and Larcker, 1981). The findings show that there is no common method bias.

4. Results

The hypothesis is evaluated with the help of SEM with PLS software. The strength of each relationship and its significance is assessed using t-statistic and Beta. The impact of independent variables on dependent variables was determined by using R^2. To calculate t-statistic based on 250 cases and 1000 repetitions, bootstrapping was applied and to determine the standardized coefficient (Beta coefficient). Values of R^2 square in SC performance and firm performance are 0.0547 and 0.33 respectively. The findings are represented in Table 2.

Table 2. PLS structural equation modelling results

Hypothesis	Relationship	Type	Beta-coefficient	T-coefficient	Significant
H2a	LSC-SCP	Direct	0.142	3.3	Yes
H2b	ASC-SCP	Direct	0.147	2.9	Yes
H1a	LSC*ISSE	Moderation	0.191	2.95	Yes
H1b	ASC*ISSF	Moderation	0.172	2.6	Yes
H3	SCP-FP	Direct	0.187	8.4	Yes

5. Discussion and Conclusions

Table 2 shows that all the hypotheses are supported, first the direct relationship, H2a and H2b states that lean and agile SC strategies positively influence the SC efficiency [35, 31]. These results are supported by the previous studies. Whereas, the other direct impact, H3 shows that SC efficiency contributed positively towards FP in line with the previous studies [37, 5, 24]. Finally, the and H1a and H1b, the hypotheses for moderating relationship are also supported, so it can be claimed that IS strategy for efficiency and flexibility strengthen the association among SC strategy and SC efficiency as expected. This research presents various offerings. Along with the findings, it provides evidence that how and why specific IS strategies can be beneficially lined up with various sorts of SC, in this way presenting a contingency perspective in the relation between the IS implemented in the SC and different form of SC. Past research by [32] exploring relationship between SC system and SC efficiency propose that effective implementation of IS in the organizations, SCs is related to enhance FP. The outcomes of research broaden it by demonstrating that strategies of SC need to be in line with IS, consequently, this strategy will notably influence the SC efficiency. The use of SCIS has proved to have general advantages in the SC [15], whereas, the contingent approach in this relationship among the design of applications and kind of SC is absent. The study covers this theoretical gap. Our results indicate, additionally to enhance FP by positively controlling SC performances, the Lean and Agile SC strategy will directly enhance SC efficiency and that will lead to FP as supported from findings.

Subsequently, the outcomes point out the requirement of the compatibility of IS suppliers in relation to IS Brilliance, and expertise. Our research gives a conceptual understanding for recognising specific fields where IT expertise of suppliers should be aligned according to the SC strategy. This research further establishes and justifies the use of the four constructs model for SC strategy and IS strategy and allows to utilize and establish these models

for further work. SCs are getting complex, and their adequate handling needs to be more perceptive and relevant. However, due to a lot of SCIS for organizations, SC users find it difficult that what type of SCIS will be of huge advantage for them. The research also offers a decision-plan for SC administrators of the organization to determine, established on the authority of the SC strategy, the specific module of SCIS the respective suppliers should implement, and which field they may require technical development for improvement.

6. Limitations and Future Research

There are certain bindings despite its contributions in this research. First, a single respondent is questioned regarding SC issues relating to strategy and implementation by each organization. Even though the majority of the respondents were higher-ranked individuals (Directors and Managerial level employees) in SC operations like purchasing, it is not possible for an individual in a firm to administer the complete SC. Hence there is the chance of related bias in the answers to the survey queries. Subsequently, in our research model, a chance of Common Methods bias is also there, from the same individual answering the dependent and independent variables. The tests shown above in the methodology section report that the unavailability of common method bias, recommends that bias is not induced in our results due to using a single respondent. Moreover, from the perspective of the single or focal manufacturer, despite covering different prospects of SC, the feedbacks, covering different prospects of the SC may not consider common realities for all organizations in the SC. For example, many organizations using the SC may have various stages of automation. Certainly, it's troublesome to understand the complications and refinements of the whole SC from the perspective of a single company. Taking research ahead, a collaboration between SC and IS strategies in different industries could be investigated. There is a great possibility of prevailing industry-special patterns of IS strategy for specific SC strategy.

The lean efficiency combination may be present in industries that are relative to or projected to demand, like retail, low technology or industrial products manufacturers. The ''agile-flexibility'' is predictable to be specifically important to the organisations which have consistent technological advances, like, fashion, computers and cell phone industry. Studies on these trends will provide the way that SC and IS Strategy may effectively combine in industry-specific arrangements. This research identifies, when SC strategy is matched with IS strategy with relation to its application selection will have an encouraging impact on the SC efficiency.

References

[1] M. Al-Odeh, (2016). *"Supply chain information systems technologies and management strategies in northern minnesota,"* Journal of Supply Chain Management Systems, Vol. 5, No. 2, pp. 22-37.

[2] G. Arzu Akyuz and T. Erman Erkan, *"Supply chain performance measurement: A literature review,"* International Journal of Production Research, Vol. 48, No. 17, pp. 5137-5155, 2010.

[3] M. Biehl, *"Selecting internal and external supply chain functionality: The case of ERP systems versus electronic marketplaces,"* Journal of Enterprise Information Management, Vol. 18, No. 4, pp. 441-457, 2005.

[4] G. Büyüközkan and F. Göçer, *"Digital Supply Chain: Literature review and a proposed framework for future research,"* Computers in Industry, Vol. 97, pp. 157-177, 2018.

[5] A. S. Carr and J. N. Pearson, *"Strategically managed buyer–supplier relationships and performance outcomes,"* Journal of Operations Management, Vol. 17, No. 5, pp. 497-519, 1999.

[6] V. Choudhury, *"Strategic choices in the development of interorganizational information systems,"* Information Systems Research, Vol. 8, No. 1, pp. 1-24, 1997.

[7] M. Christopher and J. Gattorna, *"Supply chain cost management and value-based pricing,"* Industrial Marketing Management, Vol. 34, No. 2, pp. 115-121, 2005.

[8] M. Christopher, H. Peck, and D. Towill, *"A taxonomy for selecting global supply chain strategies,"* The International Journal of Logistics Management, Vol. 17, No. 2, pp. 277-287, 2006.

[9] F. Corbière, F. Rowe, and C. S. Saunders, *"Digitalizing interorganizational relationships: Sequential and intertwined decisions for data synchronization,"* International Journal of Information Management, Vol. 48, pp. 203-217, 2019.

[10] L. J. Cronbach, *"Coefficient alpha and the internal structure of tests,"* Psychometrika, Vol. 16, No. 3, pp. 297-334, 1951.

[11] L. S. Dias and M. G. Ierapetritou, *"From process control to supply chain management: An overview of integrated decision making strategies,"* Computers and Chemical Engineering, Vol. 106, pp. 826-835, 2017.

[12] P. Folan and J. Browne, *"Development of an extended enterprise performance measurement system,"* Production Planning and Control, Vol. 16, No. 6, pp. 531-544, 2005.

[13] C. Fornell and D. F. Larcker, *"Evaluating structural equation models with unobservable variables and*

measurement error," Journal of Marketing Research, Vol. 18, No. 1, pp. 39-50, 1981.

[14] M. T. Frohlich and R. Westbrook, *"Arcs of integration: an international study of supply chain strategies,"* Journal of 0perations Management, Vol. 19, No. 2, pp. 185-200, 2001.

[15] J. C. Henderson and H. Venkatraman, *"Strategic alignment: Leveraging information technology for transforming organizations,"* IBM Systems Journal, Vol. 38, No. 2.3, pp. 472-484, 1999.

[16] J. Henseler, C. M. Ringle, and M. Sarstedt, *"A new criterion for assessing discriminant validity in variance-based structural equation modeling,"* Journal of The Academy of Marketing Science, Vol. 43, No. 1, pp. 115-135, 2015.

[17] K. N. Iyer, *"Information technology and supply chain collaboration: Examining the contingent role of environmental uncertainty,"* Information Resources Management Journal (IRMJ), Vol. 24, No. 3, pp. 26-44, 2011.

[18] V. R. Kannan and K. C. Tan, *"Supplier selection and assessment: Their impact on business performance,"* Journal of Supply Chain Management, Vol. 38, No. 3, pp. 11-21, 2002.

[19] D. J. Ketchen Jr and G. T. M. Hult, "Bridging organization theory and supply chain management: The case of best value supply chains," Journal of Operations Management, Vol. 25, No. 2, pp. 573-580, 2007.

[20] P. R. Kleindorfer, K. Singhal, and L. N. Van Wassenhove, *"Sustainable operations management,"* Production and Operations Management, Vol. 14, No. 4, pp. 482-492, 2005.

[21] İ. Koçoğlu, S. Z. İmamoğlu, H. İnce, and H. Keskin, *"The effect of supply chain integration on information sharing: Enhancing the supply chain performance,"* Procedia-Social and Behavioral Sciences, Vol. 24, pp. 1630-1649, 2011.

[22] N. Kumar, S. Saxena, and R. Agrawal, *"Supply chain management: Road ahead with a literature review based analysis,"* Journal of Supply Chain Management Systems, Vol. 1, No. 4, pp. 278-305, 2012.

[23] H. Lee, M. S. Kim, and K. K. Kim, *"Interorganizational information systems visibility and supply chain performance,"* International Journal of Information Management, Vol, 34, No. 2, pp. 285-295, 2014.

[24] S. Li, S. S. Rao, T. Ragu-Nathan, and Ragu- B. Nathan, *"Development and validation of a measurement instrument for studying supply chain management practices,"* Journal of Operations Management, Vol. 23, No. 6, pp. 618-641, 2005.

[25] J. Luftman and T. Brier, *"Achieving and sustaining business-IT alignment,"* California Management Review, Vol. 42, No. 1, pp. 109-122, 1999.

[26] R. Narasimhan and S. W. Kim, *"Information system utilization strategy for supply chain integration,"* Journal of Business Logistics, Vol. 22, No. 2, pp. 51-75, 2001.

[27] X. Zhou and J. Chen, *"A Comparison of Impacts of Climate Change on Urban Poverty and Rural Poverty in the North-West China,"* International Journal of Management and Sustainability, Vol. 8, No. 1, pp. 20-31, 2019.

[28] S. Nazir and A. Pinsonneault, *"IT and firm agility: an electronic integration perspective,"* Journal of the Association for Information Systems, Vol. 13, No. 3, pp. 21-41, 2012.

[29] M. Pagell, *"Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics,"* Journal of Operations Management, Vol. 22, No. 5, pp. 459-487, 2004.

[30] J. Zhang, *"Executive Social Network and Enterprise Innovation,"* Journal of Accounting, Business and Finance Research, Vol. 7, No. 1, pp. 17-23, 2019.

[31] Y. Qi, K. K. Boyer, and X. Zhao, *"Supply chain strategy, product characteristics, and performance impact: evidence from Chinese manufacturers,"* Decision Sciences, Vol. 40, No. 4, pp. 667-695, 2009.

[32] E. Samadi and I. Kassou, *"The relationship between IT and supply chain performance: A systematic review and future research,"* American Journal of Industrial and Business Management, Vol. 6, No. 4, pp. 480, 2016.

[33] Shin, I. *"Adoption of enterprise application software and firm performance,"* Small Business Economics, Vol. 26, No. 3, pp. 241-256, 2006.

[34] J. Soroor, M. J. Tarokh, and M. Keshtgary, *"Preventing failure in IT-enabled systems for supply chain management,"* International Journal of Production Research, Vol. 47, No. 23, pp. 6543-6557, 2009.

[35] M.-L. Tseng, J. H. Chiang, and L. W. Lan, *"Selection of optimal supplier in supply chain management strategy with analytic network process and choquet integral,"* Computers and Industrial Engineering, Vol. 57, No. 1, pp. 330-340, 2009.

[36] T. Varma and D. Khan, *"Information technology in supply chain management,"* Journal of Supply Chain Management Systems, Vol. 3, No. 3, pp. 633-668, 2014.

[37] W. Yu, M. A. Jacobs, W. D. Salisbury, and H. Enns, *"The effects of supply chain integration on customer satisfaction and financial performance: An organizational learning perspective,"* International Journal

of Production Economics, Vol. 146, No. 1, pp. 346-358, 2013.

Annexure 1. Job title of respondent firms

Job Title	**Number of Organizations**	**Percentage**
Senior Managers	150	60
Directors and VP's	92	37
CEO/President	8	3

Annexure 2. The job function of respondent firms

Job functions*	**Number of Organizations**	**Percentage**
Corporate executive	30	12
Purchasing/procurement	161	64
Manufacturing/production	55	22
Distribution	40	16
Transportation	42	17
Sales	11	4
Note: In some cases, one company represented multiple sample points since the responding person was responsible for more than one function in the firm; the calculation of the percentage is based on the total sample size of 250. 37% of the respondents were responsible for more than one function in the firm		

Annexure 3. Industry category of respondent firms

Industry category of respondent firms		
Industry category	**Number of Organizations**	**Percentage**
Manufacturing	190	76
Process industry	13	5
Service	12	5
Others	35	14

Annexure 4. Component-based analysis: Loadings on intended construct and cross-loadings

	LSC	**ASC**	**ISSE**	**ISSF**	**SCP**	**FP**
LSC1	0.81	0.17	0.15	0.03	0.07	- 0.12
LSC2	0.75	0.10	0.11	0.14	0.17	-0.18
LSC3	0.79	0.10	0.09	-0.02	0.08	0.11
LSC4	0.88	0.43	0.28	0.13	0.23	-0.03
LSC5	0.87	0.43	0.28	0.13	0.23	-0.01
LSC6	0.82	0.32	0.34	0.17	0.34	-0.06
ASC1	0.43	0.95	0.11	0.16	0.33	0.04
ASC2	0.51	0.95	0.16	0.22	0.33	0.02
ASC3	0.19	0.81	0.15	0.28	0.27	0.03
ASC4	0.14	0.84	0.17	0.28	0.28	0.04
ASC5	0.15	0.79	0.19	0.23	0.21	0.04
ISSE1	0.26	0.10	0.81	0.32	0.21	0.23
ISSE2	0.20	-0.01	0.83	0.34	0.31	0.27
ISSE3	0.36	0.18	0.80	0.34	0.38	0.13
ISSE4	0.29	0.18	0.80	0.43	0.39	0.21
ISSE5	0.34	0.17	0.84	0.44	0.41	0.12
ISSF1	0.10	0.10	0.37	0.90	0.26	0.13
ISSF2	0.09	-0.05	0.43	0.85	0.07	0.13
ISSF3	0.17	0.02	0.48	0.81	0.17	0.07
ISSF4	0.19	0.36	0.38	0.91	0.36	0.15
SCP1	0.24	0.20	0.32	0.24	0.77	0.05
SCP2	0.39	0.38	0.40	0.19	0.79	0.04
SCP3	0.19	0.34	0.24	0.26	0.79	0.17
SCP4	0.24	0.15	0.38	0.22	0.81	-0.04
SCP5	0.19	0.22	0.26	0.21	0.78	-0.03
SCP6	0.12	0.20	0.28	0.28	0.80	0.11
SCP7	0.33	0.09	0.41	0.28	0.84	0.06
SCP8	0.17	0.03	0.37	0.26	0.80	0.15
SCP9	0.27	0.16	0.30	0.29	0.84	0.21
SCP10	0.27	0.09	0.56	0.31	0.81	0.10
FP1	-0.05	-0.03	0.22	0.09	0.12	0.83
FP2	-0.11	0.10	0.21	0.16	0.21	0.92
FP3	-0.14	-0.07	0.23	0.04	0.07	0.82
FP4	0.15	0.03	0.17	0.15	0.16	0.93
FP5	0.20	0.03	0.26	0.20	0.15	0.84
FP6	0.11	0.07	0.19	0.11	0.08	0.85

Annexure 5. Correlation of constructs and the AVE

Construct	**LSC**	**ASC**	**ISSE**	**ISSF**	**SCP**	**FP**
LSC	0.83					
ASC	0.390**	0.88				
ISSE	0.239**	0.153*	0.86			
ISSF	0.205**	0.178*	0.153*	0.77		
SCP	0.250**	0.458**	0.245**	0.159*	0.86	
FP	-0.122	-0.042	0.112	0.193*	0.286**	0.73