Knowledge-Based Supply Chain Practice: A study on Indian digital selling companies

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Abstract

Knowledge-enabled supply chain process or supply chain learning (SCL) in Indian digital selling firms is an evolving area due to rapid growth of online trade in India. This study attempts to identify the integration of knowledge management systems with the supply chain management process in Indian digital selling companies. We have developed a conceptual model with backgrounds of supply chain learning, components and outcome variables, and empirically tested through structural equation modelling using a sample of online sellers in India. The relationship model has been developed with the help of PLS SEM tool which brings out how knowledge management-enabled supply chain process is facilitating online businesses in a more dynamic way to meet the ever-changing business environment and customer requirements.

Keywords: *Knowledge Management Systems, Supply Chain Management, Online selling*

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Introduction

Building a knowledge-creating organization provides competitive advantage. This is facilitated by innovative use and management of organizational knowledge by knowledge-creating companies and learning organizations. In case of online selling companies, real time knowledge is especially required from the first stage of SCM till the last stage to support creation and dissemination of business knowledge and its integration into new products, services and business processes.

This work discusses the impact of knowledge management-based SCM in digital selling companies.

Online trade has been growing at a very rapid pace in India. According to the ASSOCHAM (Associated Chambers of Commerce and Industry of India) – Resurgent India study (2017), by the year 2017, 100 million shoppers had used the online method to make purchases and this channel is estimated to generate $17.52 billion in sales by the end of 2018. In such a demanding business environment, organizations must have access to far-reaching collection of knowledge about customers' needs, the business environment, and the skills and experience of its human resources.

Knowledge management as a discipline will promote an integrated approach to identifying, capturing, evaluating, retrieving and sharing all of an enterprise's information assets.

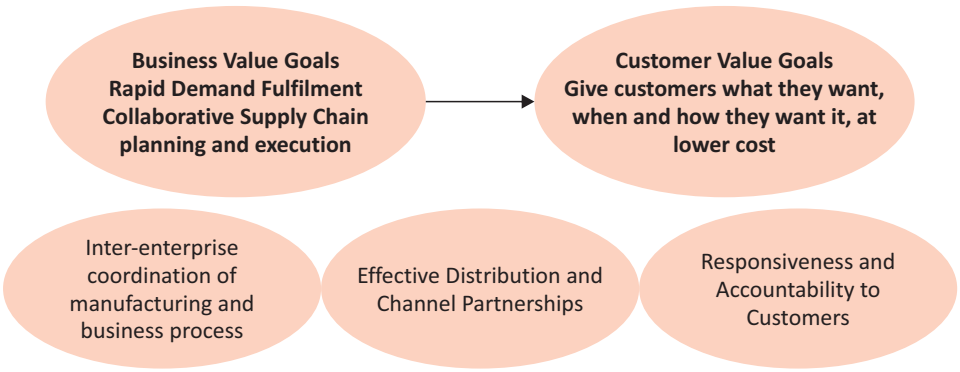
These assets may include databases, documents, policies, procedures and previously un-captured expertise and experience in individual workers. For any line of business and across business sectors, the volume of data is increasing exponentially; this includes data at rest as well as data in motion, which is real-time data from a variety of sensors and actuators. Knowledge management systems can facilitate this voluminous data to become the backbone of all businesses today.

In the past, the proposed methodology was studied with respect to the Malaysian automobile industry. In this study, more in-depth knowledge collaboration has been used with respect to Indian online selling companies.

Supply Chain Management

The main challenges or a major source of SCM failure in supply chain management are the lack of proper demand planning knowledge, tools and guidelines. The absence of knowledge causes major production, inventory and other business problems no matter how efficiently the rest of the supply chain management process has been built.

Figure 1: Achieving the goals and objectives of supply chain management is a major challenge for companies today



Objectives of the Research

The major objectives of this work are to:

1. Develop a conceptual model of the background of supply chain management with knowledge-enabled learning; knowledge-enabled learning with knowledge-enabled supply chain learning (KBSCP), and hypothesizing interrelationships.
2. Test the model for reliability and validity to support hypothesized relationships; develop a structural equation model of the established factors.

Theoretical background

Sustainable supply chain management is a vital element in achieving competitive advantage in business management; knowledge management is seen to be a key enabler. Learning organizations, information/knowledge sharing, joint knowledge creation, information technology and knowledge storage are amongst the highest driving and dependence powers. These attributes are deemed to be most effective to enhance the performance of firms (Lim K.M et al., 2017). Knowledge sharing plays a partial intervening role in the relationships between collaborative innovation activities and a firm's innovation performance. Collaborative innovation capability exhibits a moderating effect on collaborative innovation activities - innovation performance relationship (Wang.C et al., 2017). The issue of knowledge obsolescence in supply chain management remains unexplored. A deeper understanding of the knowledge accumulation process is needed (Marra M. et al., 2012). Supply chain management is considered as a leading operational strategy arrangement in both manufacturing and service industries, and over the years, companies have seriously implemented supply chain management strategies in their organizations. Knowledge management (KM) is a major enabler of supply chain management, and is a critical element in information intensive and multi-cultured enterprise environments (Samuel. E. K. et al., 2012).

Identification of Constructs

In this research, two aspects of KM are considered, namely knowledge acquisition and knowledge application. Through the systematic development and use of KM, firms in a supply chain can minimize wasteful activities and improve productivity and efficiency. Embedding KM in SCM ensures that the best available knowledge is utilized to create and deliver the products and services. In this manner, valuable experience and knowledge of best practices can then be efficiently stored and utilized throughout the supply chain.

Constructs included in the first proposed model are as follows:

I. Background of supply chain learning

II. Knowledge-enabled learning

I. Background of Supply Chain Learning: Independent Variable

The background of supply chain learning is an independent variable

From earlier studies, variables have been identified which contribute to the transfer and collaboration of knowledge in the supply chain process**.** The variables which were identified for background of SCL are:

- Integrative Mechanism
- Shared Culture
- Commitment, Trust and Communication
- Joint Decision Making
- Win-Win Approach

The term 'integrative mechanisms' refers to the processes and structures that link the supply-chain partners. When linkages between the supply chain members are strong, it leads to greater effectiveness in the transfer of implicit and explicit knowledge

between organizations. Integrative mechanisms are supported by technologies such as Electronic Data Interchange , IT links, and integrative software such as Enterprise Resource Planning that is used to integrate the exchange of information between the supply chain members. Shared culture is likely to have a direct impact on the ability of supply chain partners to learn and absorb knowledge. 'Culture' is defined as a pattern of shared values and beliefs that help individuals understand organizational functioning and thus, provide them norms for behaviour in an organization (Deshpande and Webster, 1989). A shared culture encourages openness, experimentation with new ideas and trusting behaviour, which will improve the learning and sharing process. Trust is the keystone of any collaborative supply chain. Trust takes time to nurture and develops after repeated transactions between the supply chain members. Many studies (Kwon and Suh, 2005; Mohr and Spekman, 1994; Perry et al., 2004) have shown that trust indeed is one of the most important features for building successful supply chain alliances. Commitment denotes a partner's willingness to devote time, energy, or resources to the supply chain group (Spekman et al., 2002). When the supply chain partners make such an investment, alliances between the supply chain partners succeed. Communication is a vital factor that facilitates knowledge transfer. The frequency, depth and content of communications between supply chain members impacts learning and the associated knowledge transfer between the supply chain members. The existence of joint decision-making by the supply chain partners strengthens the learning process through highly interactive exchanges and knowledge transfers. Flexible, adaptive and open organizations learn much faster than organizations that are not flexible and not open to new ideas. If supply chain partners have adopted a win-win approach, it discourages the partners to act opportunistically while encouraging to work for the common good. The existence of a win-win approach decreases the tension between the partners and encourages the learning process. The factor background of supply chain learning is measured by:

- Integrative Mechanism: IM
- Shared Culture: SCS
- Commitment, Trust and Communication:CL,CO,TL
- Joint Decision Making: JDM
- Win-Win Approach: WWA

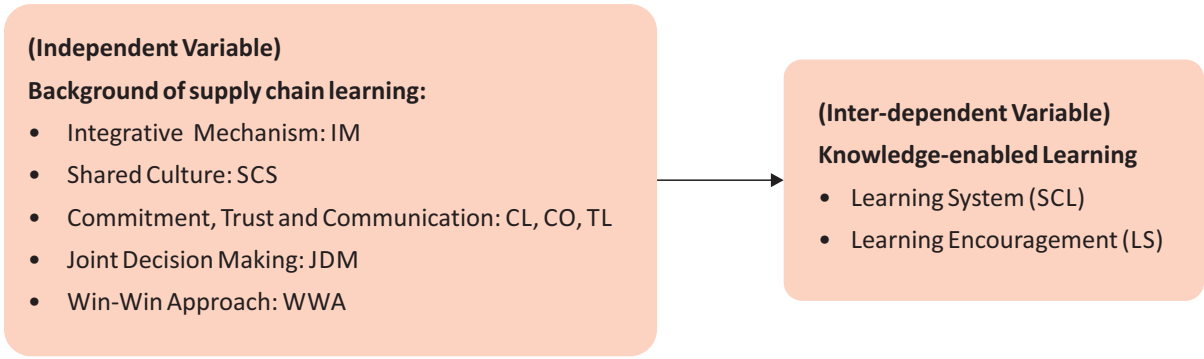
II. Knowledge-enabled Learning:

According to Hamel (1991), the collection of intellectual capital of an organization is the combination of its technologies, experiences, skills and management processes, and these are combined together to create the organization's core competencies. But, these competencies are not equally distributed throughout industries since some firms are better at developing and internalizing them. A plausible explanation of this phenomenon is that some organizations learn better than others (De Geus, 1997). Clearly, supply chains provide an environment within which all organizations can take advantage from learning processes based on the transfer of skills and knowledge. Spekman et al. (2002) recognized that a learning environment is vital for the members in a supply chain to achieve efficiency and improve performance. They explained that a firm's ability to learn is largely dependent on its capability to harness, transform and transfer information into internal knowledge. Two variables are used to measure SCL:

(i) Learning System (SCL)

(ii) Learning Encouragement (LS)

Figure 2: Proposed Model



Hypothesis Development

- H1: An organization that has a highly developed level of Supply-Chain-Learning has better performance.

For measuring the variables, the following points were considered for validating the constructs.

Background of supply chain learning will be measured as follows:

(i) Integrative Mechanism (IM)

- The organization shares its business units' proprietary information with its trading partners (IM1).
- The organization informs its trading partners in advance of changing needs (IM2).
- The organization's trading partners share proprietary information with your organization (IM3).
- The organization's trading partners keep your organization fully informed about issues that affect its business (IM4).
- The organization's trading partners share business knowledge of core business processes with your organization (IM5).
- The organization and its trading partners exchange information that helps establishment of business planning (IM 6).
- The organization and its trading partners keep each other informed about events or changes that may affect the other partners (IM7).

(ii) Shared Culture (SCS)

- The company and the supplier have a shared continuous improvement philosophy (SCS1).
- The organization shares a similar sense of fair play with the suppliers (SCS2).
- The organization has a high level of shared understanding about key supply chain issues (SCS3).
- Within the supply chain, everyone has a shared vision or mission statement (SCS4).

(iii) Commitment, Trust and Communication (CL, TL, CO)

Commitment (CL)

- The partner is committed to the organization (CL1).
- Maintaining the relationship with the partner is vital (CL2).
- Sustaining the relationship with the partner is important (CL3).
- The partners are willing to devote energy to sustain the relationship (CL4).

Trust (TL)

- The partners are trustworthy (TL1).
- There is complete confidence in the partner's motives (TL2).
- We have faith in our partner (TL3).

Communication (CO)

- Frequent communication occurs between the organizations (CO1).
- There is continuous contact between the organization and partner (CO2).
- Communication between the organization and the partner is frequent (CO3).
- There is a high level of contact between the organization and partner (CO4).

(iv) Joint Decision Making (JDM)

- Our firm works with the partner on long-range planning (JDM1).
- The organization establishes a joint team to manage our relationship (JDM2).
- In supply chain, there is value harmony in decision-making (JDM3).
- Individuals throughout the supply chain participate in decisions that are critical to its overall success (JDM4).

(v) Win-win Approach (WWA)

- The organization senses that the partner has a willingness to help when problems arise (WWA1).
- Organizations proactively try to enhance each other's business (WWA2).
- The organization understands the critical issues that affect the partners' business (WWA3).

II) Knowledge-Enabled Learning will be measured as follows:

(i) Learning System (SCL)

- In the supply chain, different points of view are encouraged within this supply chain (SCL1).
- Developing new insights is important for the supply chain (SCL2).
- Members of the supply chain develop many new insights (SCL3).
- New ideas are generally accepted by members of the supply chain (SCL4).

(ii) Learning Encouragement (LS)

- The system and procedures of the supply chain support innovation transfer between supply chain members (LS1).
- The supply chain structure supports the development of new ideas (LS2).
- The supply chain structure facilitates the sharing of ideas between members (LS3).
- The supply chain rewards new ideas (LS4).
- Employees are rewarded for sharing their ideas within the supply chain (LS4).

Research Tools

The model is estimated using Structural Equation Modelling with Partial Least Square method.

Model and Estimation

Structural Equation Modelling (SEM) multivariate data analysis method is often used in research because it can test theoretically supported linear and additive causal models (Chin, 1996; Haenlein & Kaplan, 2004; Statsoft, 2013). By using SEM, researchers can visually observe the relationships that exist among variables of importance in order to prioritize resources. The fact that unobservable, hard-to-measure latent variables can be used in SEM makes it ideal for tackling research problems. There are two sub-models in a structural equation model; the inner model specifies the relationships between the independent and dependent latent variables, whereas the outer model specifies the relationships between the latent variables and their observed indicators. In SEM, a variable is either exogenous or endogenous. An exogenous variable has path arrows pointing outwards and none leading to it. On the other hand, an endogenous variable has at least one path leading to it and represents the effects of other variables. There are several approaches to SEM. The first approach is the

widely applied Covariance-based SEM (CB-SEM) using software packages such as AMOS, EQS, LISREL and MPlus. The second approach is Partial Least Squares (PLS), which focuses on the analysis of variance and can be carried out using PLS-Graph, VisualPLS, SmartPLS and WarpPLS. PLS is a soft modelling approach to SEM with no assumptions about data distribution (Vinzi et al., 2010). Thus, PLS-SEM becomes a good alternative to CB-SEM when the following situations are encountered (Bacon, 1999; Hwang et al., 2010; Wong, 2010):

- Sample size is small.
- Applications have little available theory.
- Predictive accuracy is paramount.
- Correct model specification cannot be ensured.

It was needed to reduce the latent variables to single scores i.e. factor scores. Since the authors were not sure whether the variance of the interaction effects had any meaning or interpretation, all the main and moderating effects of exogenous variables were centralized. Centralization means all variables were measured around the mean by taking the deviation from the mean of the variable. That gave CentrlCR, CentrlIR, CentrlSSC and CentrlSCL. The PLS model was then run with only main effects of the exogenous variables on the endogenous variables. The above step gives the measurement models of the latent variables exactly the same as the main effects model. This is because any change in the measurement model by including or dropping measured variables will not change the meaning of the constructs.

Sampling frame and size

Since 2014, the online selling sector has seen extraordinary growth throughout the globe. The growth was driven by rapid technology adoption led by the increasing use of devices such as smart phones and tablets, and access to the internet through broadband, 3G, 4G, 5G, etc, which led to a growing online consumer base. In addition, favourable demographics and a growing internet user base assisted this growth.

With the entry of gigantic online selling organizations such as Amazon and Alibaba, the competition has further intensified. Both these international players have deep pockets and the patience to drive the Indian online selling market. Also, their strong domain knowledge and best practices from their international experience give them an additional edge. Additionally, these companies have been part of markets where they have seen the online market evolve and are aware of the challenges and strategies to address issues thereof.

Indian companies have risen to this competition by expanding sellers and products on their platforms, innovating on multiple customer touch points, and providing seamless and rapid delivery services in order to compete with the international entities. Competition is expected to persist, with these online companies experimenting with different ways to attract customers and expand the online selling market. Because of the above reasons, online selling companies require knowledge at the right points of time at each stage of their supply chain process.

For this research, a sample set of listed online selling companies operating in India with more than 50 employees was considered. Questionnaires were distributed in 120 companies. Complete responses were received from 78 companies such as Yebhi.com, GATI, Amazon, fashionandyou.com, Shop Clues, Pepperfry, Ebay, Shop CJ, Lime road, CaratLane.com, Snapdeal, Flipkart, etc. All the companies are operating in India.

Result and Discussion

All these tests are t-tests. Since PLS is a distribution-free procedure, we used empirical distributions to test the hypotheses. Thus, bootstrapping samples were

generated. We generated 1,000 bootstrapping samples of size 78 for the main effects. For testing the moderating effects, we generated 500 samples of size 78.

The t-test was used. The outer weight and path-coefficient values, which should be reported, are the sample means of the bootstrapping samples. Since all the measures were expected to influence the latent variables positively and all the path coefficients were hypothesized to have positive values, we used the one-tailed t-test at sample size of infinity. When testing hypotheses using p-values as in the SPSS output, we use the significance level; lower than 0.10 means significant at the 10% level, lower than 0.05 means significant at the 5% level and lower than 0.01 means significant at the 1% level. Significance means that the hypothesis of no-impact, no-affect is rejected. The SPSS p-values are all values for the two-tailed test.

Table 1: Path Coefficients (Mean, STDEV, T-Values)

	Original Sample (0)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (| 0/STERR|)
Commit, Tr and Comm-> LS	0.123190	0.151361	0.331210	0.331210	0.371939
Commit, Tr and Comm-> SCL	0.041467	0.161487	0.205715	0.283715	0.143624
IM-> LS	-0.032828	0.046266	0.201514	0.201514	0.162909
IM-> SCL	0.246771	0.004633	0.261174	0.261174	0.344556
JDM-> LS	0.447166	0.352401	0.229826	0.229826	1.945678
JDM-> SCL	0.570163	0.395066	0.336391	0.336391	1.694943
SCS-> LS	0.176236	0.112181	0.174839	0.174839	1.007987
SCS -> SCL	0.516592	0.374110	0.244020	0.244020	2.118236
WWA -> LS	0.428801	0.392935	0.228882	0.228882	1.873458
WWA -> SCL	-0.337311	-0.284464	0.250855	0.250855	1.553928

Path coefficients are standardized versions of linear regression weights, which can be used in examining the possible causal linkage between statistical variables in the structural equation modelling approach.

Table 2: Latent Variable Correlations

	Commit, Tr and Comm	IM	JDM	LS	SCL	SCS	WWA
Commit, Tr and Comm	1.000000						
IM	0.369325	1.000000					
JDM	0.630498	0.440445	1.000000				
LS	0.753159	0.193443	0.670652	1.000000			
SCL	0.656373	0.612194	0787609	0.515892	1.000000		
SCS	0.732134	0.123484	0.339781	0.699576	0.507139	1.000000	
WWA	0.539007	-0.088481	0.234119	0.720039	0.080559	0.665259	1.000000

Table 3: Cross Validated redundancy (CV Red) Values

	1-SSE/SSO
Commit, Tr and Com in	0.226022
IH	0.353075
J DM	0.354515
LS	0.326244
SCL	0.206056
SCS	0.381465
WWA	0.630048

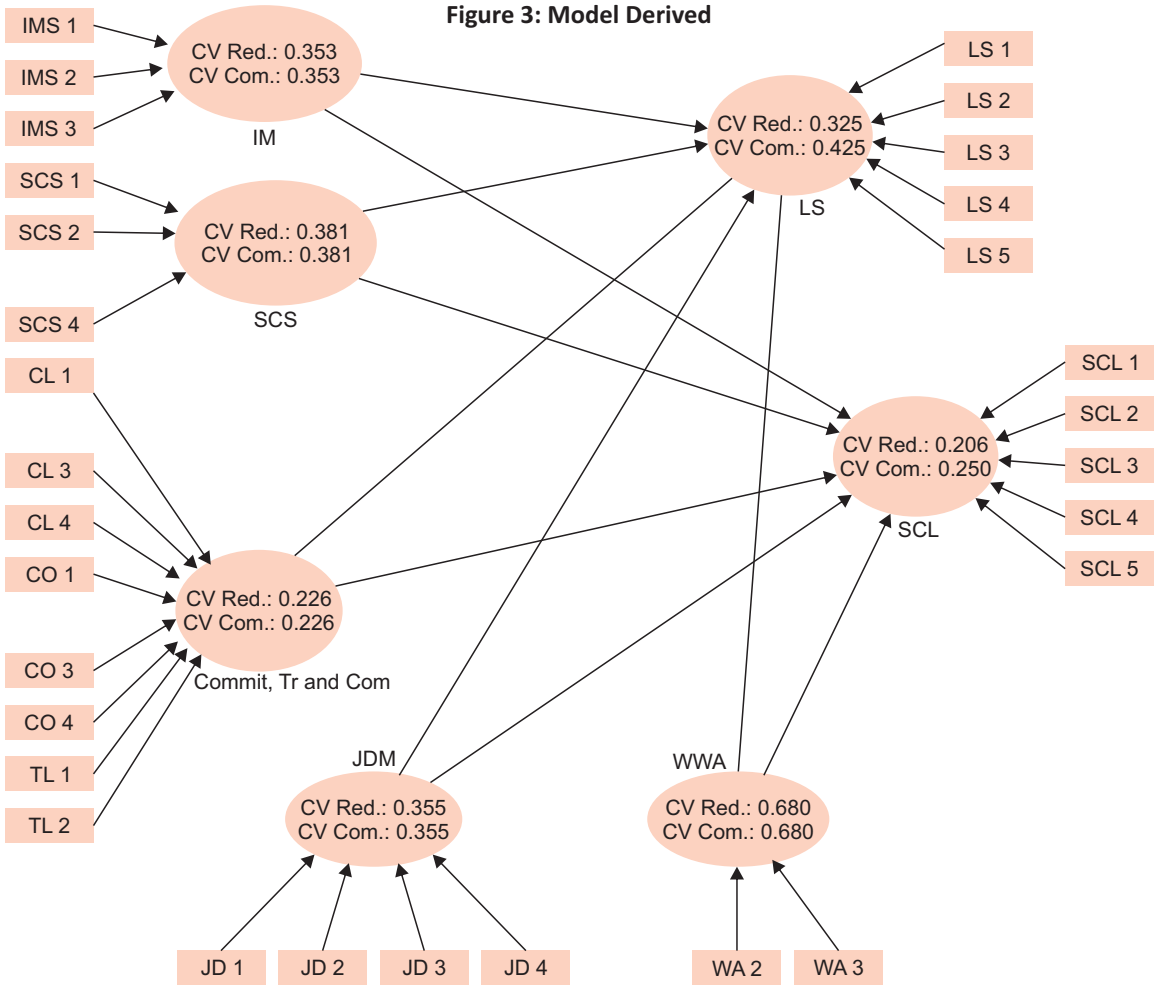
Table 4: Cross Validated Communalities (CV Com) Values

	1-SSE/SSO
Commit. Tr and Comm	0.226022
IM	0.353075
JDM	0.354515
LS	0.424646
SCL	0.249786
Scs	0.361465
WWA	0.660048

Table 5: Path Coefficients (Mean, STDEV, T-Values)

	Original Sample (0)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR]	T Statistics [|0/STERR|]
Commit, Tr and Comm -> LS	0.123190	0,151361	0.331210	0.331210	0.371939
Commit, Tr and Comm-> SCL	0.041467	0.161487	0.288715	0.288715	0.143624
IH -> LS	-0.032828	0.046266	0.201514	0.201514	0.162908
IH -> SCL	0.246771	0.004683	0.261174	0.261174	0.944856
JDM-> LS	0.447168	0.352401	0.229826	0.229826	1.945678
JDM->SCL	0.570163	0,395066	0.336391	0,336391	1.694943
SCS-> LS	0.176236	0,112181	0.174839	0.174839	1.007987
SCS -> SCL	0.516892	0,374110	0.244020	0.244020	2.118236
WWA -> LS	0.428801	0.392935	0.228882	0.228882	1.873458
WWA -> SCL	-0.397311	-0.284464	0.250855	0.250855	1.583828

Figure 3: Model Derived



Interpretations

- The significant levels between the variables are towards the positive side.
- All paths are significant and positive – hypotheses are validated.
- Model fit is good with high R-sq. for both side variables.
- Predictive validity is good with CV-Red and CV-Com being high for the dependent variables.
- SC 3 was dropped, which indicates that there is absence of shared understanding about key supply chain issues.
- CL2 was dropped, which indicates that maintaining long term relation is not strong enough.
- CO2 was dropped, which indicates that the continuous contact between the partners is missing.
- WWA1 was dropped, which shows the absence of a strong relationship.

Knowledge-based Supply Chain Management Process and Organizational Performance

Based on the knowledge management literature, the knowledge base of an organization leads to a set of capabilities that enhances the chances for competitive growth and survival. Organizations differ in the nature and content of their knowledge bases and the set of capabilities derived from these knowledge bases. These differences have long-term effects on the relative performance of the organization. It is further

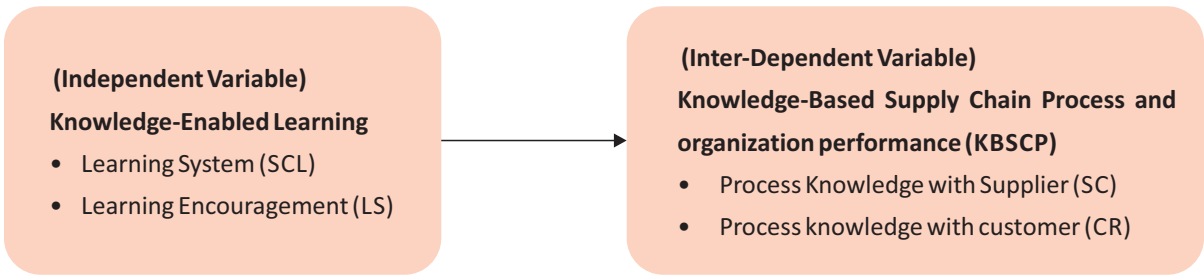
noted that knowledge creation practiced by organizations should be purposeful and the knowledge must be applied in some way to make it valuable.

Two components of applied KBSCP addressed in this work are:

i. Applied supplier process-knowledge and
ii. Applied customer process-knowledge.

Applied supplier-process knowledge deals with the use of knowledge that is shared between the organization and suppliers with respect to supplier processes. This knowledge includes shared production plans, knowledge relating to the flexibility to respond to unexpected demand, knowledge concerning suppliers' order entry and invoicing systems, communication systems, and suppliers' knowledge relating to such practices as 'Just In Time' and other quality assurance practices. Knowledge pertaining to identification and management of risk and uncertainties from external environments is necessary in order to allow firms to remain competitive in the marketplace; this knowledge is termed as environment knowledge. The greater the effect of environmental risk and uncertainties/turbulences, the more pronounced is likely to be the impact of applied KBSCP on the organizational performance.

Figure 4: Second Proposed Model



Hypothesis 2

H2: Supply Chain Learning has a significant relationship with Knowledge-Based Supply Chain Process (KBSCP)

The points used for measuring the process knowledge with suppliers and process knowledge with customers were as follows:

(i) Process Knowledge with Suppliers (SC)

- The organization relies on a few dependable suppliers (SC1).
- The organization considers quality as the Number One criterion in selecting suppliers (SC2).
- The organization strives to establish a long term relationship with its suppliers (SC3).
- The organization helps its suppliers to improve their product quality (SC4).
- The organization has continuous improvement programs that include its key suppliers (SC5).
- The organization includes its key suppliers in its planning and goal setting activities (SC6).
- The organization actively involves its key suppliers in new product development processes (SC7).
- The organization certifies its suppliers for quality (SC8).
- The organization regularly solves problems jointly with its suppliers (SC9).

(ii) Process knowledge with customers (CR)

- The organization shares a sense of fair play with its customers (CR1).
- The organization frequently interacts with customers to set its reliability, responsiveness and

other standards (CR2).

- The organization has frequent follow-up with its customers for quality/service feedback (CR3).
- The organization frequently measures and evaluates customer satisfaction (CR4).
- The organization frequently determines future customer expectations (CR5).
- The organization facilitates customers' ability to seek assistance from it (CR6).
- The organization frequently evaluates the formal and informal complaints of its customers (CR7).
- The organization periodically evaluates the importance of its relationship with its customers (CR8).

Table 6: Path Coefficients (Mean, STDEV, T-Values)

	Original Sample (0)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|0/STERR|)
LS -> CR	0.819947	0.800608	0.106769	0.106769	7.679611
LS -> SC	0.718154	0.740030	0.170533	0.170533	4.211235
SCL -> CR	0.183679	0.177466	0.126070	0.126070	1.219001
SCL -> SC	0.278774	0.225621	0.208695	0.208695	1.335800

Table 7: Redundancy

	Redundancy
CR	0.338947
LS	
SC	0.284646
SSCL	

Table 8: R Square

	R Square
CR	0.839913
LS	
SC	0.822221
SSCL	

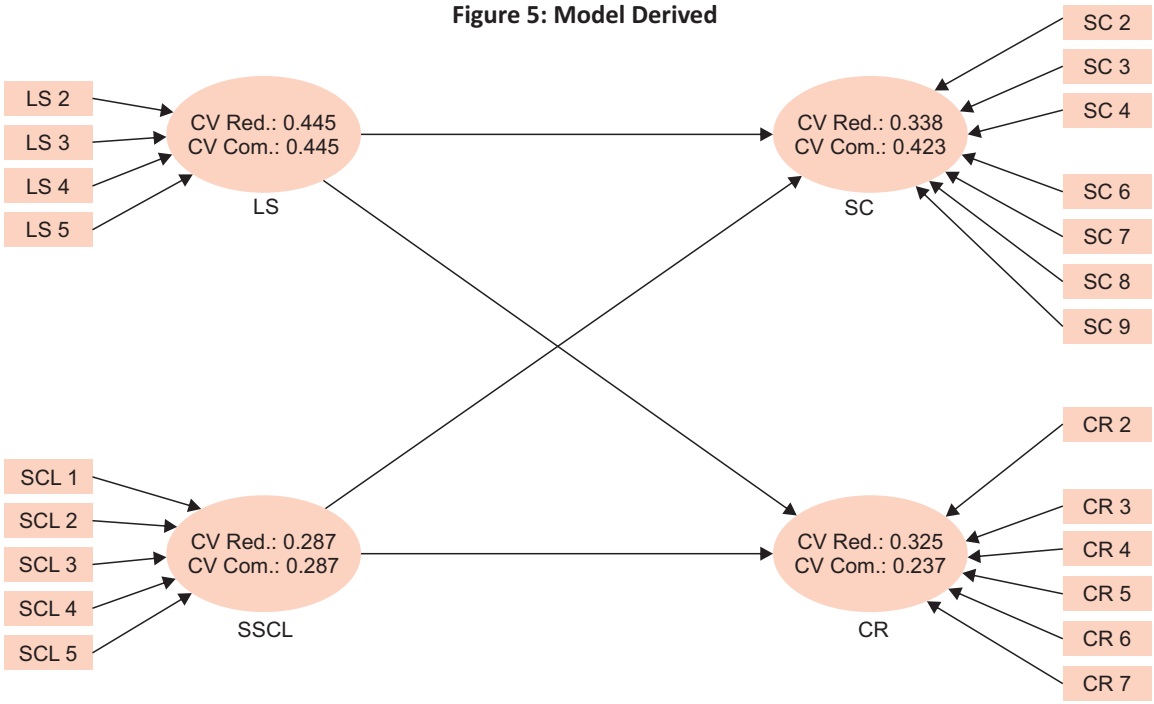
Table 9: Cross Validated redundancy (CV Red) Values

	1-SSE/SSO
CR	0.324947
LS	0.445335
SC	0.338030
SSCL	0.287412

Table 10: Cross Validated Communalities (CV Com) Values

	1-SSE/SSO
CR	0.237117
LS	0.445335
SC	0.423437
SSCL	0.287412

Figure 5: Model Derived



Interpretation

- Formative models require the assessment of multi co-linearity between the manifest variables. SC5 was dropped due to high multi co-linearity. This shows that an organization has very few continuous improvement programs that include its key suppliers. We took a cut-off VIF=5.
- CR2, CR8 and SC1 were dropped because of significant coefficients with perverse signs method in the first round. SC1 is dropped, which indicates that the organization does not rely on a few dependable suppliers. CR2 was left out because the organization does not frequently interact with customers to set its reliability, responsiveness and other standards. CR 8 was dropped because in the organization, there is very little periodical evaluation of its relationship with its customers.
- All paths are significant and positive – hypotheses are validated.
- Model fit is good with high R-sq. for both independent variables.
- Predictive validity is good with CV-Red and CV-Com being high for the dependent variables.

Findings

The results in this study support a variety of conclusions. First, the relationship between SCL and knowledge-enabled learning has been established. Additionally, the relationship between SCL with applied KBSCP with respect to the data set has also been established. The results from this study indicate that organizations will improve their performance if they can acquire and apply knowledge in an integrated manner. Knowledge acquisition (learning and transfer) and application go hand-in-hand. Learning is necessary but not an adequate prerequisite for the improvement of organizational performance. Better performance is a result of learning among the supply chain members, which results in effective application of knowledge. Improved performance results from the translation of learning into meaningful applications. Top management should encourage and create a suitable environment by providing the necessary hardware, software, systems and processes to facilitate creation and exchange of knowledge within the supply chain. The exchange of knowledge cannot be complete without trust, commitment and frequent

communication between the supply chain members. The application of knowledge stimulates better organizational performance by cutting costs, improving operational efficiencies, and by improving relationships with customers and suppliers.

Conclusion

This study has examined only one type of applied knowledge. The quantity (and quality) of knowledge generated and applied may depend not only on the specific sources to which the organization has access, but also on the proportionate representation of each type of knowledge in the organization's total knowledge base. A longitudinal study needs to be conducted in order to understand the real effects of supply chain learning and application.

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