

Sharing Knowledge within Supply Chains: A Conceptual Model using the Theories

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Abstract— This paper aims to identify the factors influencing knowledge sharing in the supply chain and the related theories. A quali-quantitative mixed method has been adopted in our exploratory study. Firstly, a Delphi method has been applied to design the conceptual model. After this, the resulting model has been examined and empirically applied to explore the selected case study, by a quantitative approach. The main instrument of the study is a researcher-made questionnaire that its validity was achieved through Content. Also, Cronbach's alpha test has been used to assess reliability of the questionnaire, which according to the alpha obtained at 93 %, it could be concluded that the questionnaire's reliability is acceptable. Based on the results, an appropriate model for knowledge sharing in supply chain has been developed on the basis of 15 factors and the related theories. The research's results (arising by the testing and validation of the model) showed that the heterogeneity of knowledge management systems (KMSs) of organizations involved in Khorasan Electricity Supply Chain, Iran is above average level. Trust among enterprises in supply chain and the clear economic benefits are at average level. This paper will contribute to improve understanding on the factors influencing KS among organizations involved in supply chain, providing for a conceptual model useful for future investigations.

Keywords— *Knowledge Sharing, Supply Chain, Heterogeneous KMSs, Inter-organizational Trust*

1. Introduction

At present, with the development of knowledge based economy, knowledge is increasingly becoming an important resource of enterprises to maintain a competitive advantage and sustainable development. Commentators on contemporary themes of strategic management stress that a firm's competitive advantage flows from its unique knowledge and how it manages knowledge [1]. Additionally, competition between supply chains is fastly replacing competitiveness between and among firms, thanks to the maximum value that the supply chains make available for the customers. Supply chain is the network of the organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services delivered to the ultimate consumer [2]. In the other definition, supply chain is referred to the flow of materials, information, money, and services from raw material suppliers, through factories and warehouses, to the end customers [3]. A typical supply chain, which links a company with its suppliers and its distributors and customers, is illustrated in Figure 1.

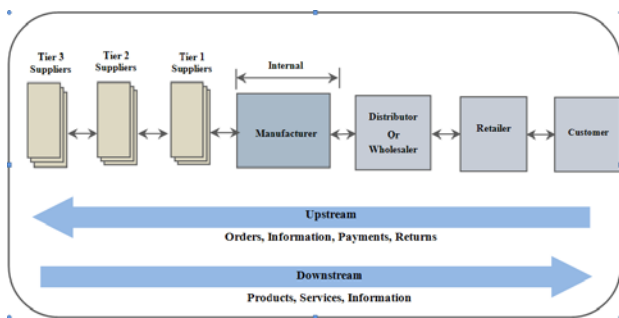


Figure 1. Generic supply chain [3]

Currently, supply chains are focused on tangible assets and resources and also intangible assets such as knowledge. Knowledge is glue between the other supply chain groups which work together in order to maintain an integrated and coordinated supply chain [4]. Knowledge is a very powerful concept, yet it has no clear definition so far. Defining knowledge and explaining its nature proved to be elusive and without a convincing and universally accepted result [5]. Knowledge in an area is justified belief about relationships among concepts relevant to that particular area [6]. Supply Chain knowledge is greatly different from the knowledge of a single enterprise. Based on Yang Min Cai & Ling Chao’ model, which is shown in Figure 2, supply chain knowledge divide into the hierarchy composed of individuals, departments, enterprises and supply chains. The upper level is based on the lower level, whose knowledge become upper knowledge through finishing and abstraction. The lower the level is, the greater the amount of knowledge is and the more irregular it is. The bottom-up processes are the mining and finishing of knowledge, whereas, the top-down processes are the learning and application of knowledge [7].

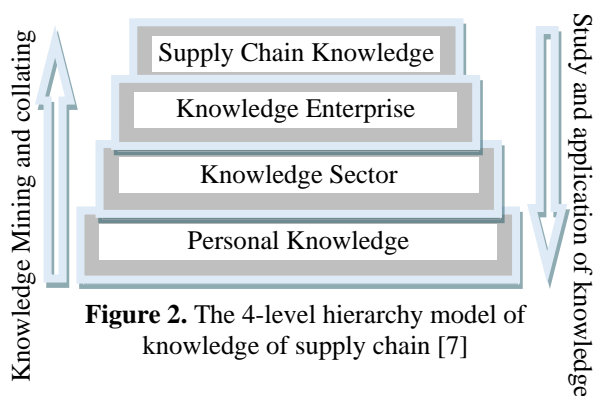


Figure 2. The 4-level hierarchy model of knowledge of supply chain [7]

Knowledge sharing is a significant driver of the supply chain performance which has attracted the attention of scholars in recent years. Knowledge sharing is a set of behavior that involves in exchange information assistance to others [8]. Knowledge transfer and knowledge sharing are

sometimes used synonymously or considered to have overlapping content. Several authors have pointed out this confusion while others have attempted to clarify the differences and define the terms. For example, Riege identifies over three dozen knowledge-sharing barriers in one article in 2005. In a more recent article in 2007, the same author uses the term knowledge transfer when suggesting actions to overcome the same and similar barriers [9]. So knowledge transfer (KT) should not be ignored to explore knowledge sharing. As a matter of fact, assuring the effectiveness of knowledge sharing in supply chain may be a source of competitive advantage . This is the reason why providing a systematic study of the factors influencing the share of knowledge in supply chain covers a high significance. The existing competition among supply chains to present maximum value to the customer makes the investigation even more relevant. According to above considerations, this study is going to examine the factors influencing knowledge sharing in the supply chain and the related theories. The paper is structured as follows. Firstly, we review prior researches about factors influencing knowledge sharing in the supply chain. Secondly, we discuss research methodology in detail. In the third section, the research model is proposed. Finally, the results of the conceptual model test in Khorasan Electricity Supply Chain and the Practical suggestions will be proposed.

2. Literature Review

Theory in Knowledge Sharing

A wide range of theories have been used in knowledge sharing research including social exchange theory, social capital theory, social cognitive theory, theory of reasonable action, theory of planned behavior, etc. [10,11]. The influence of attitudes toward knowledge sharing on knowledge sharing intentions and behavior has been investigated rather extensively using the theory of reasoned action [10]. According to the theory of reasoned action (TRA) developed by Ajzen and Fishbein in 1980, beliefs and evaluations would affect individual’s attitudes while normative beliefs and motivation to comply would affect subjective norms. Next, attitudes and subjective norms would affect individual’s intention, and intention has influence on behavior in sequence. Next, Ajzen (1985, 1989) finds that many constraints in real life would hinder the formation of intention and behavior, so he adds a new dimension, perceived behavioral control, to enhance the predictability of the TRA which is named the theory of planned behavior [12]. Social capital theory is also often used to explain knowledge sharing behavior in the organization.

Social capital is defined as the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit [13]. It has been considered as worthy asset that stems by easy access to available resources by utilizing social relationships [14]. Three components belong to the construct of social capital: the structural, the cognitive and the relational capital [10]. Trust is a relational capital variable [11]. Kankanhalli et al. (2005) employed social capital theory to account for the moderating influence of contextual factors including trust, pro-sharing norms, and identification [12]. Social Cognitive Theory (SCT) offered several major advances for the field of psychology and, we would suggest, organizational behavior. SCT includes cognitive constructs such as self-regulatory mechanisms, which extend beyond issues of learning and/or modifying behavior [15]. Perceived self-efficacy occupies a pivotal role in the causal structure of social cognitive theory because efficacy beliefs affect adaptation and change not only in their own right, but through their impact on other determinants [16]. Adaptive Structuration Theory (AST) being popular in Information Science (IS) research since information technology (IT) became an important element in organizations. AST focuses on the interaction between groups in organization with technology, and how technology can be applied in daily work activities. KMS is a special type of information system designed to support business processes by assisting in the creation, storage/retrieval, transfer, and application of knowledge [11]. According to the resource dependence theory, the firm forms inter-organizational linkages aiming primarily at gaining control over critical sources. Dependence is identified as the key antecedent variable motivating the establishment of inter-firm relationship. Magnitude of interdependence is as the sum of the two trading partners' dependence on each other. With a higher magnitude of interdependence, there is a greater synergistic effect of knowledge sharing between firms [17]. Social exchange theory predicts knowledge sharing behavior from a cost-benefit framework. Social exchange is similar to economic exchange, and they both assume that exchange occurs when the benefit individual gains is greater than cost. The difference is that social exchange investigates intangible costs and intangible benefits. Therefore, it cannot definitely identify rights or obligations. Kankanhalli et al. employed social exchange theory to identify cost and benefit factors affecting electronic knowledge repository (EKR) usage in 2005. They divide benefits of knowledge contributors into extrinsic benefits (organizational reward, image, and reciprocity) and intrinsic

benefits (knowledge self-efficacy and enjoyment in helping others). Codification effort and loss of knowledge power are costs of knowledge contributors [12]. Ref. [11] refers that organization and the nested work groups can manipulate the institutional structures and there by influence, guide, motivate, or alter individual actions. These actions are called 'meta structuring' actions, because they either reinforce the existing institutional structures or alter those structures to create conditions more conducive to knowledge sharing. In Institutional Theory (INT), the 'meta structuring' actions influences the behaviors of knowledge sharing in three ways; domination, significance and legitimization. Significance variable is top management support that is considered one of the important potential influences on organizational knowledge sharing.

Factors Affecting Knowledge Sharing in Supply Chain

At the first stage of its development, the available studies about knowledge sharing mainly focused on the internal knowledge sharing. Since 2002, external knowledge sharing has begun to attract the attention of scholars at both national and international level. Since 2003, the research on knowledge sharing in supply chain has been gradually improved. In a research, the factors affecting trading partners' knowledge sharing were studied using the lens of transaction cost economics and socio-political theories. The findings showed that trust towards the partner, the partner's power, and magnitude of interdependence are the factors that affect the firm's decision-making on knowledge sharing with a particular trading partner [17]. In another research, the influencing factors on trust and knowledge sharing in supply chain were identified, including communication, cooperation behavior, opportunism, and loss of knowledge [18]. An author identified the main influencing factors on knowledge sharing among partners in supply chain including moral hazard in knowledge sharing among Partners, complexity and diversity of supply chain knowledge, difficulty to evaluate the contribution of different partners in knowledge sharing, and heterogeneity of knowledge management systems [19]. Other authors investigated some influencing factors on knowledge sharing in supply chain from the perspective of knowledge characteristics. The results showed that the knowledge tacitness, knowledge complexity, and knowledge embeddedness reduce the behavior and effects of knowledge sharing among supply chain members [20]. In another research, it was studied knowledge sharing among enterprises in the supply chain. Knowledge sharing cost, knowledge sharing environment, the infrastructure of information technology, the learning capacity, and

cultural factors are considered to be the factors that affect the knowledge sharing and knowledge transfer among enterprises in supply chain [21]. Some researchers in their study on factors affecting information sharing in supply chain of IKKCo (Iran Khodro Khorasan Company) using the integrated cognitive mapping method and bayesian networks conclude that information sharing is directly under the influence of organizational enablers (IT capability, leadership support, participatory culture and organizational structure), relational enablers, and uncertainty of the country's major decisions. As well as environmental uncertainty, commitment to IT and security of information systems, and mobility of the supply chain influence on information sharing in the supply chain by their impact on organizational enablers (such as leadership support) and relational enablers (e.g. commitment) [22]. Other researchers ranked the factors affecting information sharing in the supply chain of NIORDC using fuzzy multi-criteria decision making (FMCDM) technique. Based on the research's results, accountability and commitment among supply chain members, senior management support, the accuracy rate of the provided information, the level of the available information technology capability among the members of the supply chain, the cost of the required information technology, the lack of customer reliability, and the interests of the supply chain members were respectively identified as the most important factors affecting the information sharing in the supply chain of NIORDC [23].

3. Method

This research has been accomplished in two main parts including the design and the evaluation of the model. Particularity, Delphi method has been used to design a conceptual model. Delphi technique is well suited as a method for consensus-building by using a series of questionnaires to collect data from a panel of selected subjects [24]. Also, there is no fixed procedure regarding the acceptable percentage of reaching consensus in responses. Usually uniformity and homogeneity of the findings between 51% to %100 of answers are considered as a consensus [25]. The selection of the qualified members for Delphi group is considered the most important stage of this method because the validity of the results depends on the competence and knowledge of these people. The selection of group members is usually done through Non-probability sampling. Non-probability sampling is often divided into three primary categories: quota sampling, purposive sampling, and convenience sampling. Purposive sampling is also referred to as judgmental sampling or expert sampling. The main objective of purposive sampling is to produce a

sample that can be considered "representative" of the population. The selection of a purposive sample is often accomplished by applying expert knowledge of the population to select in a non-random manner a sample of elements that represents a cross-section of the population [26]. Accordingly, in order to form the Delphi panel in this research, 132 people (85 in abroad and 47 in Iran) have been identified using the purposive sampling and finally, among invited experts in Delphi panel, 23 people agreed and formed the expert panel of the research. The development stage of Delphi, for this research, has been organized into three phases as follows: in the first phase, an unstructured or open questionnaire has been provided to the expert panel to identify all factors influencing knowledge sharing in the supply chain. After gathering and organizing responses, finally, 110 factors have been identified, in order to be used to design structured questionnaire (as the instrument of the next phase). In the second phase, Expert panel have been asked for their comments and views on the 110 factors in a five points "likert" scale range. At this stage with the aim of re-evaluation of the importance and effect of the factors agreed in the initial Delphi plan, the significance of each element has been measured by a statistical Z-test and proportion of supporters and opposes for each of the factors have been obtained. Based on the results of this stage, 63 factors have been approved by the Delphi panel members and 47 rejected factors have been removed from the final model of factors influencing knowledge sharing in the supply chain. In the final phase, Delphi panel have been, once again, asked to comment their views in relation to each of the 63 factors to identify the agreement and disagreement Items. Also, indicators for the remaining factors have been determined in this stage (Refer Appendix 1). Thus, Delphi technique ended after the third round and the final model for KS in supply chain in 15 factors and the related theories have been confirmed. Finally, The resulting model has been examined and evaluated in Khorasan Electricity Supply Chain, Iran. The main instrument of the study is a researcher-made questionnaire that its validity was achieved through Content. Also, Cronbach's alpha test has been used to assess reliability of the questionnaire, which according to the alpha obtained at 93 %, it could be concluded that the questionnaire's reliability (trustworthy) is acceptable. The statistical population of the research comprises all the managers of Khorasan Electricity Supply Chain in Iran, employed in the fields of generation, transmission, and distribution (461 people). 215 of them have been selected as samples, using Stratified Random Sampling (Refer Table 1).

Table 1. The statistical population of the research

Structure of Khorasan Electricity Supply Chain in Iran				
Case study Companies				
Supplier	Generator	Transmitter	Distributor	Customer
<ul style="list-style-type: none"> ▪ Fossil Fuel Suppliers: <ul style="list-style-type: none"> - Gas Co. - Oil Co. ▪ Suppliers of Power Generation, Transmission and Distribution Equipments ▪ Service Providers: <ul style="list-style-type: none"> - Executive Contractors of New Facilities - Development and Construction - Existing Facilities Repair and Maintenance Contractors ▪ Engineering and Supervision Consultants ▪ Financial suppliers: <ul style="list-style-type: none"> - Ministry of Energy - Tavanir Co. - The Private Sector 	<ul style="list-style-type: none"> ▪ C1: Mashhad Power Generation Management Co. ▪ C2: Tous Power Generation Management Co. ▪ C3: Shariati Combined Cycle power Plant ▪ C4: Ferdowsi Combined Cycle Power Plant ▪ C5: Khayyam Power Generation Management Co. ▪ C6: Binalud Green Electricity Generation Co. 	<ul style="list-style-type: none"> ▪ C7: Khorasan Regional Electricity Co. 	<ul style="list-style-type: none"> ▪ C8: Mashhad Electric Energy Distribution Co. ▪ C9: khorasan Province Electricity Distribution Co. 	<ul style="list-style-type: none"> ▪ Transmission and Over-Distribution ▪ Subscribers (voltage level: 63 KV Upward) ▪ Distribution Subscribers (i.e., Household, Public, Commercial, Industrial, Agricultural, etc.)

4. Findings

The Research Output: The Development of the Conceptual Model

The study suggests a conceptual model that considers the 15 factors and the related theories to support the constructs in developing a fit model for knowledge sharing in the supply chain (see figure 3). The theories could be used as a basis to improve understanding on the factors. The theories include Social Capital Theory, Theory of Planned Behavior, Social Cognitive Theory, Adaptive Structuration Theory, Institutional Theory, Resource Dependence Theory, and Social Exchange Theory. The Social capital variables are Communication, Tie Strength, Participation, Shared values, Pro-sharing norms and Trust among enterprises in supply chain. The variable of the Social Cognitive Theory is Knowledge Creation Self-Efficacy. The variable of the adaptive Structuration Theory is heterogeneity of knowledge management systems. The related theory with the variable of the magnitude of interdependence is Resource Dependence Theory. The Institutional Theory is chosen to explain the variable of the senior management support and Commitment. The variables of the planned behavior theory are attitude toward Knowledge Sharing and Knowledge Sharing Intention. And the variables of the Social Exchange Theory include corporate image, Knowledge Sharing Cost and clear economic benefits.

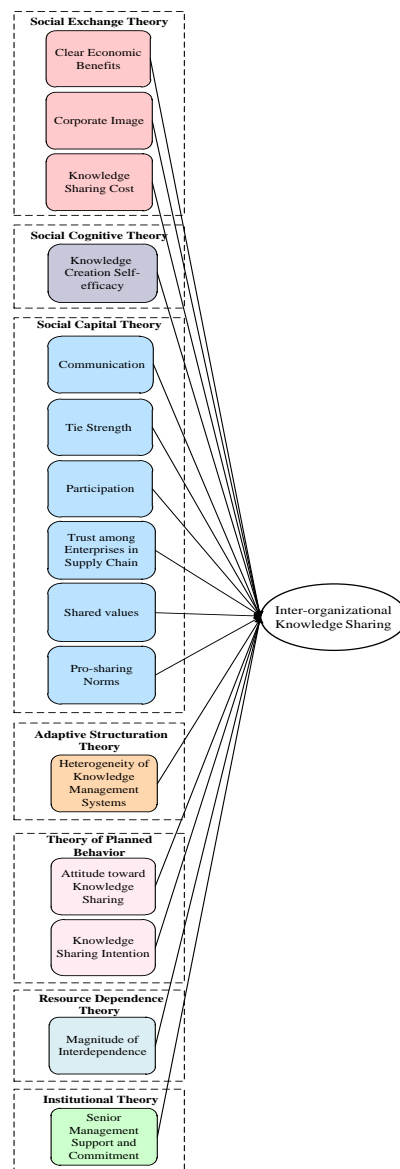


Figure 3. The research model

The results of the testing and validation of the model in Khorasan Electricity Supply Chain, Iran showed that the clear economic benefits and trust among enterprises in supply chain are at average level. In addition, knowledge sharing cost is below average level. Also, the results indicated that the heterogeneity of knowledge management systems of organizations involved in Electricity Supply Chain and other factors affecting knowledge sharing in Supply Chain are above average level (Refer Table 2).

Table 2. Student's t -Test to evaluate the factors affecting KS in Khorasan Electricity Supply Chain from the managers ' point of view

Factor	M	σ	T	P-value
Communication	67.9	20.1	13.09	0.000
Tie Strength	63.1	19.5	9.88	0.000
Participation	66.6	19.7	12.31	0.000
Trust among Enterprises in Supply Chain	51.0	15.7	1.76	0.040
Shared Values	64.2	16.4	12.65	0.000
Pro-sharing Norms	62.4	17.3	10.53	0.000
Knowledge Creation Self-efficacy	70.1	14.6	20.21	0.000
Heterogeneity of Knowledge Management Systems	56.5	14.7	6.48	0.000
Magnitude of Interdependence	64.9	17.2	12.68	0.000
Senior Management Support and Commitment	64.3	22.6	9.28	0.000
Attitude toward Knowledge Sharing	68.3	14.6	18.29	0.000
Knowledge Sharing Intention	65.8	17.4	13.30	0.000
Corporate Image	63.7	17.1	11.77	0.000
Knowledge Sharing Cost	45.7	20.0	-3.13	0.001
Clear Economic Benefits	50.0	19.8	-0.04	0.486

5. Discussion and Conclusions

Based on the results, it should be referred that one of the barriers of using inter-organizational knowledge is that heterogeneous knowledge management systems (KMSs) from different organizations are unable to communicate, cooperate and reuse knowledge with each other. The non-collaborative KMSs have several disadvantages. In terms of knowledge workers, they have to spend a lot of time and effort to look for relevant knowledge from different KMSs because they are often required to access knowledge from other knowledge sources in order to complete their works. In terms of knowledge engineers, they have to spend a lot of resources in creating and updating organizational knowledge even though same knowledge is available in other KMSs. Unfortunately, the absence of a common language or standardization has created a barrier to prevent the collaboration of KMSs. The collaboration problem of heterogeneous KMSs could be resolved by using the suitable mediation approaches ranging from mapping approaches, levels of automation, and mediation methods to matching techniques. In this way, it is possible for the participant organizations to reuse inter-organizational knowledge within the network even though there are fundamental differences among

organizations in terms of KMS structures and knowledge formats. The retrieved inter-organizational knowledge could then be used to support knowledge creating, storing, dissemination, using and evaluation of the organizational KM process. Each network should only contain knowledge of a specific domain to ensure the knowledge workers can retrieve relevant any knowledge effectively. For example, an IS network should only provide knowledge in the domain of IS. Once an organization recognizes the need for a particular type of knowledge, the organization can invite other organizations that possess the knowledge of similar domain to establish a network together. When this network of knowledge has matured, other organizations which need to use the knowledge may choose to join the network instead of establishing their own individual knowledge network. Within a network, each organization must commit to a mutual agreement to allow other participants to access an agreed portion of the associated knowledge reposit in its knowledge base. Besides, a single organization can commit to more than one network of different domains [27]. The construction and maintaining of knowledge sharing platform is usually charged by the leading member who gains maximum benefit from the cooperation, which is beneficial to the stability of supply chain [19]. Considering the "clear economic benefits" factor is at average level, it is required to establish a "knowledge controlling" that coordinates goal setting (planning) and goal assessment, e.g., on the basis of the intellectual capital approach in order to show that a KM initiative really is worth the investment [28]. Also, if there are appropriate rewards or incentive mechanisms; employees will be motivated to share their knowledge [12]. Finally, according to the research's results, Without trust during the collaborative process, information exchanged or knowledge shared between the partners may be low in accuracy [29]. Trust is an important factor for most of the processes related to knowledge such as the process of creating, sharing and utilizing the knowledge [30]. A majority of the past studies report significant positive relationship between trust and knowledge sharing [31]. Trust is defined as a belief that one organization acts in a consistent manner and will perform in accordance with expectations and intentions [32]. In general, it can be mentioned that there are three broad strands in the literature on trust. First, trust within organizations. Second, trust between organizations. And finally, trust between organizations and their customers. The result of a research showed that despite the high priority of trust and job security among the factors affecting the success of knowledge management, especially in the knowledge sharing stage in most studies, trust factor among the 24 identified factors was located

in 21, 7, and 18 ranks respectively in stages of the creation, sharing and application of knowledge in the Khorasan Regional Electricity Co. [33]. Our focus is exclusively on the trust among enterprises in supply chain. There are various factors affecting the loss of trust among enterprises in supply chain such as knowledge loss risk, opportunism, etc [18, 29]. A closer examination of this topic in Iranian Electricity Supply Chain could be a basis for future researches. The research results are consistent with various studies [i.e., 12, 34]. This study is conducted on supply chains, with data collected from Khorasan Electricity Supply Chain in Iran. The extent to which the findings can be generalized to others is unknown. This research can help to enhance KS practices among the member enterprises of supply chain and in result to improve the overall performance to present maximum value to the customer. The findings of the study will expand the ability of academics to recognize and understand the key factors affecting knowledge sharing in supply chains.

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Appendix 1. Constructs and measures of the research model.

In the following questions, partners or supply chain partners refer to the other organizations involved in the supply chain which can be suppliers, manufacturers, distributors, or customers.

Constructs & Measure Items	Related Ref.
Magnitude of Interdependence	
MI1: Your organization communicates with the partners to obtain critical resource for survival.	[32, 35]
MI2:The lack of alternatives for the organization’s resources and the partners has increased your organization’s intention toward knowledge sharing with the existing partners.	
MI3:Your organization cooperates with the partners to meet mutual needs.	
MI4:The need to have ongoing coordination between your organization and the partners has increased the partners’ intention to share their knowledge with your organization.	
Tie Strength [32, 35]	
TS1: Your organization has positive frequent communication and interactions with the partners.	
TS2:Your organization has long term-oriented relationship with the partners.	
TS3:Your organization has regular meetings with the partners.	

TS4: Strong tie between your organization and the partners has been reinforced to share knowledge between them.

Heterogeneity of Knowledge Management Systems

HKMS1:Knowledge management system is designed and implemented in your organization.

HKMS2:The different understanding of the same knowledge between your organization and the partners has made difficult to share knowledge between them.

HKMS3:The different tools and methods used by organizations involved in supply chain to store and exchange knowledge are obstacles for knowledge sharing.

Clear Economic Benefits

CEB1:The Variable Part of your organization’s payroll system is based on evaluating the each member's contribution for knowledge sharing.

CEB2:The benefits of knowledge sharing have increased your organization's intention toward knowledge sharing with the partners.

CEB3:Knowledge sharing between your organization and the partners has caused to improve your organization performance and also the whole supply chain.

CEB4:The economic benefits of knowledge sharing are quite evident.

Trust among Enterprises in Supply Chain [29]

TR1: The Partners are completely open in dealing with your organization.

TR2:The Partners don’t make false claims.

TR3:There is a high risk that the partners will act opportunistically.

Shared Values [29]

SV1:Your organization has compatible goals with its partners.

SV2:Your organization is enthusiastic about pursuing the collective missions of its partners.

SV3:Your organization and the partners support each other’s goals.

Senior Management Support and Commitment [36]

SMSC1:Your organization has a compelling knowledge vision and strategy, actively promoted by senior

managers.

SMSC2:Your organization's senior manager is obliged to ease the learning process among the staff.

SMSC3:Knowledge exchange is valued and encouraged by senior managers.

SMSC4:Your organization's senior managers provide the necessary resources to share knowledge.

Corporate Image [37]

IMA1:Your organization shares its knowledge with the partners to make good image and impression in their minds.

IMA2:Your organization shares its knowledge to achieve or maintain its status among the partners.

IMA3:Knowledge Sharing with the partners has a good reputation for Your organization.

Attitude toward Knowledge Sharing [38, 39]

ATT1:Knowledge Sharing is considered as strength by staff in your organization.

ATT2: As your organization is one of the supply chain members, it is essential to share frequently knowledge and experiences with the partners.

ATT3:Sharing knowledge with the partners makes your organization lose its unique value.

Pro-sharing Norms [40]

PN1:Consensus, rules, and values among the organizations involved in supply chain are highly emphasized.

PN2:Your organization follows principle of consensus and rules among the supply chain members to interact with the partners.

PN3:Your organization's behavior is required to meet the expectation of the partners.

Knowledge Sharing Cost [12]

KSC1:Complexity in knowledge encoding process is a barrier to share knowledge between your organization and the partners.

KSC2: Spending much time and effort to decode knowledge is a barrier to knowledge sharing between your organization and the partners.

KSC3: Fear of losing Knowledge Power is a barrier to knowledge sharing between your organization and the partners.

Knowledge Sharing Intention [32, 38]

KSI1:Your organization will always provide manuals, methodologies and models by the request of the partners.

KSI2:Your organization intend to share skills and "know how" with the partners more frequently in the future.

KSI3:Your organization will try to share expertise and experience with the partners in a more effective way in future.

Participation [29]

PA1:The partners take into account your organization suggestions.

PA2:Your organization plays an active role in supply chain decision making.

Communication [29]

CM1:Your organization and the Supply chain partners frequently exchange each other's opinions.

CM2:The partners frequently keep your organization informed of new developments.

Knowledge Creation Self-efficacy [38,41,42]

KCSE1:Your organization's employees believe in their ability in expressing their ideas and experiences, combining knowledge of different sources and learning from others.

KCSE2:Your organization's employees are confident that they can perform effectively many different tasks.

KCSE3:Your organization's employees meet challenging problems as tasks to be mastered.

KCSE4:Your organization's employees feel confident applying their knowledge to help others resolve their problems.