Word Count: 5031

Plagiarism Percentage 15%

Matches

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Suspected Content

Knowledge Sharing in Closed-loop Supply Chain Management Shu-San Gan1,a 1Mechanical

Engineering Department, Petra Christian University, Indonesia agshusan @petra.ac.id Keywords:

Closed-loop supply chain, supply chain relationship, knowledge management, **16**

tacit knowledge, knowledge capability. Abstract. In the recent decades,

closed-loop supply chain has been studied extensively due to the **42**

increased concern on sustainable development. It integrates forward and reverse flows where the collaborative supply chain takes place. Knowledge management is one important part of an organization that can improve the effectiveness of the processes within the organization. Knowledge sharing is significant in a collaborative supply chain since it affects the organizational performance and competitive advantage. The complexity in

closed-loop supply chain can be **4**

managed better by encouraging knowledge sharing among the supply chain members.

This paper presents a conceptual framework to **4**

implement knowledge sharing

in a closed-loop supply chain management, for improving the CLSC membersâ €™ performance. The **14**

success factors have been identified, and a framework has been presented, it consists of knowledge flows, management aspect and socio-technical aspect. 1. Introduction Knowledge Management is one important part of an organization, that can helps the organization to perform effective processes through sharing and re-using knowledge, as well as to gain competitive advantage. De Geus (1988) claims that sustainable competitive advantage is mainly supported by the ability to learn faster than our competitors. Therefore,

it is important to be able to retrieve knowledge. The process of retrieving knowledge **20**

is described by Nonaka (1991) in five interrelated phases. The first phase is to share tacit knowledge, which usually is not directly obtainable by the organization. Generally, tacit knowledge is held or owned by individuals and obtained mainly from a several period of experience and not easily expressed in words. In contrast to the explicit knowledge that can usually be expressed among others through manual procedures, work documents, or images and data, tacit knowledge requires a more complicated effort. It is influenced by emotions, feelings and individual mental models that need to be shared in order to build mutual trust.

Therefore, knowledge sharing becomes

> an important challenge for the success of the process **6**

of knowledge capture. In the recent decades, the study on closed-loop supply chain (CLSC) has been growing rapidly due to the increased concern on sustainable development. Process recovery has been improved to increase productâ€™s life-time, hence

> end-of-use or end- of-life products **32**

are collected, recovered, and further released back to the market. Therefore, there is a need to consider the processes in

> supply chain management, not only the forward channel, but also the reverse **21**

one in an integrative manner. In doing so, there are several parties involved. Previous studies show that the relationship among CLSC members are important (Ostlin et al., 2008; Kumar & Malegeant, 2006). In Dyer (1998), a Toyota case demonstrates the power of knowledge sharing which has been able to improve the productivity of Toyotaâ€™s supplier network. Also, from a knowledge-based perspective, knowledge can give significant contribution to an intangible strategic resources within the

> supply chain . In this paper, we develop a conceptual framework to **29**

implement knowledge sharing

> in a closed-loop supply chain management, for improving the CLSC membersâ€™ performance. In **14**

section 2 and 3 we will provide the relevant theories about knowledge management and

> closed-loop supply chain, respectively. In section 4 **18**

we present a comparison

> on the implementation of knowledge sharing in two case studies. Section 5 will present the **15**

conceptual framework with the development rationality, followed by conclusion in section 6. 2. Knowledge Management According to Alavi (1999),

based on the work of Nonaka (1994) and Huber (1991), 8

â€œknowledge is a justified belief that increases an entityâ€™s capacity for taking effective actionâ€ . Davenport and Marchard (1999) suggest that managing knowledge means having

a structured approach to develop methods for recognizing, assessing, organizing, storing and applying knowledge, 22

such that the need and aims of the organization are achieved. Alameh

et al. (2011) define knowledge management as 15

â€œa set of processes for understanding and applying knowledge strategic resources in an organizationâ€ . Nowadays, knowledge has been

considered as the main source for competitiveness, 49

since it could improve efficiency and effectiveness of the organization. Nonaka (1994) classifies knowledge into two categories,

tacit and explicit. Tacit knowledge is implicit, it is stored in oneâ€™s head (Polanyi, 1967) which usually 17

rooted in action, experience, and involvement in a specific context. The explicit knowledge is codified and can be communicated in symbolic form or systemic language. 9

Nonaka & Krogh (2009) explain further

that explicit knowledge has a universal character and supporting capacity to act across contexts. It is accessible through consciousness. 3

On the other hand,

tacit knowledge is tied to the senses, tactile experiences, movement, skills, intuition, unarticulated mental models, or implicit rules of thumb. 10

It can be accessible through consciousness if it leans towards the explicit side of the continuum. Davenport and 3

Prusak (1997) claim that three main objectives in most of the knowledge management projects are (1) knowledge becomes visible (2) develops knowledge sharing culture (3) builds knowledge infrastructure beyond technical system. Alavi & Leidner (1999) provide knowledge definitions and the implications. Knowledge capability is defined as the potential within the knowledge to influence action. The implication of knowledge management

is about building core competencies and understanding strategic know-how. They also 19

claim that

the role of Information technology (IT) in terms of knowledge 39

capability

is to enhance intellectual capital by supporting development of individual and organizational competencies. 8

Lee et al. (2012) study the interaction between knowledge management

infrastructure, knowledge process capability, organizational creativity, and performance. 1

They suggest

that collaboration, learning culture, and top management support 1

positively knowledge

process capabilities i.e. acquisition, conversion, application, and protection. 1

Information technology

(IT) is the core infrastructure of knowledge management, and IT support is the most crucial factor in determining knowledge process capabilities. 1

They also find that

knowledge process capabilities positively affect creative organizational learning, 1

and furthermore,

creative organizational learning positively affects organizational performance. 1

3. Closed-loop Supply Chain and Knowledge Sharing Many of CLSC definitions are mainly concerned with combining

forward and reverse supply chains. According to 48

Guide et al. (2003), closed-loop supply chain 38

is â€œsupply chains that are designed to consider the processes required for returns of products, in addition to the traditional forward processesâ€ . The additional activities are

product acquisition; reverse logistics; test, sort and inspection; recovery processes 41

â€“ direct reuse, repair, remanufacture, and recycle â€“ and disposal; as well as remarketing. Ferguson & Souza (2010) define CLSC as â€œsupply chains where, in addition to the typical forward flow of materials from suppliers to end customers, there are flows of products back to manufacturersâ€ . Pochampally et al., 2009 and Lebreton, 2007 presents similar definition or description of CLSC. Moreover, Blanc (2006) and Guide & Wassenhove (2006) consider not only the combined practice of

forward and reverse supply chain and additional activities in the reverse 37

flow, but also value creation and recovery

over the entire life-cycle of a product, as well as the whole business 6

processes involved. Guide & Wassenhove (2006)

define closed-loop supply chain management asâ€œthe design, control, and operation of a system to maximize value creation over the entire life cycle of a product with dynamic recovery of value from different types and volumes of returns over timeâ€ . This

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definition has been evolved from merely integration of

forward and reverse channel of supply chain. They also argue that

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managers start to recognize the potential of reverse supply chain, and therefore

researchers should seek ways to maximize value recovery and innovative way to release value from product returns.

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Further, they believe that the research

models should consider the entire product life-cycle.

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Closed-loop supply chain involves reverse supply

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chain.

Guide & Wassenhove (2009) suggest that key activities in reverse supply chain

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can be categorized as (1) front end, which deals with

product returns management; (2) engine, which covers remanufacturing operations issues; and (3) back end, which handles market development of remanufactured product. The

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previous studies clearly show that the implementation of closed-loop supply chain would require 1. knowledge capability for implementing the reverse flow, in addition to the forward flow; 2. knowledge sharing to improve the value creation over the entire life-cycle; 3. knowledge infrastructure to support the

supply chainâ€™s performance. The importance of knowledge management for collaborative supply chain

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has been established by Lin et al. (2002). They examine the knowledge flows and categorize knowledge into seven kinds according to the functions i.e. design &

> development, pre-sales, sales, manufacturing, distribution, service& support, and finance. **26**

> In this paper we propose the knowledge in closed-loop supply chain **28**

into three main categories i.e. manufacturing processes as the core activity, the other activities in the forward flow, and the activities in the reverse flow. Collins et al. (2010) argue

> that translating a firmâ€™ s knowledge resources into usable knowledge management capabilities may **23**

improve the firmâ€™s competitive advantage. In a

> closed-loop supply chain management, there are several members, such as **5**

manufacturer, supplier, distributor, core collector, and sometimes third party logistics and recovery firms. The supply chain performance is not achieved by single member but it requires the whole member performance. The weakest link in the chain would cost the supply chain performance. Therefore, it is important to promote knowledge sharing among supply chain members such that the knowledge capabilities in the strongest member could be transferred to the others. 4. Comparison of two case studies in implementing knowledge sharing In building the conceptual framework, we study two cases i.e. Toyota case and a joint-venture construction project. We study the success factors and combine the results with the theories from previous studies. 4.1. Toyota Case (Dyer, 1998) The automotive industry offers exciting opportunities to empirically observe inter- organizational learning. Automobile production involves a network of suppliers that often contribute significantly in the proportion of components, up to 70% of the value of the vehicle. Therefore, the quality and cost of a car will depend on the productivity of suppliers within the automotive industryâ€™s network. According to Nishiguchi (1994) and Lieberman (1994), Toyota is a company that is superior in transferring knowledge

> in a way that significantly increase the productivity of **6**

the suppliers within the network. On the other hand, automakers and suppliers in the United States stagnated until 1980s, and only increased after the Japanese automotive company began to establish transplants in the United States. Dyer found that Japanese automakers, particularly Toyota, have built the habit of sharing knowledge in bilateral and multi-lateral with its suppliers, which can lead to a superior inter-organizational learning. In this exploratory study, the production network composed of a group of companies that collaborate in car manufacture. Toyota became the center of a network because (1) it is the only

company that has a direct relationship with all the other companies in the network, (2) Toyota coordinate all the activities of all companies in the network The success of Toyota's network knowledge sharing is attained through initiation and evolution. Toyotaâ€™s initiation is an innovative approach by establishing Supplier association, On-site Consulting, and Supplier Learning Teams (Jishuken). Supplier association process is linked to Toyotaâ€™s purchasing and the knowledge shared here is mainly explicit knowledge. In the initial phase, Toyota provides free consultancy to share knowledge, especially tacit knowledge. These consultants act as a catalyst for creating knowledge sharing norms, stimulate openness to share knowledge among suppliers. After the social bonds and norms has been formed, Toyota makes small groups, and arranged carefully in order to maximize the willingness and ability of suppliers to learn from each other. For example, direct competitors are not placed in the same group, rotate members of the groups in order to maximize diversity of ideas. Thus, Toyota has established a nested networks, which was formed to facilitate the tacit knowledge sharing within themselves and reduce the role of Toyota. In time, these networks become more effective in facilitating the sharing of knowledge both explicit and tacit. So, the evolution occurs. Toyota also consistently monitor the sharing of knowledge, even provide incentives by giving bigger business contract to outstanding suppliers. The study managed to find traits that are important in creating and managing knowledge sharing in a network effectively, (a) create organizational units to gather knowledge in the network, (b) eliminate ownership of knowledge, (c) create nested networks in the knowledge sharing network. 4.2. Joint-venture Construction Project (Dulaimi, 2007) In a construction project, the problems encountered in the field are usually resolved on a case by case basis and that knowledge stops at the team involved in the project. Therefore, knowledge management becomes an important issue in an effort to manage knowledge related to problems in the field, so that when similar cases occur, the team already has a basic knowledge of how to solve the problem, and do not re- invent the wheel. Dulaimiâ€™s study takes the social and technical perspective, which becomes critical when the case at hand is an

> international joint venture projects where knowledge **2**

sharing must occur between different companies and different national culture. Dulaimi refers to

> Trist and Bamforth, 1951; Pasmore et al., 1982; and Riege, 2005; **2**

which state that an organization needs to combine technology and people in order to implement effective knowledge sharing. Dulaimi also adopted a model by Pan and Scarborough (1998), which explains the social aspects of knowledge within the organization, where there are three layers of knowledge sharing system. The first layer is infrastructure that is hardware or

> software. The second layer is info-structure, in the form of formal rules that govern the exchange of knowledge. The **2**

third layer is info-culture that

> represents the background knowledge embedded in social relations within the **45**

group. The case study conducted on

four construction projects operating in Singapore. For the 2

first layer, cases are evaluated whether the infrastructure is flexible and structured. In the second layer, cases are analyzed whether the exchange of knowledge is organized, implicit or explicit. For the infoculture layer, the openness and compatibility are studied. Dulaimi find that knowledge sharing occurs only when foreign contractors are

motivated by the need to learn from the local industry. 2

The organizational structure, information technology systems and different practices in the joint venture are usually directed on the completion of the work, not on knowledge sharing. In addition, there is very little evidence showing the attempts to implement knowledge sharing. Fragmentation of labor between local and foreign contractors further reduces technical need to share knowledge as well as the opportunity to work collaboratively. This condition is exacerbated by cultural differences in learning, and language differences. 4.3. Success Factors in the Knowledge Sharing Implementation, lessons learned from the case studies. Although both cases have identified the need for knowledge sharing, but the implementation in Toyota's approach is very different to the approach of the project contractor joint venture (JV) International in Singapore. There are several area of differences a. The form of the cooperation The cooperation between Toyota and its suppliers are interdependent relationship and centered on one company, that is Toyota. In the JV contractor, there is a fragmentation of labor so that the interdependence is very low, each party can do her job separately with a little need for interaction with others. b. Benefit sharing In the case of Toyota, all parties in the network share the benefits of knowledge sharing because it can increase the productivity of each party, which in turn brings out superiority against their competitors. Whereas in the case of contractors JV, the objective of each cooperation is varied among projects. Most of the time, cooperation is focused on joining resources and expertise, as well as sharing commercial risk. Only one of the JV projects shows single objective, which is getting control of the market and the price through a cooperation with local companies, which demonstrates a good knowledge sharing practices. It can be concluded that one of the keys to successful knowledge sharing is finding advantages that lead to economic benefit that can be shared by both parties. c. Commitment Toyota shows a very high commitment to support the knowledge sharing, by facilitating, monitoring and intensifying knowledge sharing activities, such as forming an association of suppliers, Jishuken, and the transfer of employees. In all these processes Toyota becomes the core company in the network. On the other hand, in the JV contractor, each company conducts knowledge sharing activities independently, so it depends on those who need to initiate, and no commitment to do it continuingly. Additionally, no company is at the core of the network so that no one is responsible for monitoring and ensuring the process of knowledge sharing. Cultural and language barriers encountered in JV contractor case has become an obstacle to the process of knowledge sharing, yet it is not an issue in the case of Toyota. Therefore,

it can be concluded that cultural differences and 34

language barrier are not obstacles as long as each party has a high commitment to implement knowledge sharing. d. Infrastructure Toyota provides an adequate infrastructure for the knowledge sharing, where there exists a unit that accumulates knowledge in a structured manner. Knowledge ownership is also eliminated so that the data access is more flexible, can be acquired rapidly, and do not need to go through a long bureaucracy. In the case of contractors JV, the four companies studied turned out to have an infrastructure that is not flexible even though structured. It can be concluded that the flexibility of the infrastructure is very important in the process of knowledge sharing. e. Info-structure Under the nested networks in the case of Toyota, the exchange of information becomes organized and explicit, such as via the process of on-site consulting, Jishuken, and team problem-solving. This allows the transfer of tacit knowledge. In contrast, in the JV contractorsâ€™ case, most of the knowledge sharing process is done implicitly. f. Info-culture In the Toyota case, during the transplants of Toyota way in the United States, there certainly exist cultural differences, both national culture and corporate culture. However, all parties in the network demonstrates a willingness to share knowledge, hence the cultural differences had not become a bottleneck. On the other hand, the JV contractors failed to demonstrate a desire to share knowledge through action. There are contractors who declare the desire to implement knowledge sharing, but not followed by consequent action. 5. Conceptual Framework In a supply chain where the forward and reverse flows form a closed loop, hereinafter

network. Suppliers, manufacturers, distributors, and retailers are in the forward chain to reach the consumer. On the reverse chain, the parties involved are collectors (this role can be carried out by retailers, third party or the manufacturer), the manufacturer in the role of doing the recovery process, the distributor of recovered product, and retailers to market the recovered products, as given in Figure 1. In order to implement the right knowledge management system, the type of knowledge-work needs to be recognized in advance. Davenport (2005) proposes a classification based on the complexity of work vs. the level of interdependence, and comes up with four approaches for knowledge-work i.e. integration model, collaboration model, transaction model, and expert model. He states that collaborative model is the most difficult to treat because it is iterative and needs lots of improvisation, and highly dependent on workersâ€™ skills in the relevant area of expertise. In the Davenportâ€™s knowledge-work matrix, CLSC can be classified as collaborative model, because the level of interdependence is high with the involvement of several parties in the process loop, while the complexity of the work can be ranked high because it requires interpretation and the decision primarily related to a number of uncertainties appears in the CLSC, such as the uncertainty of demand, variability of product returns, and the degree of recovery. Material Manufacturing Recovery Process forward channel reverse channel Distribution Consumer Collecting Test & Inspection Disposal Figure 1. A

Since CLSC involves a closed cycle, the management, which include efficiency, quality, speed of service, innovation, and environmental impact, will be influenced by knowledge

described as follows: â€¢ Raw materials Knowledge of the properties of raw materials and the right treatment can improve the performance of the product design as well as the production process and minimize transportation cost and speed of manufacturing services. â€¢ Process Knowledge of the production process from design to assembly would be beneficial to distributors in arranging transport and capacity, the parties addressing the maintenance and improvement of products (can be a distributor, retailer or other contracted third parties), the collector when performing disassembly, recovery process departments â€“ whether remanufacturing or recycling process, and the department handling the production waste. Apparently, there is a limitation to the knowledge that can be shared, such as the design of innovative and superior products, which are not always able to be shared openly. â€¢ Use-period Knowledge of how users use the product can be an advantage to the product design improvements, increased efficiency of energy use in the active product, and increased environmentally friendly design. Similarly, for the collector, knowledge about user behavior can facilitate the process of collecting the product

at the end of the useful life (end-of- 44

use) or

at the end of its life cycle (end-of- 5

life). For product recovery department, knowledge regarding the usersâ€™ treatment can improve the effectiveness of the recovery process. â€¢

End-of-life Knowledge about the condition of the product will be beneficial to the 12

department that handles the recovery process. Knowledge about the handling of

product at the end of its useful life 4

cycle would enable product design improvements. For the finance department, it could increase the productâ€™s valuation process. Knowledge of the recovery process will be useful for determining the selling price, the appropriate distribution channel, and the marketing strategy that could improve the consumersâ€™ interest in buying the product recovery results. The raw material suppliers do not benefit directly from this knowledge sharing. In the reverse chain of the CLSC, the need for pure raw material requirements is significantly reduced. However, on the other hand manufacturers still require the services of the suppliers for the continuity of the overall production. Therefore, the benefits that can be gained by the suppliers are focused more on tacit knowledge sharing to increase productivity, as has been done by Toyota. We have argued the importance of knowledge management in a CLSC management from

the productâ€™s life-cycle aspect. Lee et al. (2002) 33

and Collins et al. (2010) support the role of

knowledge management in collaborative supply chain that could enhance the 46

supply chainâ€™s performance. Furthermore, the idea of knowledge management in closed-loop supply chain 11

will be focused on knowledge sharing, as shown in Figure 2. Figure 2.

Knowledge Sharing in a Closed-loop Supply Chain The knowledge sharing 30

conceptual framework is developed by considering three aspects, namely knowledge sharing flows, management aspect, and socio-technical aspects. 1. Knowledge sharing flows The flows of knowledge sharing within a

closed-loop supply chain are constructed by the 16

studying the

forward and reverse flows in the CLSC, and then identifying the flows of 25

knowledge-work in each of the CLSC member that would form a knowledge capability, which can be seen in Figure 2. 2. Management aspect This aspect consists of leadership, strategy and commitment. In a CLSC, manufacturer is the member who has the highest interest in the successful implementation of knowledge sharing, because she usually becomes the leader in the CLSC knowledge sharing network (CLSC-KSN), although not necessarily so. Leaders must initiate the establishment of a network that has groups with regular agenda, which can be done through real meetings or through cyberspace, and must have strong leadership to mobilize the groups. From the strategic aspect, in order to make sure that the network is working as expected, the groups need to find common objectives that benefits all members within the network, and then elaborate the strategy for each party in the supply chain. On the issue of commitment, as in the case of Toyota, the commitment of the networkâ€™s leader is vital, because it determines whether the knowledge sharing process is managed well or just be a slogan. 3. Socio-technical aspect There are three layers in the socio-technical aspect: a. Infrastructure The infrastructure can be built with social-web type, whose characteristics are flexible, in which all parties can access the required knowledge without excessive prohibition or restriction (Dave & Koskela, 2009). As an illustration, manufacturer puts product information and knowledge such as technical specifications, handling procedures, packaging information, how to perform maintenance and repairs, as well as the disassembly process. Other parties, such as retailer who acts as a repair center can add knowledge about the kind of damage that often occurs and the way retailers handle. All network members can comment and provide ideas or proposals improvements, so that the exchange of knowledge takes place. The social- web type infrastructure can also be organized with a good search facility, so that the stored knowledge can be easily

found and accessed. Trust could be an issue here, so the network leader should establish a sound agreement where security, process ownership, and access levels are carefully protected. b. Info-structure The info-structure of knowledge sharing using social-web has the ability

to capture the tacit knowledge and makes it explicit, because the 43

social-web is easy to use and able to stimulate discussion. In order to make sure that the knowledge exchange is conducted in a structured manner, the social-web can be designed with formal and informal rules. Wiki is a good example for such practice, they provide a set of rule for anyone who wants to add and change information in the Wiki. The users in CLSC-KSN are not anonymous, because they are inherent in the collaboration among members in the supply chain so that the knowledge shared through this forum is more reliable, within the preset quality standard, and protected from vandalism. c. Info-culture The social-web characteristics that are always available anywhere and anytime would encourage the members to be more actively involved in sharing knowledge. According to Dulaimi (2007), when an organization

have a culture that promotes openness and trust, 2

the chance to be successful in implementing knowledge sharing is high. The web-social, together with strong leadership of CLSC-KSN, could ensure openness and trust. This way, the process of knowledge sharing improves and further enables the improvement of CLSC performance 6. Conclusion

Knowledge sharing is an important factor in knowledge management. Through an 35

effective knowledge sharing, tacit knowledge can be made explicit, and further then is diffused into the organization. Through several case studies we have identified several

factors that determine the success of knowledge sharing between the different organizations. Those factors 27

are management aspect which includes leadership, strategy and commitment; and socio- technical aspect which includes infrastructure, info-structure and info-culture. The concept of knowledge sharing is needed in a CLSC network because

it can improve the performance of the supply chain 36

network, ranging from the efficiency, quality, speed of service, and innovation to handle the environmental impact. The idea to apply knowledge sharing within a closed supply chain networks have also been presented, using the social-web whose characteristics complies to the ones in socio- technical aspects. This idea still needs to be further explored in order to obtain a detailed framework and strategies as well as techniques for implementation. References 1. Alameh, M., Zamani, M., Davoodi, S.M.R., The Relationship between Organizational Culture and Knowledge Management (A Case Study: Isfahan University). Procedia

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