

A Knowledge Capture and Sharing Approach to Effective Software Service Supply Chain Management

Ali Baydoun, Jamal El-Den

School of Engineering and Information Technology, Charles Darwin University, Australia

ABSTRACT

In recent years, with the increase of demand in the service industry, we have witnessed the emergence of a new kind of supply chain (the service supply chain) which is characteristically different from the traditional manufacturing/production supply chain. The research addresses the Software Service Supply Chain (SSSC), research on SSSC is scarce and there is a need for a proper definition as well as identification and setting up of the phases of such SC. The service enterprise continues to apply and adapt practically the same phases of the manufacturing supply chain management. The lack of understanding and definition of the service supply chain negatively impacts the service sector productivity and performance, in particular, the software service sector. The research will introduce an SSSC definition as well as a knowledge based framework which introduces the phases of the SSSC. Prior research on SSC fell short in defining, addressing and introducing the basic steps for the SSSC. In addition, no prior research introduced a framework which combines knowledge management concepts to improve the overall steps and productivity of the SSSC. The research will provide answers on how the service supply chain in general and the SSSC in particular could be improved based on the benefits of its employees' accumulated knowledge as a result of their involvement in the activities and processes in both the service company as well as the clients' companies while developing the clients' software development demands. In addition, the research will argue against the perishable nature of services in the software service industry and will posit and justify the reusable nature of the "software" in the SSSC by arguing that if a service (software) is not consumed when available; it should be retained for future use. A framework for knowledge based Software Service Supply Chain (SSSC) will be also suggested to reflect all phases of the supply chain (SC) in the software service industry. These phases are closely integrated and implemented with concepts from knowledge management to improve current and future needs of a company's processes and competitive advantages in the market place. Furthermore, a software service company will be chosen from the software industry as an example case study to verify the research outcome. This experimental case study will highlight and analyse a real life scenario of the software production supply chain of the chosen company and identify all aspects of lessons learned during the software development.

Key words: Software Service Supply Chain (SSSC), Knowledge, Knowledge Management (KM), Supply Chain (SC), Service Supply Chain (SSC)

1. INTRODUCTION

The recent information and technology evolution has significantly influenced the customers' attitudes when selecting new products and services. Thus, the market is moving towards hyper competition (rapidly escalating competition), extreme emphases on price, quality and satisfaction of customer needs, and an increasing focus on innovation and continuous learning (Hitt, Keats & DeMarie 1998). Recently, the success of any organization becomes considerably depended on the continual investment in learning and acquiring new knowledge. This continual investment in knowledge learning creates more business opportunities and improves the existing supply chain productivities (Jelenic 2011). In addition, the service industry becomes prominent as a new way of doing business. As a consequence, the software service industry gained momentum as more organizations needed more software to run their operations and to effectively fulfil customers' increasing demands. Research on the software Service Supply Chain (SSSC) is scarce and there is a need for a proper definition as well as identification and setting up of the phases of such SC. The management of knowledge created and exchanged among employees during the phases of the SSSC is an integral part of its success because of obvious reasons. Accordingly, a knowledge based Supply chain (SC) is required in order to ensure increase productivity, competition, and quality and innovation services. Thus, the implementation

of knowledge management concept in the organizational supply chain allows the organization to be more adaptive, responsive and eventually achieve an advanced strategic competitive position in the market place (van Zyl 2003). It is also considered that the main important strategic resource for any functional business is the individual and the organizational learned knowledge and experience (Jelenic 2011).

1.2. Services Characteristics and Reusable Nature in the Service in the SSSC

(Baltacioglu et al. 2007) stated that the structural difference of a service supply chain from that of the traditional supply chain arises from the unique characteristics of services, which distinguish them from goods. (Lovelock 1981) summarized the characteristics of the services in the following four steps:

1. Intangibility: service cannot be seen, smelled, heard, touched, nor tasted before being delivered.
2. Simultaneity: service is created and consumed at the same moment. Thus, customers must be present for the service to be provided and delivered.
3. Heterogeneity: service cannot be easily standardized and measured.
4. Perishable: if a service is not consumed when available, there is no chance to stock it for future use. Because a service is a deed or performance, rather than a tangible item that the customer keeps, it is 'perishable' and cannot be stocked for sale or future use.

This paper conforms to the first three characteristics listed above and argues against the "perishable" nature of services in the SSSC. It is believed that services in an IT service company are application software and would not necessarily perish as it is the case in other service industries such as Airline, hotel, insurance and health industries. In such industries, services have no value if not used. Thus, we argue that the software service company's services are generally reusable rather than perishable. It is anticipated that not all software would be reusable but those that the organization decides on their possible future "re-use" would be captured and retained in the organizational knowledge base. Hence, the literature characteristics listed above would be amended to reflect the possible non-perishable nature of the services in the software industry:

1. Intangibility: services cannot be seen, touched, smelt or tasted
2. Simultaneity: reflects the fact that customers must be present for the service to be provided
3. Heterogeneity: the fact that services cannot be easily standardized
4. Reusable: if a service is not utilised/adopted when available, it is retained for future use. In other words, in the software industry, the unused software must be documented and stored in the company's knowledge base for future utilisation and adaptation. Thus, a new client may require similar or almost similar software; therefore, to facilitate the production process, the retained software can be retrieved from the company's knowledge base and slightly amended to meet the new client's requirements with very limited time and cost.

2. ORGANIZATIONAL KNOWLEDGE

2.1. Defining Organizational Knowledge

Organizations are becoming more and more dependent on their employees' know-how and expertise for competitive advantage. (Nonaka 1994) stated that Knowledge has been recognized as a strategic resource for any successful organizational performance. Organizations will continuously need to obtain and retain knowledge that enables them enhancing their performance. Managers and decision makers must learn how to acquire manage and utilize these intangible assets that have a direct influence on decision results, which in terms, influence organizational and supply chain performance. Therefore, the participants of the organization supply chain must coordinate and share their knowledge to respond to new economic, social and environmental requirements and challenges (Elaine, Luc & Marie 2011). Knowledge is usually held by teams and individuals who have been assigned jobs and participating in different activities and working on focused problems. This knowledge is usually embedded in the organization's products, processes and external relationships (King 2009). Therefore the management must openly accept and encourage employees to gather, sort, transform, record and share knowledge. Otherwise this important asset will be wasted and lost over the period of time. Tacit knowledge, in particular, is lost through outsourcing, downsizing and terminations of employment. Therefore, employees who leave the organization will definitely take their valuable knowledge resources, skills and experience with them (Smith 2001).

2.1.1. Knowledge management (KM)

KM is the process of identifying and locating knowledge and knowledge sources within the organization and then transfer this knowledge into explicit form that can be shared, utilized and retained in the organization's knowledge base for future use and

effective decision making (Dalkir 2005). In addition, according to (El-Den 2004a, 2004b) “The management of knowledge has become of paramount importance, particularly tacit knowledge, as organizations are becoming more aware of the importance of the knowledge ‘imbedded in the heads’ of their employees, as well as the organization’s explicit knowledge. They are also realizing that the success of their businesses depends on the proper management of both of these issues”. (Wiig 1994) stated that the main aim of the KM is to facilitate an organization in acting intelligently, in order to secure its success and to make an organization to realize the best value of its knowledge assets. (Kristin 2012) defined that the purpose of KM is to share perspectives, ideas, experience and information: to ensure that these are available in the right place at the right time to enable informed decisions and to improve efficiency by reducing the need to rediscover knowledge. For the purpose of this paper, KM is a process of identifying the knowledge sources in the SC and then transfers this knowledge from tacit knowledge into explicit knowledge in order to be retained in the SC knowledge base and then retrieve it by the SC participants and share it across the SC when needed.

2.1.2. Knowledge management processes in literature

To develop and suggest an effective KM process for our paper, we revise and analyse the following KM processes by some recognised academic authors in (Table 1).

2.1.3. The research proposed KM process

Figure 1 shows the KM process in this paper:

Knowledge creation: This phase consists of the following three phases:

Knowledge initiation: In this phase the initial discussion of the expected outcome from the development process is initiated among the SSSC experts. This will result of a deep understanding and observation of the knowledge content.

Capture knowledge: As a result of the discussion, the individual captures, amplifies and enlarges that knowledge by his/her reflection and perception on previously accumulated knowledge by the group. Also, the captured knowledge is a result of the members’ interaction with other members.

Knowledge Nurture: As a result of “capture knowledge phase”, the knowledge content is nurtured because it is understood and new opinions and ideas may be formed based on it.

Knowledge Refinement: In this phase, the knowledge content from the previous phase has to be filtered against the organization objectives and goals, if the content meets the company’s objectives, then it contextualized with some indexing, explanation

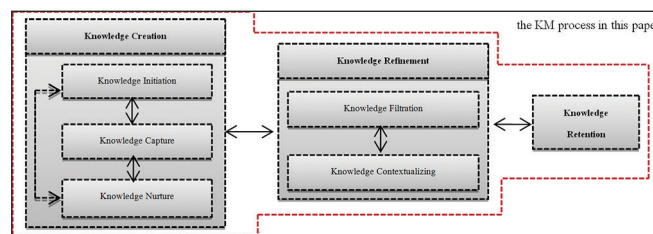


Figure 1: The research proposed KM process (Baydoun & El-Den 2016)

Table 1: Comparison of KM Processes (Baydoun & El-Den 2016)

(Heisig 2009)	(Wiig 1994)	(McElroy 1999)	(Bukowitz & Williams 2003)	(Zack 1996)	(Dalkir 2005)	(Feghali & El-Den 2008)
Use	Creation	Individual and group learning	Get	Acquisition	Knowledge Capture and/or Creation	Knowledge Initiation/
Identify	Sourcing	Knowledge claim validation	Use	Refinement		Release
Create	Compilation	Information acquisition	Lean	Store/retrieve		Knowledge
Acquire	Transformation	Knowledge validation	Contribute	Distribution	Knowledge Sharing and Dissemination	Nurturing
Share	Dissemination	Knowledge integration	Assess	Presentation	Knowledge	Knowledge
Store	Application		Build/Sustain		Acquisition and Application	Filtration
	Value realization		Divest			Knowledge Retention

and user friendly description that will simplify the retention and retrieval process. This phase consists of the following two phases:

Knowledge Filtration: After the creation of the new knowledge content, then the knowledge pass by the knowledge filtration phase. In this phase, the knowledge is verified and assessed against the company's goals and objectives. If knowledge does not meet the organization goals, then it is disposed or outsourced.

Knowledge Contextualizing: In this phase, the filtered knowledge is contextualized with some explanation or metadata forms to simplify its future use.

Knowledge Retention: After filtering and nurturing the initiated knowledge, knowledge has to be retained and employed back in the company SC to facilitate and improve its process. This phase requires continuous maintenance to insure its accessibility and functionality.

3. SUPPLY CHAIN (SC)

3.1. Types and Definition of SC

There are two types of SC in the literature: Manufacturing and Service SCs. (La Londe & Masters 1994)proposed that "Manufacturing SC is a set of firms which pass the materials among each other during the production process. Normally several independent firms are involved in manufacturing a product and placing it in the hands of the end user in a supply chain. Raw materials and component producers, product assemblers, wholesalers, retailers and transportation companies are all members of the supply chain". (Baltacioglu et al. 2007)defined Service SC (SSC)as "a network of suppliers, service providers, consumers and other supporting units that performs the functions of transaction of resources required to produce services; transformation of these resources into supporting and core services; and the delivery of these services to customers". SSC is a wide area that includes businesses specialising in different kind of services including software development, finance and accounting, insurance, retail, medical and government services. Despite, the growing importance of the service sector, there are still limited academic literature which focus on the service supply chain definition and framework, unfortunately, the service sector remains short of a common definition, framework and of a proper process to accomplish the steps of the SSC. Service enterprises continue to apply and adapt the supply chain management concept of the manufacturing industry. Both practitioners and academics need to better understand the service SC to gain and sustain competitive advantages in the market place (Zhou & Park 2009). The combination between the manufacturing and services SC and the lack of understanding and definition of the service supply chain is negatively impacting the service sector productivity and performance, in particularly, the software service supply chain (SSSC)where the software experts and their prior knowledge and expertise are the vital part of the SC productivity and performance. For the purpose of this paper, we will propose that SSC is initialized from: (1)"know how" skills and knowledge of the employees; (2)create and develop the service (including outsourcing and suppliers' involvement); (3)testing the functionality of the service; (4)deliver, distribute and implement the service at the customer level; (5)utilise the service by the end-customer; (6)finally collect customers experiences and implementation knowledge.

3.2. Software Service Supply Chain (SSSC)

Software Service Supply Chain (SSSC)is a relatively new research area with its roots in the traditional manufacturing supply chain. Generally, traditional SCs in one way or another rely on the software use to facilitate organizational processes and operations. For example, a government SSC heavily rely on developing application software to process, store and retain data/information on clients, and a manufacturing supply chain builds software to monitor and control the production process for products and services. It is apparent from the literature that there is a lack of academic literature that discusses and suggests a framework for the SSSC. Therefore, in this paper, SSSC will be discussed and the development of a proper framework will be introduced to highlight the phases of a software service supply chain with emphasis on managing the know-how, expertise and experience of the "people" involved in the software development process. For convenience of the research, we will assume and refer to the software service company as a source company. Simply stated, the source company develops and sells application software to clients' in different industries.

3.2.1. Software service supply chain (SSSC) definition

(Du et al. 2013) stated that "Software supply chain (SSC)is the whole development, release, deployment, and maintenance processes of software from source code to the final software delivering to users". He added that Software supply chain is a

complete process starting from customer demand to providing the customer’s required products and services. For the purpose of this paper, we propose that the SSSC encompasses the following steps:

1. Administration arrangement, legal and contract agreement between the customer and the source company
2. Analysis of customer’s requirements
3. Roles, expertise and resources assignment for the project
4. Software design, development and test
5. Capture and retention of employees’ know-how during the “Internal” software development process.
6. Software delivery and implementation at the customer end
7. Providing ongoing support and maintenance of the software
8. Capture and retention of employees’ know-how during “external” information gathering and software deployment

3.2.2. Differences between SSSC and traditional SCs

According to (Sampson 2000) the participant in the supply chain receives inputs from suppliers and then processes these inputs and delivers them to the customers whereas in the services organizations, the customers are the primary suppliers who provide their bodies, minds, belongings, or information as inputs to the service processes. **Table 3** draws comparisons between the Manufacturing SC, the Service SC and the Software Service SC:

3.2.3. Software service supply chain process

Figure 2 shows a high level description of the proposed source company’s supply chain. It is based on the literature’s main description of a SSC. The four main activities shown in Figure 2 are to be extended later in the research.

a. Demand/Project Management phase includes the analysis of customer’s requirements, management of customers’ demand, management of suppliers/outsourcing and legal agreement. It is triggered by a demand of service by a client. The output from this phase is a legal binding agreement between the two parties.

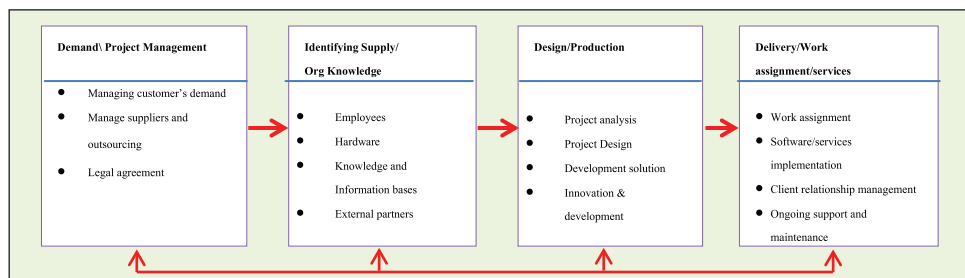


Figure 2: Software Service Supply chain Process (Baydoun & El-Den 2016)

Table 3: SCs and SSSC Comparison (Baydoun & El-Den 2016)

Area	Manufacturing systems supply chain	Service industry supply chain	Software Service Supply Chain
Development duration	Standard development duration for all the goods	Short process – on spot service while the client present	Long process, depends on the software complexity – it involves testing, re-developing, updating and integrating between many skills and expertise.
Delivery/ and ongoing support and maintenance	Goods sold to the client – no visit or ongoing support needed	Service delivered in the present of the client- for example opening a bank account – no site visit required – but however, the ongoing support are required	The software has to be delivered, installed, tested and implemented at the client site by the source company’s developers – this process requires direct interaction between the source company developers and the client IT system and environment – ongoing support and maintenance are essential in this SC
Error prone/ obstructions	Products are verified and tested on delivery – very little chance for error and faults in goods	Less error prone because it is a standard services that has been already provided to the many clients	It may show undesired behaviour when faced with unexpected emergent situations – it is highly an error prone process

b. Supply/Org knowledge phase is a phase where the source company is developing the client's software. Knowledge and expertise which will be used later are identified, captured and retained in the organization's knowledge base. This Knowledge base is integral for the software development process and the delivery of effective services for the "client" organizations' projects.

c. Design/production phase: It is what the source company produces. Based on the components in the "supply/Org knowledge phase", the source company's employees design and develop software solutions to the clients' SC as well as engaged in developing the source company's innovations in software applications and services. Thus, this phase is a source of internal organizational learning, and knowledge acquisition process.

d. Delivery/services phase identifies the different assignments and activities employees from the source company undertake in the client's company starting from information gathering until the software implementation and subsequent maintenance. This phase is also a source of knowledge and expertise capture by employees during its fulfilment. The feedback from this phase to the previous phases represents the lessons learned, expertise gained and the knowledge acquired by the SSSC's individuals and groups during or at the end of the fulfilment of the project.

3.2.4. Software service supply chain framework

Figure 3 is the proposed framework for the SSSC, the framework focus on the project administration process, internal software developing process and it also focuses on the external implementation of the software at the client's site. The framework highlights three types of knowledge: project administration knowledge, internal knowledge and external knowledge.

Administration knowledge: represents the knowledge which is generated as a result of project administration and management. This knowledge is vital for the organization because it sets up the direction for the whole project including timing and general requirements.

Internal Knowledge: once the legal agreement signed and a project manager assigned, then the software internal development process is initiated. In this process, the project manager appoints a specialised experts group to accomplish the project. and then the project analysis report is completed which involves visiting the client's premises, meeting with the key person/team and determining client system requirements by conducting interviews, system investigation and observation, planning and document gathering. And then, sequentially the assigned experts initiate and complete the processes of software designing, developing and testing. And then the project manager organises the services and project delivery process. Therefore, the experts who accomplished the whole internal developing process of the software are a vital source of new knowledge. This knowledge represents the knowledge that is gained from the internal developing process of the software, thus, the staff who participates in the developing process will be an important source of knowledge. This knowledge consists of "know how", lessons learned, experiences, "know why", decision made, new way of doing things, skills, expertise, prior experience, etc.

External Knowledge: once the software tested and completed, then the source company delivers the software to the client's site and then its employees implement and install the software in the client's computer system, aiming to complete the demand and satisfying the client's needs. As a result, the employees who participate in this external installation process are a crucial source of external knowledge, lessons learned and "know how" skills. In this turn, the external knowledge is very essential for the source company's benefit and competitive advantages because it represents the practical experience which is accumulated

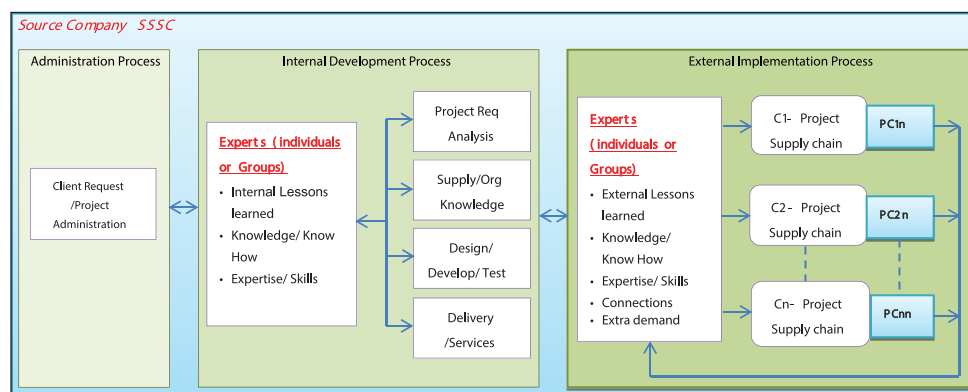


Figure 3: Software Service Supply Chain Framework (Baydoun & El-Den 2016)

from the real world experiences and challenges. Besides, the source company's employees will be also a rich source of external contacts and connection as a result of interacting directly with the client SC.

3.2.5. Integration between SSSC framework and KM process

After identifying the source of knowledge in the SSSC, the source company has to filter this knowledge against the source company's objectives and then retain this important asset in order to gain competitive advantages and profit. (Nonaka & Takeuchi 1995) states that "knowledge is the only resource that provides sustainable competitive advantage, and therefore the firm's attention and decision making should focus primarily on knowledge and the competitive capabilities derived from it". In addition, according to (Liao 2003) "knowledge is a very important resource for preserving valuable heritage, learning new things, solving problems, creating core competences, and initiating new situations for both individual and organizations now and in the future." As shown in Figure 4, the source company's employees accumulate and gain three types of knowledge: project administration knowledge, internal knowledge and external knowledge: Project administration knowledge is gained from administrating and managing the projects, this knowledge involves outsourcing contacts and notes, contracts, planning templates and projects management description and templates. Internal knowledge is gained from the individual's involvement in developing process of the client software, and external knowledge is gained from the installation and implementation of the software at the client supply chain level. Most of this knowledge is in tacit knowledge forms which it is imbedded in the heads of the source company's employees. (Omotayo 2015) point out that "the crucial point in KM is to capture the information and knowledge that is in people's heads as it was, and that has never been explicitly set down and make this available, so it can be used by others in the organisation." As highlighted in the above SSSC framework, project administration, internal and external knowledge are the main source of knowledge assets in the SSSC process.

The source of project administration knowledge is the project administration staff including the project manager who manages and administrates the SSSC development process. This knowledge consists of outsourcing management and contacts, project templates and planning knowledge.

The source of internal knowledge is the experts (individuals/groups) who are involved in the internal development process of the SSSC, this knowledge consists of lessons learned, "know how" skills, prior experience and expertise/skills; which are gained from the internal design and development of the software within the source company boarders.

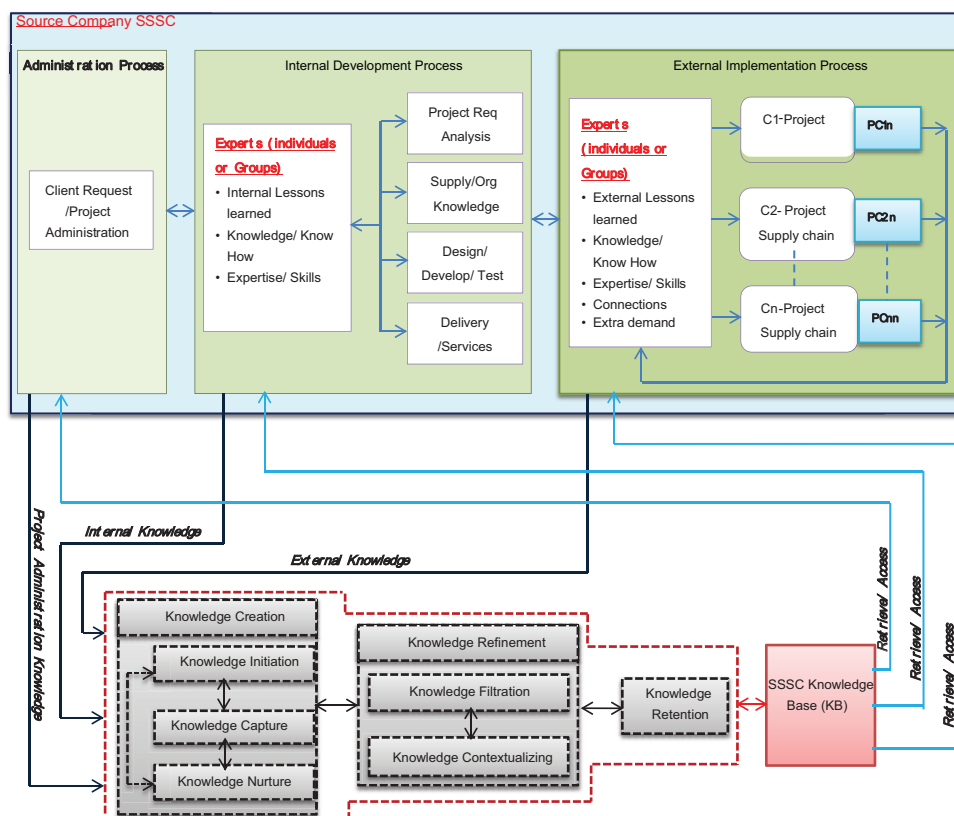


Figure 4: Integration between SSSC and KM Cycle (Baydoun & El-Den 2016)

The source of external knowledge is the experts (individuals/groups) who involved in external installation and implementation process of the SSSC at the client supply chain level. This knowledge composes of external lessons learned, know how skills, connections, extra demand, prior experience, real world experience, expertise and skills; which are gained from the external installation and implementation of the software at the client site.

This knowledge (internal/external) is primarily possessed in the heads of employees (groups/individuals) as a tacit knowledge. The KM process is emerged as a solution to transfer this knowledge (tacit) to some sort of knowledge (explicit) that can be codified, stored in the SSSC knowledge base so it can later be used in similar projects. This knowledge is to be captured and follows the SSSC KM process in order to be initiated, captured, nurtured, filtered, contextualized and finally retained in the SSSC knowledge base. Therefore, the SSSC Knowledge base holds all the filtered and nurtured internal/external knowledge that generated from the development process of the source company SSSC.

Example

SSSC Administration Process: Initially, the source company’s business manager meets with the education department representative to discuss and identify the department’s needs and then negotiate and agree on the cost of the project. The business manager, in this turn, consults and discusses the source company’s capacity and project requirements with his/her administration team. The SSSC administration process includes signing a contract to commence the project, and assigning a project manager to overseas, coordinate and manage the whole development process of the project. Consequently, new knowledge is created; this knowledge consists of new project templates, meeting valuable notes and contract. The participants in this phase can access and retrieve any required knowledge from the SSSC KB, to facilitate and improve their tasks.

SSSC Internal Development Process: The project manager, subsequently, appoints a business analysis expert who would be responsible for the requirement analysis of the client’s company. Then, based on the business analysis report, the project manager allocates resources (assigns roles, identify experts and allocates finances) for the project.

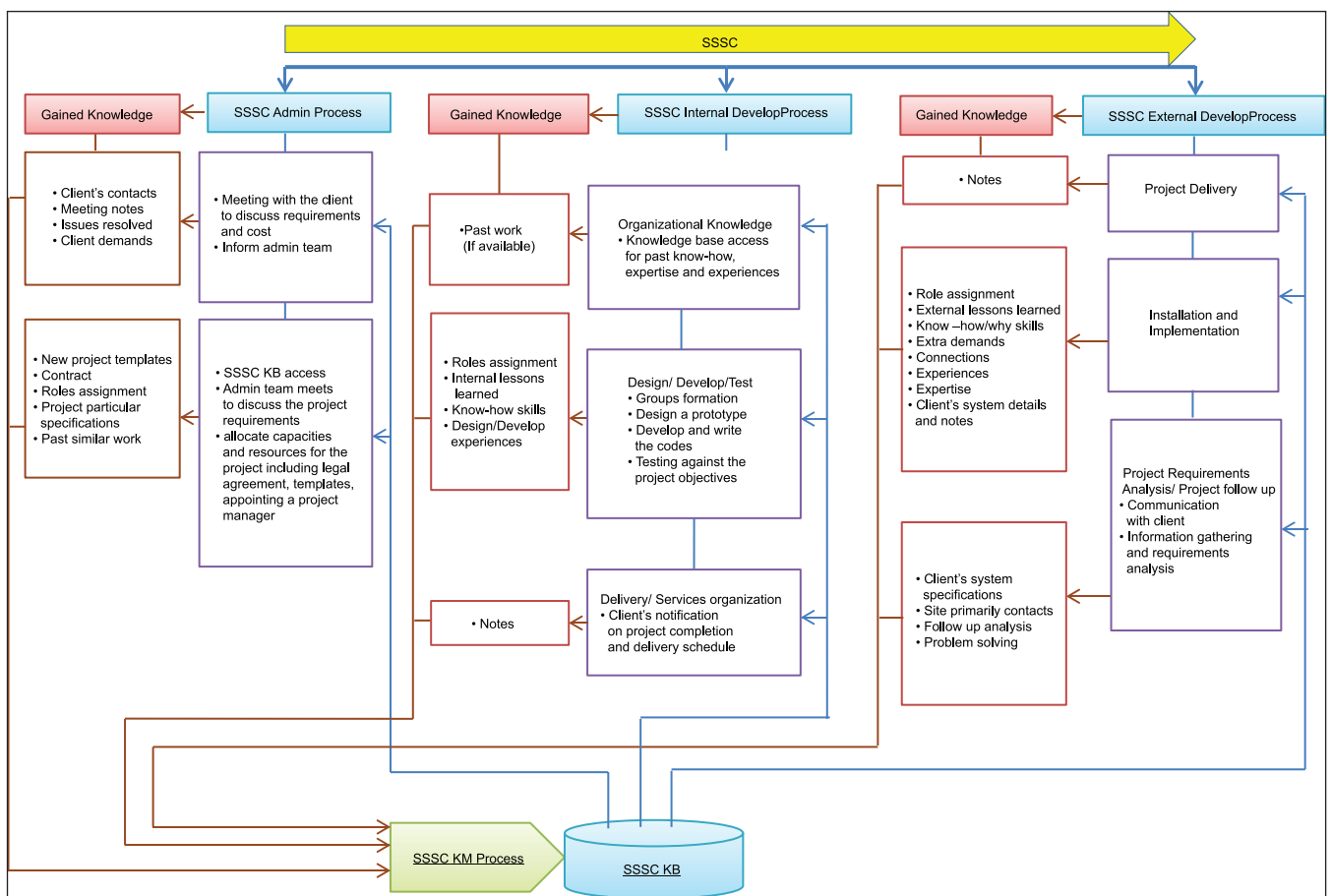


Figure 5: Illustration of Integration between SSSC and KM Cycle Example (Baydoun & El-Den 2016)

SSSC External Development Process: In this phase, the SSSC experts deliver the software to the client's side. And then they coordinate with the education department ICT system administrator to implement the software on the selected server. The source company's experts implement and install the software and provide supporting manuals and training for the department's staff. Thus, the experts, who participate in this phase, can refer back to the SSSC KB to retrieve any knowledge that simplifies the implementation process. As a result, new knowledge might be created including external lessons, "know how and why" skills, expertise, extra demands, connections and experiences.

The process in Figure 5 will be illustrated with a real life example to give a perspective into the proposed framework and to point to some possible knowledge generation.

4. CONCLUSION

The paper provided a detailed literature about supply chains in general and focused particularly in drawing comparisons between the traditional/manufacturing supply chain and the new emerging service supply chain. The paper focused on the software service supply chain where the main phases of such a SC were introduced. Based on these phases the KM processes in the literature were reviewed and a KM process which facilitates and ensures the knowledge retention and sharing in the SSSC was introduced. The paper posit that the overall activities of a SSSC are conceptually different from those of a traditional particularly the non-perishable nature of its products. The paper also provided answers on how the service supplies chain in general and the SSSC in particular could be improved based on the benefits of its employees' accumulated knowledge as a result of their involvement in the activities and processes in both the service company as well as the clients' companies while developing the clients' software development demands. An example was developed which demonstrated the knowledge sources during the software development process.

REFERENCES

- Baltacioglu, T, Ada, E, Kaplan, MD, Yurt And, O & Cem Kaplan, Y 2007, 'A new framework for service supply chains', *The Service Industries Journal*, vol. 27, no. 2, pp. 105-24.
- Dalkir, K 2005, 'Knowledge management in theory and practice', *McGill University*.
- Du, S, Lu, T, Zhao, L, Xu, B, Guo, X & Yang, H 2013, 'Towards An Analysis of Software Supply Chain Risk Management', *Lecture Notes in Engineering and Computer Science*, vol. 2207, no. 1, pp. 162-7.
- El-Den, J 2004, "Capturing and transforming opinions and ideas in a cooperative setting", in *Proceedings of the ICICKM'04 Conference, Rayrson University, Toronto*, pp. 29-30.
- El-Den, J 2004, "Transforming Tacit Knowledge into Explicit Knowledge through the Capture of Opinions and Ideas of Group Members in a Collaborative Setting", *Proceedings of The 5th European Conference on Knowledge Management*. Sept. 30 – 1st October, 2004. CNAM, Paris, France.
- Elaine, M, Luc, L & Marie, C 2011, 'Knowledge Management As A Means to Improve Performance In The Forest Industry Value Chain', paper presented to 34th Council on Forest Engineering, Quebec City (Quebec).
- Ellram, LM, Tate, WL & Billington, C 2004, 'Understanding and managing the services supply chain', *Journal of Supply Chain Management*, vol. 40, no. 3, pp. 17-32.
- Feghali, T & El-Den, J 2008, 'Knowledge transformation among virtually-cooperating group members', *Journal of Knowledge Management*, vol. 12, no. 1, pp. 92-105.
- Fisher, ML 1997, 'What Is the Right Supply Chain for Your Product?', vol. 75, pp. 102-16.
- Heisig, P 2009, 'Harmonisation of knowledge management-comparing 160 KM frameworks around the globe', *Journal of Knowledge Management*, vol. 13, no. 4, pp. 4-31.
- Hemilä, J & Vilko, J 2015, 'The development of a service supply chain model for a manufacturing SME', *The International Journal of Logistics Management*, vol. 26, no. 3, pp. 517-42.
- Hitt, MA, Keats, BW & DeMarie, SM 1998, 'Navigating in the new competitive landscape: Building strategic flexibility and competitive advantage in the 21st century', *The Academy of Management Executive*, vol. 12, no. 4, pp. 22-42.
- Jelenic, D 2011, 'The importance of knowledge management in Organizations—with emphasis on the balanced scorecard learning and growth Perspective', in *Management, Knowledge and Learning, International Conference*.
- King, WR 2009, *Knowledge management and organizational learning*, Springer.
- Kristin, C 2012, *PinkSCAN™ Assessment Report*, University of Alaska Office of Information Technology, viewed 16 April 2016, <<https://www.alaska.edu/files/oit/PinkSCAN.pdf>>.
- La Londe, BJ & Masters, JM 1994, 'Emerging logistics strategies: blueprints for the next century', *International Journal of Physical Distribution & Logistics Management*, vol. 24, no. 7, pp. 35-47.
- Lovelock, C.H., 1981. Why marketing management needs to be different for services.

- Liao, S-h 2003, 'Knowledge management technologies and applications—literature review from 1995 to 2002', *Expert systems with applications*, vol. 25, no. 2, pp. 155-64.
- Naylor, JB, Naim, MM & Berry, D 1999, 'Leagility: integrating the lean and agile manufacturing paradigms in the total supply chain', *International Journal of production economics*, vol. 62, no. 1, pp. 107-18.
- Nonaka, I 1994, 'A dynamic theory of organizational knowledge creation', *Organization science*, vol. 5, no. 1, pp. 14-37.
- Nonaka, I & Takeuchi, H 1995, *The knowledge-creating company: How Japanese companies create the dynamics of innovation*, Oxford university press.
- Omotayo, FO 2015, 'Knowledge Management as an important tool in Organisational Management: A Review of Literature', *Library Philosophy and Practice*, p. 1.
- Sampson, SE 2000, 'Customer-supplier duality and bidirectional supply chains in service organizations', *International Journal of Service Industry Management*, vol. 11, no. 4, pp. 348-64.
- Smith, EA 2001, 'The role of tacit and explicit knowledge in the workplace', *Journal of Knowledge Management*, vol. 5, no. 4, pp. 311-21.
- van Zyl, C 2003, 'Supply chain knowledge management adoption increases overall efficiency and competitiveness', *SA Journal of Information Management*, vol. 5, no. 4.
- Wiig, KM 1994, *Knowledge Management Foundations: Thinking about Thinking-how People and Organizations Represent, Create, and Use Knowledge*, Schema Press, Limited.
- Zhou, M & Park, T 2009, 'Commonalities and differences between service and manufacturing supply chains: Combining operations management studies with supply chain management', *California Journal of Operations Management*, vol. 7, no. 1, pp. 136-43.

Author query???

AQ1: Kindly cite Table 2 in text part and provide physical table