Chapter 5

Conclusions and Discussions

5.1 Conclusions

There were 2 main objectives of this research .Those were ; 1) to analyze and present problems focused by the Teak industry, especially from the value adding's perspective, and 2) to develop and propose an alternative framework which could assist in value adding to Teak Furniture Industry by knowledge management application.

The first objective of this thesis was to analyze and present problems of the teak industry, especially from the value adding's perspective. In the research problem analysis, this study founded that craft could be utilized to increase the value of the teak furniture products, especially "Phrae" golden teak. Wood craft was more than 100 years for processing and expert crafting. Since 1937, there were reforestation instead of deforestation. Recently, the ten millions of golden teak had matured. They were 20-25 years and ready for valued creation. The reason was the increasing need of real wood. The urgent issue was adding value to teak Furniture Industry in high market segmentation from natural resource. The price of teak furniture was not much different from other wooden furniture, even though it possess higher quality and higher value than other types of wood. teak wood stands out from other kinds of wood with its distinctive natural patterns and golden brown color. teak wood was a hardwood so it was durable and free from termites and weevils teak wood very easy to cut into shapes, so teak wood was one of the most ideal raw materials for furniture production**.**

In this research, it proposes to add value to teak furniture in global market for high quality furniture and premium market. The idea was to focus on new market, potentially with the colonial architecture manufacture products as art objects for everyday use. Manufacture colonial style furniture were emphasize functionality and emphasize the aesthetic aspect. Supply chain analysis of Thailand wood industry of both upstream, middle and downstream industry. The upstream industry was seeds and tissue

transplantation, teak maintaining, teak cutting and saws. The middle stream industry was teak processing plant, teak wood furniture industry. The downstream industry was packaging, logistic and selling. Under the principles of the creative economy to add value of teak furniture for both functional, beautiful, increasing the value of exports teak furniture and teak resources worth, it was found that two groups of supply chain knowledge worker were manufacturer managers and carver who could be the most value adding.

Then, the creative economy was used to identify the steps and the people who would manage the most value adding. These were the carvers and the manufacturers which in turn present the sources of the knowledge and experiences utilized in this research for the new knowledge creation. Creative economy shown that style was used to enhance value for teak furniture by making it unique artifacts in colonial style.

The second objective of this research was to propose an alternative framework which could assist in value adding to teak furniture Industry by knowledge management application. SECI was used for a model of knowledge management process development which was the appropriated as many reasons. SECI was appropriate because it was the effective km process application, not completed for both two knowledge workers. This was shown by the results of km activities coordination. SECI supports the innovations which were the result of knowledge development of between the only manufacturing, machine carving, beautiful manual carving and the use of joint in furniture manufacture. As shown in the Chapter 4 results and other advantages of development of knowledge management could improve the production process for the innovation which was shown in the joint.

In this research, chair colonial model was created as art object used in daily life focusing on the aesthetic elements and the maximum functionality based on the obtained knowledge. The first step was classification template, which was one of the tools of knowledge engineering enabling the categorization of data concerning Colonial style. The simplified data was appropriated for teak furniture carvers and teak furniture manufacturers in Colonial style. The second step analyzed tacit knowledge of the two groups of knowledge workers; carvers and teak furniture manufacturers, related to added value. CommonKADS, a tool of knowledge engineering, was adopted to capture, analyze, and synthesize the knowledge using IPO template as the framework for

designing questions. The final step was the knowledge sharing of the two groups of knowledge workers through SECI model, which was a part of knowledge management. CommonKADS, a tool of knowledge engineering, was adopted to capture, analyze, and synthesize the knowledge using IPO template as the framework for designing questions while sharing knowledge. The obtained result was the combination between existing knowledge of 'joints' frequently used in traditional Thai houses and new knowledge leading to the new joints, which had the capacity to fasten the chairs without using nails. In colonial style, nails were not preferred. The new knowledge allowed the two groups of knowledge workers to work together by manufacturing parts of furniture that were later delivered to the carvers. Joints were used to assemble the shapes and thus contributed to added value to teak furniture.

The knowledge engineering could be used in skills which was the knowledge type unexplained with text. This could be explicit as an image or video, especially the knowledge on the colonial style and skill in carving. This research shown that the use of knowledge engineering and SECI could help in the knowledge gathering effectively and systematically as well as easy for the understanding.

Joints were used to assemble the shapes and thus contributed to added value to teak furniture. This was the innovation of km process which used joint in the production. This could help the two groups of knowledge worker to worker together freely and add functionality and beauty. The joint application of the small task was new, even though it was applied to buildings already. To design joint for each chair was unique. It must support the weight and still beautiful. It was the unique style. If the joint applied to other furniture categories such as table, Joint need to be proper designed. The research joint could be applied.

In summary, teak was used as material for making furniture as art objects used in daily life focusing on beauty and functionality. The research tools used helped adding value to teak while solving the problem of 25 year-old teak stored about 10 million trees in "Phrae". This research contributed to the effective use of teak resources and added value to teak furniture industry in terms of higher value of exports. Colonial style was used to enhance the features of the furniture in a way that a greater variety was available for purchasers.

5.2 Discussions

5.2.1 For the optimized benefits of golden teak furniture's value addition, the analysis of the relationship between golden teak supply chain and creative economy was needed. The golden teak supply chain was a midstream industry. Golden teak furniture manufacture together with such art and craft as teak carving could add the optimized value to golden teak industry, because wood carving was one of Thai creative industry's arts and crafts, worldwide recognized as UNTUD (2004), and was also included in Thailand's economic plan. This corresponds to the fact that wood products and wood carving products were ranked at 7th and 8th, respectively, out of 16 top OTOP export product ranking. The export value at USD 973 million during January-December 2005 had a growth rate at 11.4% when compared to the 2004's value of USD 873 million. With the focus on the value creation by the transformation of art and architecture's intangible assets into golden teak furniture design, the value of golden teak furniture designed to suit a particular architecture in a house would worth 15% of the selling value of the whole house. A house with such well-known architecture as Colonial architecture would had a higher selling price than a house with normal architecture. Accordingly, golden teak furniture produced with Colonial architectural patterns had a higher value. As stated by UNTAD, cultural products were products and services that had culture embedded as a part of that product or service. Generally, consumers buy that product or service not only because of the product or service itself, but they also receive the culture embedded in that product or service too. As a result, the value was created beyond the product or service itself.

5.2.2 The knowledge engineering process could be used in detecting functional and beauty knowledge. The research found that golden teak carving could increase the beauty in a well-known architectural design to golden teak furniture to be used in daily life. This creates daily use art objects. With the focus on using the beauty of teak carving in the furniture design, a case study was conducted to produce the golden teak chairs, as colonial-style art objects, to be used in daily life.

5.2.3 Joint was an important mechanism in value creation under the concept of beauty and utilization in various architectural styles. This research found that Joint helps two groups of knowledge workers work well together.

5.2.4 Knowledge management concerned with six theories which were widely used and considered effective.

The theory of information based organization covered knowledge economy, the modification of organizational patterns/ significance of Knowledge Workers in the knowledge economy system. This theory of knowledge management focused on 3 aspects. First, organizations should focus on the development of knowledge workers or workers constantly worked together to assure effectiveness and performance. This gathering of workers was called "Communities of Practice" or COP. Second, organizations should focus on the best practices. And third, organizations should improve the use of information technology, which was an important and necessary component of knowledge management today (The Must), especially the internet system, a learning resource of knowledge workers in organizations. A key component of information technology of knowledge management was a variety of software or applications used in knowledge management. Those software and applications could be document management such as lotus note / demino, portal software such as microsoft share point or net weaver. There were also knowledge base software such as knowledge map, document management system, capability management system, and lesson learned knowledge base. What was also used was coordinative technology, which coordinated a community of practice, such as including electronic mails, teleconference, mobile phones, and others.

Theory of double-loop learning (Agyris, C, 1978) was considered one of the first cognitive theories that attempted to explain the process of learning or knowledge management process of the organization. This theory enabled organizations to adapt for survival in business changes. Double-loop learning theory dealt with organizational behaviors based on feedback. The adaptation could occur in two levels: optimizing working methods within the enterprise and adjusting enterprise strategy to be ready for competition or business, economic and social environments. Learning processes in organizations may be divided into two approaches: learning organizations focusing on the methods developed by business consultants or executives, and organizational learning developed by researchers in universities. Although the two concepts presented different beliefs, there was a common ground, which was to stimulate the desirable or to increase productivity of the organizations.

Theory of the fifth discipline focused on the tools used for System thinking, developing systems in the organizations, and learning to deliver the business demands, which included balance, reinforcement, and time delay. To create learning organizations capable of managing the surrounding changes, Peter Senge(1994) applied a concept based on engineering solutions and conducted the simulation of the systems involved to find out the solutions to those engineering problems. That was also known as system dynamics or systems thinking. Peter Senge believed that organizations would develop as learning organizations if they mastered 4 aspects of disciplines namely; personal mastery, mental model, shared vision, and team learning. organizations also needed another discipline required for survival or response to changes or systems thinking based on system theory. The system was a group of people learning together to work for completion. Each time, these people could learn and work more effectively as they had increasing capability and skills. An organization was composed of a system or a group of people who worked together repeatedly and were able to work more effectively. Examples could be repeated production of goods or services, annual business planning, or annual accounting. The systems in organizations had correlation. When there were changes needed, all systems or the personnel in the systems would learn to adapt themselves with dynamic to respond to business environment together.

Theory of knowledge creation (Nonaka, I. and Takeuchi, H.,1995) focused on innovation by creating the process of knowledge conversion between explicit knowledge and Tacit knowledge. SECI model (socialization, externalization, combination and internalization) consisted of 5 phases of innovation (share tacit knowledge, cerate concept, justify concept, build archetype and cross leveling) and location for knowledge conversion. A theory of knowledge creation was a widely accepted theory of knowledge management used to create innovation, especially the explanation of process of innovation in the industry of Japan. This theory enabled the leading companies in Japan to constantly create innovations. Those companies included honda, panasonic, and cannon. Initially, organizations needed to effectively manage the information and work experiences used in the operations, especially in the Eastern culture. Theory of knowledge creation stated that organizations needed to establish a process of knowledge conversion between tacit knowledge and explicit knowledge in organizations to create innovation. The model of this knowledge creation was called

"knowledge spiral." Knowledge conversion consisted of 4 processes namely; socialization, externalization, combination, and linking explicit knowledge. The final process was internalization, whereby explicit knowledge created by the organizations was put into actual practice or Learning by doing. This process enabled the personnel to gain knowledge and experiences to accomplish their assignments effectively and perpetuated the cycle of knowledge creation endlessly.

Theory of intellectual capital (Lief Edvinsson., Michael and S. Malone.,1997) was a management theory applied to maintain the value of shares on the stock market. It appeased the shareholders or stakeholders by establishing indicators so that the stakeholders could visualize the success and satisfaction in their investment or to support competitiveness against potential competitors. It gave a better view of personnel, clients, research, and efficiency of business, which reflected lesser risks. A company that had more intellectual capital than funds could gain high profitability in the future. This method of knowledge management was highly chosen by companies in stock markets, particularly to mobilize the funds or to control the share values. To create intellectual capital, the organizations had to structure a balance between human capital, which meant personnel at the management level or professional manpower who already acquired knowledge and experiences, and structural capital, which consisted of external capital such as clients and internal capital such as production process. Business structure should also assure a balance between customer capital, which referred to market share and potential customers in the near future. The organizations should consider development in the future and process capital or regular tasks, which included production process or services, and intellectual capital, which included patents, copyrights, and branding. Intangible assets were information and data, capability to process data for reaching decisions or predicting the future of business. It was important to maintain the assets either in quality or quantity in a suitable proportion to gain advantage over potential competitive organizations.

Theory of learning in action allowed individuals to have opportunity to practice important skills in organizations. This theory was developed by David Garvin(2003) and was widely recognized as a theory that could clearly explain organizational learning, separated from Individual learning. organizations benefited from learning in action and were able to solve business problems that were considered challenging. This

theory did not focus on separating people from their tasks so they could learn or performed activities as generally did in other theories. And that reduced the risks in abandoning important responsibilities. The experts in most organizations typically had various tasks and they could perceive having improvement activities as boredom and irrelevance. The executives of organizations could utilize knowledge mentioned earlier to solve problems or changes that would occur in the future. learning organization was an organization that constantly learned and developed its skills at all times to prepare for changes. Individuals or organizations that had better learning skills would be able to manage the changes more effectively and had fewer risks than competitors. organizational learning was, therefore, a key to skill enhancement in all levels; individuals, team, systems, and overall organizations. However, skill enhancement or knowledge activities usually did not bring benefits to the organizations directly or immediately. The aim was rather the long term. As most of learning activities were generally irrelevant to the personnel's tasks, the personnel were not cooperative with the activities. Moreover, over time, the organizations would consider those activities less significant or turn their attention to other matters as the business results were not seen. Therefore, the selection of topics of skill enhancement of organizations was clearly essential because knowledge gained from general learning could not be applied directly.

In this research, the theory of knowledge creation was used as it was proved more suitable than other theories as mentioned above.

5.2.5 Timakum,et.al's study (2010) explored the patterns and weaving processes of traditional Lamphun's fabric using knowledge management process, developing knowledge management systems for traditional Lamphun's fabric. The research methodologies consisted of qualitative research study applying SECI model to extract tacit knowledge of traditional Lamphun's fabric from the experts. The results obtained were converted to explicit knowledge in the forms of the writing, still images, video, and constructive research. This research aimed to study the patterns and weaving processes of traditional Lamphun's fabric emphasizing the extract of Tacit knowledge of Lamphun's "Dokpikul" pattern from the experts. The results were explicit knowledge which was obtained through the framework of SECI model. Then, the database of the website was developed under the conceptual framework of rapid application development (RAD) using PHP and MySQL. The database functioned as the source of

knowledge about traditional Lamphun's fabric, which was presented in multimedia. This website was developed for groups of experts, related authorities, students, and interested people as a forum to exchange knowledge. The next step was informal collection of data using a notebook to record data from observation, conversation, and interviews. The tools involved were digital camera and sound recorder. The results were then analyzed, categorized, verified by the experts, and developed into a database published on the website using the framework of SECI Model. The results of exchanging knowledge about traditional woven Lamphun's fabric could be presented in 4 processes detailed as follows:

(1) Process of socialization was based on teaching, interviewing, observing, and imitating technical skills of weaving traditional Lamphun's fabric from the experts and experienced.

(2) Process of externalization, which converted tacit knowledge into explicit knowledge of traditional Lamphun's fabric, involved written record, still and moving images.

(3) Process of combination categorized, stored, and published explicit knowledge through media, Information Technology, and the system of website, which managed knowledge about traditional Lamphun's fabric.

(4) Process of Internalization involved learning though Knowledge Management website and the application of knowledge into practice that it became expertise or tacit knowledge of the learners.

The Timakum's research (2014) study of traditional Lamphun's fabric served as a storage and dissemination of knowledge about weaving traditional Lamphun's fabric through information and communication technology using SECI Model. Timakum's study (2014) was consistent and supported in this research partially on the aspect of the application of SECI model for exchanging of knowledge between the manufacturers and carving, which led to new knowledge and added value.

5.2.6 Guidelines for knowledge management of the office of the national research council(2013) showed that knowledge engineering (KE) could be applied for knowledge management (KM) and distributed through knowledge management system (KMS). The preparation of the technical knowledge based on the standard of knowledge

engineering could be done through processes of knowledge acquisition: retrieval of knowledge / acquisition of knowledge detailed as follows:

(1) The framework for knowledge management, agenda / hidden agenda of knowledge in the year 2013. To obtain the framework in knowledge management in research indexing hub, the research team conducted an analysis to find out the experts and interviews to capture knowledge as guided by knowledge engineering (KE). Then, an agenda and schedule for interviews was prepared. As the experts interviewed were both the executives of local authorities and the experts who specialized in the technical standard development for research indexing hub, the interviews included scoping meeting, knowledge capture meeting and case study meeting in one session. The draft of interview agenda was shown below.

Interview agenda and hidden agenda, schedule: date of the interview, the executives / experts interviewed

Agenda 1. Background and objectives of the interview: to capture knowledge

Agenda 2. Objectives of the interviews

(2.1) To find out the scope of knowledge about the process of developing research indexing hub

(2.2) To understand operational methods used in the past and problems in the process of developing technical standards for Research Indexing Hub as well as the solutions

Agenda 3. Critical task in the process of developing research indexing hub Systems. Research indexing hub necessary knowledge including the process to develop research indexing hub, principles, and procedures, to understand how to and why in critical task was inquired.

Agenda 4. Critical aspects, necessary concepts drawn from experiences and principles related to the development of technical standards for research indexing hub through the input process and output.

What would be the input of the development of technical standards for research indexing hub (the database, technical standard, budget, tools/instrument, problems in the past/solutions)?

What would be the process of operation in each stage? What were the techniques and methods?

Output obtained (a system that could develop technical standards to solve problems of research indexing hub, knowledge for operation, and manual for system usage)

The processes of task review / reflect were also conducted.

Agenda 5. Other technical knowledge drawn from support tacit knowledge.

The interviews focused on the listening from the experts in terms of technical procedures, precautions, case study, and referenced information related to the development of technical standards for research indexing hub.

The interviews were summarized to determine the scope and to capture knowledge. The analysis was conducted based on the framework of task, sub task, inference, domain concept, and knowledge base. The data of the completed research was disseminated throughout the research agencies nationwide. The research team included in the interviews scoping meeting, knowledge capture meeting, and case study meeting in one session. The interviews with experts were transcribed, summarized, and captured for the knowledge. The results were presented in the table which included Task, sub task, inference, domain concept, knowledge base, and case studies detailed as follows:

The knowledge drawn from the interviews with the experts, research indexing hub had a national significance and was one of the main tasks of office of national science. It was considered the knowledge necessary for personnel in the research operation and data management. The office of the national research council was responsible for operating the research indexing hub and facilitating personnel or

agencies that owned the research database that wished to access research indexing hub. Problems with data storage that obstructed research indexing hub were unequal growth of data storage or information technology and the lack of thorough knowledge among agencies. Research Indexing Hub required a standard mutually accepted.

The office of the national research council 2013 was consistent and supported in this research partially on the aspect of the application of knowledge engineering for capturing of knowledge the manufacturers and carving, which led to new knowledge and added value.

5.3 Recommendation

5.3.1 Recommendation from this research

This research can be applied to other types of furniture such as desks, beds, cabinets and so on. It can be used in the form of various famous architecture or applied to products other than furniture in the future which using the same methodology to add value to the product.

5.3.2 Further research recommendation

This research could be applied to other types of crafts such as weaving pattern in various periods. It was based on the analysis of the supply chain concept and the creative economy. This was for art of weaving pattern and the objects was for used in everyday life under the concept of knowledge engineering and SECI model

The weaving crafts were sample. Research methodology included 1.analysis of Lanna style weaving pattern with template knowledge models. This was the process of gathering information about Lanna architecture, types of weaving pattern in Lanna architecture period, and key elements of the weaving pattern in the Lanna architecture period. The knowledge obtained was for people involved in the weaving pattern manufacturing in Lanna architecture. 2. The body of knowledge on teak weaving pattern was compiled in congruent with knowledge engineering. 3. Knowledge of weaving crafts was compiled under knowledge engineering. 4. Knowledge of weaving pattern and human weaving ware shared and converted to weaving manufacturing as art objects in Lanna style used in everyday life for displaying beauty and functionality through SECI model.