

INNOVATION IN MALAYSIAN WOOD BASED MANUFACTURING FIRM: AN ILLUMINATING CASE STUDY

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ABSTRACT

The purpose of this paper is to highlight the innovation pattern and strategy in wood-based upstream production in view of its significance in the LMT (Low and Medium Technology) industries in a developing economy such as Malaysia. The design of this research is based on a single case study approach. Purposive sampling technique was used and data collection obtained through interview approach. Semi-structured interview was conducted with the general manager of one of the selected wood based manufacturing firm in the state of Selangor, Malaysia which fulfilled the basic criterion set chosen such as the experience involved in innovative activities in past three years. The major findings of the study implied that both product and process innovation are complementary to each other. Sequentially, product innovation takes place and followed by the process innovation. In addition, it has been observed that both competition and market demand induces innovation activities in the wood-based innovation in the manufacturing firm. It is also detected that virtually customers have actively involved in the firm's innovation process. Alternatively, trade shows, exhibition, online furniture deco webpage, and Wood Furniture Association are traced as the important external sources which have contributed to the information in the firm's innovation process. Information gathered from the external sources subsequently transformed into internal innovation through trial and error process by internal employees of the firm.

INTRODUCTION

Technological application is a critical determinant of productivity growth and international competitiveness. Since it is not spread evenly across

the economy in a developing country, analyses of industry performance and structural change attach greater importance to technological criteria. The OECD (2011) has defined industry classification, centered on technological classification, referred to the formulation such as the research and development (R&D) expenditure to the turnover of a company or to the output value of a sector. On this mode, thus, the classification of the industries is based on the R&D intensity. Basically, on this criterion, there are four categories of classification implied, namely, high technology industry, medium-high technology industry, medium-low technology industry, and low technology industry.

In OECD countries, low and medium technology industries (LMT) have larger shares in manufacturing sectors compared to other categories. In precisely, it is about 60 percent of employment shares that are contributed by LMT industries in OECD countries (Heidenreich, 2008). Considering the significance of LMT industries contributing towards Malaysian economy, it is important for the researchers to investigate the course of the significant role of LMT industries and others in terms of determining the technological and social economy development (Kreinsen, Jacobson, Laestadius, and Smith, 2005). Fundamentally, in innovation literature, it has been categorically stated that the innovation pattern has substantial changes, time and again, due to its highly heterogeneous nature in industries (Kirner, Kinkel, and Jaeger, 2008). Malerba (2005) annotated the differences of innovation across sectors in terms of source, actors involved, boundaries and process, and also organization of innovative activities.

In view of the important role of the LMT sector in an economy, it is worthwhile for the researchers to undertake in-depth investigation of innovation involved in the LMT sector in a developing economy. Apparently, owing to the heterogeneous features in LMT sector, an exploration based on discussion about the sector is important to reveal the comprehensive pattern of innovation in the LMT sector (Kirner, *et. al.*, 2008). Focusing on the LMT sector, for the present study, thus, wood-based industry is chosen in view of its significant contribution in national economy GDP, employment, value added, and the involvement in exportation activities in a developing economy, such as Malaysia.

In the case of Malaysia, however, wood-based industry contributes about 3.7 percent of GDP and 3.2 percent of the country's total merchandise exports (Ratnasingam, 2013). In addition, this industry has created for more than 300,000 employment opportunities in the country. Along with the importance of wood-based industry, the competitiveness of this sector has to be viable to be facilitated by the government policy.

During the First Industrial Master Plan from year 1986 to 1995, government approaches in promoting the wood-based industry was focused on establishing a furniture complex. This strategy, however, did not show significant productivity growth in the wood-based industry (Ratnasingam, 2013). Later on, implementation of the Second Industrial Master Plan (1996-2005) again addressed to enhance the productivity growth in the wood-based industry by introducing agglomeration of interlinked activities in between the industrial member towards industrial development (Ng & Thiruchelvam, 2012). This strategy captured significant improvement in wood-based industry productivity growth in the country.

Nevertheless, the current situation of wood-based industry faced challenges from the emerging countries competitors, such as China and Indonesia. The growing number of wood-based manufacturers face Malaysian wood-based industry to continually grow and strengthen the production in order to sustain their position in the world market. Thus, Third Industrial Master Plan (2006-2020) reinforces the productivity growth in the wood-based industry through enhancing value added in wood-based industry (Norchahaya, MTIB, n. d.). In order to achieve its laudable goal, the Malaysian government resorted to developing the cluster area for enhancing knowledge sharing between the industrial actors.

Enhancing knowledge sharing is viewed as the key approach in encouraging innovation in wood-based industry. In this context, the collective societal process works as integrating the information as well as accumulating the knowledge with the purpose to create new knowledge, or in other words, innovation (Ng & Thiruchelvam, 2012). In the wood-based industry, knowledge sharing between upstream and downstream wood-based industry enables the wood-based industry wants to improve their production techniques, and product designs. In this case, the furniture (final product) designs and functions are able to benefit in creating the fashionable designs and product functions through knowledge sharing among the competitor (furniture manufacturer). Intensively, the latest design idea is later transmitted to the upstream manufacturer, and hence created new production techniques in upstream productions.

Conversely, the latest designs may be induced from the upstream production and transmitted to the downstream furniture manufacturers. In this process, the upstream productions introduced new production techniques and thus creating new partial completed products. This partial completed product is thus diffused to the upstream furniture production and the new final product functions or designs are created.

Presumably, innovation of both upstream and downstream are important in wood based industry. According to Ratnasingam (2013), Malaysia is the “largest exporter of sawn timber and the second largest supplier of plywood”. This implies that the upstream wood-based manufacturing still comprise the greater portion in the Malaysia wood-based products exportation. Several studies have highlighted the furniture sector innovation pattern and strategy but a few studies have focused on investigating the innovation pattern and strategy in upstream manufacturing innovation. To fill up the gap, thus, the present case study made a pioneering attempt to study the innovation pattern and strategy in the wood-based upstream production in the Malaysian context.

LITERATURE REVIEW

Innovation definition

Schumpeter (1934) has stressed that the crucial key for businesses to grow continually is to accumulate knowledge, that is to say, increase knowledge input. Essentially, Schumpeter had grounded the theory of innovation economics which argued differently from the conventional theory by specifying that the growth of productivity is based on capital and labor accumulation. Schumpeter hypothesis however, implied that to spur higher productivity, the firm should focus on creating knowledge input.

In general, knowledge creation can be achieved through innovation activities. Basically, the essence of innovation is ‘newness’ (Damanpour, 1990; Johannessen, Olsen & Lumpkin, 2001; Mazzarol & Rebound, 2008; Schumpeter, 1934). Schumpeter (1934) has conceptualized innovation by identifying the phenomenon with five types of “newness” activities such as the introduction of a new good or new quality; new method of production; opening new markets; new source of material, and process reorganization.

Schumpeter’s definition has provided the fundamentals towards innovation studies. Several scholars have explored the idea further. For instance, Damanpour (1989) defined innovation as “the generation, development, and adoption of novel ideas on the part of the firms. Particularly, novel ideas that have taken part in the firm include the development or adoption of new technology, physical change on the business structure and business operation change. This definition has virtually revealed the core of innovation as to create ‘new’ to the business.

In addition to Damanpour (1989), Mazzarol & Rebound (2008) had also defined innovation by specifying four elements based on the 'new' concept. These are new processes, new productions, new marketing techniques, and new organization and managerial approaches.

Johannessen, Olsen and Lumpkin (2001) have defined the concept of innovation in their research even more precisely. They examined innovation activity area from prior research by Schumpeter and Kirzner and have successfully tested six major areas of activities as to regard to the "innovation" conceptualized in the business arena. These activities are new products, new services, new methods of productions, opening new markets, new source of supplies, and new ways of organizing.

While discussing the definition of innovation in terms of newness, innovation has often used in conjunction with the concept of the invention. The New Oxford Dictionary of English (1998) thus defined invention as "creating something new that has never existed before." Even though the definition of 'invention' has the element of 'newness', but it has to be distinguished from innovative concept. Sullivan and Dooley (2008, pg. 5) defined innovation as "a process of making changes to something established by introducing something new that add value to customers." The idea traced that the core value of innovation is to add value for the customer rather than just creating new or making changes to something already in existence as established.

Neely and Hii (1998) further defined innovation into two typology terms in order to distinguish the innovation in term of creating new or making changes to something already in existence of established. These two typologies are radical innovation and incremental innovation. Radical innovation means the launch of new ideas in order to create a totally new product, process, or even a market. On the other hand, incremental innovation is to make changes on something that has been already established.

In summation, innovation is largely defined as creating new or making changes on products, services, methods of production, market, source of supply, and ways of organizing in order to add value to the customers.

Innovation in wood based industry

Wood-based industry is classified as the LMT category due to its innovation- lower R&D intensity (OECD, 2011). The majority of the LMT manufacturing firms are considered in the SMEs group (Kreinsen, 2008).

For instance, Malaysia, Tanzania, and China's composition of wood furniture manufacturing firms (in LMT category) are SMEs (Mutambala 2011; Ng & Thiruchelvam, 2011; Xiao Zhi & Eric, 2006).

The "smallness" characteristics of the SMEs have indeed revealed their limited capital source so as to compare to the larger enterprises (Xiao Zhi & Eric, 2006). Likewise, majority of wood furniture manufacturers are facing the constraint in investing aggressively in innovation activities. Thus, Mutambala (2011), for instance, stated that wood furniture manufacturers in Tanzania are likely to retain in the traditional production techniques. This implied that they are relying on the manual technology, and resorting to labor intensive approach in the manufacturing process.

Similarly, a wood furniture case study in China has identified that the majority of wood furniture manufacturers are subject to low cost production (Xiao Zhi & Eric, 2006). The key feature of the low cost production is to lower the cost of production and to optimize the production as such to enhance the profit. Owing to the low cost mass production techniques, China furniture manufacturers are favoring to labor intensive approaches, that is, employed low wage workers in production rather than to operate by using machinery-capital intensive technique. Similarly, due to the higher cost in furniture machinery in Malaysia, wood furniture manufacturers are depending on local resources and labor intensity in their productions, and employing in-house R&D strategies (Ng, & Thiruchelvam, 2011).

In the view of seeking the innovation practice in the wood based industry, innovation strategies suggested by Kreinsen (2008) exposed the rational of innovation practices in wood-based manufacturers. As a case in point, Ratnasingam (2004) proposed that wood furniture sector is a state-of-art technology industry. In essence, this industry is fashion-oriented and it is locus in value added for articulated the customers' life style rather than focus on the quality of the products as such (Ng, & Thiruchelvam, 2011). To a great extent, thus, a fashion-oriented industry can be classified as devoted customer orientation strategy.

With regards to the future of the wood furniture sector, thus, customers input such as their preferences in furniture designs are the main sources for innovation activities in the production process. Despite the fact of the customer-oriented feature, product innovation taken in manufacturing firms should be more aggressive. However, in reality, product innovation taking place in furniture manufacturers has tended to the more or less imitating the foreign products rather than creating a new unique designs (Mutambala 2011; Ng & Thiruchelvam, 2011; Xiao Zhi & Eric, 2006). This

implies that, the product innovation is in incremental mode rather than the radical mood in the country. Profoundly, this phenomenon can be explained as the upshot from the shortage of knowledge and skilled workforce for the best innovation in creating new designs or patterns of the product (Ng & Thiruchelvam, 2011).

By pondering on the process innovation in the wood furniture sector, it is traced that the demand pull from the customer can elucidate in detail on the process innovation that attributed to the furniture manufacturers. In general, the demand calls from the customers stimulated the change of the way in the production process and thus change the pattern of the products. In China, for instance, the urge on the cheaper products has postulated the low cost production. Thus, the production process of the furniture manufacturers in China has to be continuously improved or modified in order to gain the lower production cost (Xiao Zhi & Eric, 2006).

On the other hand, the process innovation in the wood furniture sector has followed the trend in the product innovation. In precise terms, product innovation tends to strike on the modification or improvement in the production process. In this trend, the process innovation taking place in the production is preferable to the incremental or architectural mode rather than the radical mode.

Innovation mode (Radical, Incremental, Architectural Innovation)

The distinction between science technological, and non-science technological (processes, experiences know how) innovation has further been conceptualised in Bender (2004) whereby innovation divided into two modes, namely radical and incremental mode. Radical innovation is about “making major changes in something established” (Sullivan, 2008, pg. 23), which are based on a set of new scientific findings and principles (Bender, 2004). On the other hand, incremental innovation is about the “improvement of the existing products related to the scientific findings and ordained technological concepts” (Bender, 2004). In a retrospective view on both ‘new elements’ in radical innovation and ‘improvement’ in incremental innovation, Henderson and Clark (1990) has initiated the concept of “architectural innovation”.

Architectural innovation refers to “reconfiguration of an established system to link together existing components in a new way (Henderson & Clark, 1990).” Likewise, Sundbo (1998) viewed that architectural innovation as the ability to acquire and use component competencies for integration in new products and solutions. Component competencies

are the firm's internal abilities and knowledge used in solving problems. Further, as Kreinsen (2008) has further stated that, "architectural innovation not only comprise the ability to combine and recombine the available technology component, but also implies taking up, adoption and application of distributed knowledge for novel problem solving."

In capping the notion of 'innovation mode' in low technology sector, Whitley (2000) argued that "innovation mode can be seen as the product of enterprise strategies that are also reflected their organizational capabilities and strategic priorities". Generally, different economic structure and institutional environment may cause the different organizational capabilities. Speaking precisely, the different institutional environment can affect organizational capabilities and thus influence on the choice in innovation mode. Tunzelmann and Acha (2005) asserted that the successful innovation strategy of the company is to use their own specific management skills and organizational capabilities to manage with the dynamic technologies and demand patterns.

Indeed, different sectors may have a different environmental structure, and organizational capabilities. Extensively, high and medium-high technological sector may hold different innovation mode in comparison to low and medium-low technological sector. Kreinsen (2008) proclaimed that LMT sector mostly exercise the in-house practical knowledge-based. Intensively, in-house practical knowledge-based is the key driver for LMT sector in gaining competitive advantage (Bender, 2004). Explicitly, LMT sector uses the organizational capabilities and knowledge to expand existing knowledge in order to gain the competitive advantage (Kreinsen, 2008). In-house practical knowledge-based can be put into practices through architectural or incremental innovation mode.

This phenomenon can be explained, as the nature of LMT sector which is dominated by the SMEs, that the SMEs are always being characterized as firms with limited resources and capabilities. Likewise, Xiaozhi and Eric (2006) research in China's furniture sector found that most of the innovation activities are continuous modification of existing products are based on customers' orders. This finding has in fact revealed that the China firms likely to take incremental innovation making modification or expand for the existing products, rather than radical innovation-creating novel one.

Types of innovation

OECD (2011) implies that technological innovation activities in manufacturing firms are "those scientific, technological, organizational

financial, and commercial steps, including investment in new knowledge, which actually, or are intended to lead to the implementation of technologically new or improved products or processes.” Explicitly, the definition has indicated to distinguish innovation activities, namely, products and process innovation. In general, product innovation refers to making new or improvement of products, equipment or service in order to gain competitive advantages in the market (Neely & Hii, 1994). In the same fashion, Wheelwright and Clark (2000) stated that product innovation involves the change of “incremental improvements of the products, additions to the product families, next-generation products, and new core products”. These changes are implicitly referred to the tangible change on the products.

In contrast, Kirner, *et. al.* (2009) stated that product innovation can be either in material or immaterial products. In other words, product innovation can be in tangible or intangible forms. This definition has embraced an intangible form of product innovation activities in firms. These activities imply product related services such as maintenance, training, consulting, project planning, software development, and etc.

On the other spectrum, process innovation co-exists with product innovation in a firm’s manufacturing process. Process innovation is a set of activities that encompass the method for the production or the transforms of input into output that add value to the organization reciprocally (Sullivan, 2008, pg. 17-18). The definition revealed that process innovation is focused on “how work is done rather than what an organization has done” (Sullivan, 2008, pg. 19). Although the context between product and process innovation are quite different but the process innovation activities also involve in either new or improve mode of innovation (Damanpour & Evan, 1990; Neely & Hii, 1994).

Fundamentally, product and process innovation are not mutually exclusive from each other (Neely and Hii, 1994). Likewise, process innovation is complementary to the product innovation by reducing the cost and improving the quality of the products (Sullivan, 2008). Bender (2004) thus argued that to some extent, product innovation cannot be separated from the process innovation. For instance, in metal and steel sector, the modification or introduce on new materials, have implied the changes in the production process.

In an attempt to investigate innovation types in LMT innovation, Kirner, *et. al.* (2009) studied the innovation performance in the German manufacturing sector, and they found that LMT firms have a higher degree in process innovation and their process innovation performance

is at least as efficient as HMT firms. This finding established that LMT firms possess high ability in innovative process design continuously and thus obtained a better product quality through lower deficiency rate.

Likewise, Ng and Thiruchelvam (2011) conducted a study in Malaysia wood furniture sector. It has been detected that there are about two third of the innovators who were found to be active in both product and process innovation. This suggests that among the total numbers of innovators, innovators that focused on one type of innovation accounted for a small number of total innovators involved in the study.

Innovation sources

In general, wood-based industry is classified as the low R&D intensity sector (OECD, 2011). Indeed, this classification indicated that wood-based industry involved less in technological innovation in nature. However, recently, there are some scholars who argued that, R&D intensity does not capture the whole picture of innovation in the LMT sector (Kreinsen & Jacobson, 2008; Heidenreich, 2008; Wziatek-Kubiak, et. al., 2009). The wood-based industry (one of the low technology industry) is in fact innovating, despite the fact that wood-based industry is one of the low technology industries. Thus, on this count, the innovation activities in wood-based industry is classified as “practical application of knowledge-oriented” innovation activities (Kriensen & Jacobson, 2008).

Principally, innovation is an outcome from “knowledge intensive” activities (Kreinsen & Schwing, 2011). Knowledge in wood-based industry (LMT sectors) can be obtained from different levels which are trans-sectoral, sectoral, and local. (Kreinsen, et. al., 2005). Owing to the multi-level knowledge accesses, LMT innovation is said to be linked to the complex mechanism of knowledge dissemination (Kirner. et. al., 2009). This complex mechanism of knowledge dissemination involved actors which are important in inducing innovation activities.

Incidentally, actors involved in innovation activities for wood-based industry include customers, machinery and material suppliers, retailers and exporters, and supporting industries (Ng & Thiruchelvam, 2011). In addition, other type of sources involved in the innovation activities such as trade shows and internal employees are also included. Xiao Zhi & Eric (2006) in their research study highlighted the product designer, company upper management and competitors perceived as the top sources of innovation in the case of China furniture manufacturers.

In the same manner, Ng and Thiruchelvam (2011) have denoted that the actors in intermediate business environment such as customers, machinery and material suppliers, retailers and exporters, and supporting industries are linked closely to the furniture manufacture, whereas, the connection between government and education institution are limited in Malaysian wooden furniture sector.

METHODOLOGY

Research design

According to Yin (1994), there are several case study designs. Indeed, each type of case study design can serve for the different purpose or in other words, the different design of the case study is to answer different research question. In the present study, a descriptive case study is chosen in attempting to answer the research question. Incidentally, Yin (2003) and Bryman (2008) stated that a descriptive case study is fundamentally used to describe an intervention or phenomenon and the real-life context in which it occurred.

Sampling techniques

Sampling technique used in this case study is purposive sampling techniques. Purposive sampling is a non-probability sampling techniques (Oliver, 2012). In essence, this technique used when the “decisions concerning the individuals to be included in the sample are taken by the researcher, based upon a variety of criteria which may include specialist knowledge of the research issue, our capacity and willingness to participate in the research” (Oliver, 2012).

In this case study, the targeted company is located in the state of Selangor, Malaysia. Basically, the company is an upstream wood-based manufacturer. This company has been operating in the business for about 20 years and has 250 employees. In addition, the main productions in this company are veneer board and timber. The company has involved both domestic and overseas business.

In specific terms, the targeted company selected for this case study is based on several criteria. These criteria are, the experience involved in innovative activities in the past three years, employees more than 5 people (not a micro enterprise) and is categorized as wooden based

manufacturer. In addition, the participant in the selected company is from the top management level employees, or key decision maker for the company. The reason in this selection is because the management level employees, or key decision maker for the company are familiar with the operation and management system in the company.

Structural questionnaire design and reliability

In a broad sense, the present authors used open questions to interview the participant. Bryman (2008) contended that the advantages of open questions are to allow the respondents to answer in their own terms. In other words, the open questions give way for the respondents to answer the questions based on their level of knowledge and understanding. Thus, it enables the present researchers to better deal with the issue. In addition, the open questions are useful for exploring the new areas or ones in which the researcher has the limited knowledge (Bryman, 2008). In this case study, the researchers have attempted to explore the innovation in furniture component manufacturing firms. Therefore, open questions are thought suitable to use in order to detect better answers to the research questions.

In formulating the questionnaire, the present researchers employed the first "General Rule of Thumb" (Bryman, 2008). The General Rule of Thumb stated that the questions ask in the interview should be able to address the research's question in the studies. Thus, in this study, the researchers design the interview questions so as to get an appropriate answer to the research questions laid down for the relevant issues pertaining to the concerned case study. In addition, owing to the language issue, researchers translated the questionnaire in the mandarin version. In fact, the translation is to ensure that the respondent-the manager clearly understands the questions asked by the researchers.

The study involved a pilot study. Bryman (2008) claimed that pilot studies are important in order to make the questionnaire form more reliable. There are several reasons for the researcher to conduct the pilot studies for case study research. Firstly, pilot studies designed as to the purpose to avoid the hazard questions that make interviewee do not understand the questions. Moreover, pilot studies avoid the questions that have tendency to make interviewee feel uncomfortable.

As regards to the language issue, the pilot study is conducted on a Chinese student in Universiti Utara Malaysia who has the fundamental

knowledge in innovation activities. Indeed, the reason of Chinese student is selected is because of the participant (the Manager of the enterprise) in this case study belonged to the Chinese race. Incidentally, the Chinese student is expected to have the similar understanding of the mandarin questions to be asked in the research process.

The interview questions employed in the pilot study are the questions design derived from the literature review (refer to appendix, questionnaire design from literature review). There are only few corrections that have been made after the pilot study has been conducted on the selected participant (refer to the corrected questionnaire in appendix). Both the appendix attaches in the case study have incorporated the English version of questionnaire only. Corresponding to the pilot study, the researchers employed the amended questionnaire in the case study.

Data collection process

Data collection technique in this research is through the interview approach. The researchers used an audio recorder to note down the information provided by the participant. The interview question is in the semi-structure form. After completing the whole interview process, the researchers transcribed the interview information from the audio recorder. Bryman (2008, pg. 453) stated that “transcription has advantages of keeping intact the interviewee’s and interviewer’s words and it does so by piling up the amount of text to be analyzed.” Furthermore, in terms of validity, after transcribing the interview information, researcher verify the transcription content with the interviewee.

In the first stage of data collection, the researchers sent through email a formal letter to the targeted company in order to invite the organizers as the participant in this case study. Thereafter, the researchers made a phone call to the company and assure that the company received the formal letter. In this way, the researchers have undergone with the pre-requisites to seek the respondent’s participation in this case study by clarifying the purpose of the case study in the formal letter.

After two days, the researchers made a phone call to the company to confirm the person who can participate in the case study. There were two persons suggested from the company’s secretary which fulfill the pre-condition of the case study. These two respondents are general manager and the owner of the company. Nevertheless, the secretary claimed that the company owner is busy and he cannot participate in this case study.

The only person that can involve in this case study is the company's general manager.

Even though the general manager agreed to participate in this case study, however, due to the confidential issues, the researchers have is not being permitted to disclose the name of the company and general manager. Thus, in this case study, all the coding notes from interviewee is employing Mr. A, as to substitute the real name of the participant.

Subsequently, Mr. A gives consent to the researcher to record the whole interview process. Nevertheless, the researcher had to assure that the record is to be kept as the researchers' own references without disclosing to others. As regards to the time constraint of the participant, the researchers had decided to conduct the interview after the working hours. Indeed, the purposes to conduct the interview after working hours is to ensure the participant has adequate time for the interview.

In essence, the researchers employed semi-structured interview in this case study. According to Bernard (1988), semi-structure interview is best used when the researcher has only one chance to interview the participant. In other words, the cross-sectional research which allowed the data collection in a particular period is suitable to use semi-structured interview.

Likewise, due to the limited chance to interview, the researchers had to plan well in advance. Lindlof and Taylor (2002) argued that, interview guide is important to prepare before the researchers conduct the interview. In fact, interview guide helps researcher to emphasis in the topic regarded in the case study, without constraining the interview in a particular format.

The researchers had sent a list of interview questions to the participant that included both Mandarin and English version (refer to the Appendix) before the interview was conducted. Later, the researchers called the manager to ensure that the manager is clear and understand the questions send to him. Henceforth, the researchers immediately make an appointment with the manager for interview, after ensure that manager is clear and understand the list of instruction and the questions send to him.

Substantially, in the interview process, the researcher asked according to the interview questions that have set in the earlier stage. However, the researchers noticed that some answer given by the interviewee were unclear, and not precisely towards the questions asked. Thus,

the researcher used probing questions to make a clear understanding of the sentences spoken by the interviewee. According to Berg (2011), probing questions is to draw out more complete stories about the subject. Incidentally, probing questions is to “ask the subjects on what the interviewee has already answered in response to a given question.”

The whole interview process was about one and half hours. In between the interview, the researchers used a recorder to record the conversation. Bryman (2008) stated that, recording is important for semi-structured interview. Implicitly, the recording had made as to grabs the information from the interviewee without missing any important message. Subsequently, the interview record had to be transcribed.

Data analysis and interpretation

Interview record meant to be transcribed into words as for the interpretation and analysis purposes. There are few steps used in this case study to transcript the interview conversation. In the first step, the researchers transcribed the interview conversation into Mandarin content. This Mandarin content was later on email to the interviewee as for him to check on the validity of the content.

According to the Merriam (2009), the strategy to ensuring for internal validity or credibility is “member check”. In other words, this strategy also called “respondent validation”. The functional role of the member check is to solicit feedback on the emerging findings from some of the people that involved in the interview. In this manner, the transcript of the interview conversation was sent to the interviewee, as to validate the transcription content.

Nevertheless, Mandarin transcript’s content is not fulfilling the case study writing mode, thus, the researchers had to translate the transcription’s content into the English version. Owing to the time constraint, the validation of the English version is to go through with the check and review by several students in Universiti Utara Malaysia who know both Mandarin and English language. In addition, the final draft of the transcription is passed to the interviewee for his reference.

Eventually, after obtaining the consent from the interviewee, the researchers had proceeded towards the data interpretation and analysis. Miles and Huberman (1994) annotated that “coding is the analysis for qualitative research”. Incidentally, coding is the action of reviewing a set of field notes, transcribed or synthesized and to dissect them

meaningfully. Thus, through the stated action, the researcher is able to “make sense” on the data and draw the connection to a specific setting (Miles & Huberman, 1994). The present researchers had developed the coding categories from the interview transcript by using NVIVO 10th Edition software. Besides, after completing the coding works, the researchers sought to make sense of the coding categories, and drew the possible link in between the coding categories. Indeed, the steps of drawing the possible link had to go through trial and error process, until the final result tended to satisfying to draw all the possible links describe by the interviewee.

FINDINGS AND DISCUSSION

The purpose of the case study is “thick description” in the phenomenon (Geertz, 1973). Thus, with the purpose of deeply describing the innovation pattern in the wood-based manufacturer, the researchers resorted to code and theme for the coding is meant to further explain the phenomenon. Six themes have been categorized. Each theme alongside its particular findings were drawn out, discussed, and related to the body of literature.

Theme 1: Innovation definition

Mr. A annotated that innovation is to “create something new.” This definition is parallel to the definition of the scholars (Damanpour, 1990; Johannessen, Olsen&Lumpkin, 2001; Mazzarol & Rebound, 2008; Schumpeter, 1934). Intensively, Mr. A extends the definition of innovation by contended “modify the existing products in order to give the new appearance on the product”. As a matter of fact, innovation does not necessarily imply to create a new product, but it is also with the modification of something established such as processes or products. Essentially, the concept of innovation, thus, defined as creating new or modification on something establish in giving the new appearance of the product.

Theme 2: Innovation driver

Competition enables to stipulate innovation activities in the low tech sector. Kreinsen and Schwinge (2011) stated that this condition occurred mainly due to the strong competition based on price and cost. Therefore, manufacturers are inclined to optimizing continuously on manufacturing processes and technologies rather than pursue more risky innovative activities. Nevertheless, once the market competition pressure is higher

among lower cost competitors, it forces the manager to pursue innovation activities for the purpose to survive and outperform in the market. In this case, Mr. A indicates:

“Competition among the wood-based manufacturing firms is tight. The increment of the labor wages (after introducing the minimum wages) leads to increase the manufacturing cost. In this case, our company encounter greater market competition from the low cost competitors from the Asia countries. Consequently, the company has to be innovating so as to sustain in the market.”

On the other hand, Kreinsen and Schwinge (2011) contended that customer demand is the factor to trigger the innovation activities in low technology industry. The turbulent market condition and the dynamism demand forcing firms to pursue innovation activities in order to secure the company's market position or creating new markets. Mr. A stated that “market demand’ is the factor in triggering the innovation in his company. Regarding that point, Mr. A indicates:

“Market demand is one of the reasons for us to innovate. Likewise, in our case, we noticed that veneer board production should not be merely emphasizing on the quality and production. The current trend of the wood furniture sector has shown us about the need to incorporate the art-state design. Therefore, we need to incorporate the art-state design in our manufacturing process. For instance, our company's products have incorporated the latest design from the market, as well as, any special design which is recommended by customers.”

Extensively, the design of the veneer board production in this company is grounded on the concept of “nature beauty”. Mr. A explicates their production concept as follows:

“Nature beauty signifies maintaining the natural appearance of grain and figure in the wood. The challenge in manufacturer veneer board is the slicing techniques. Raw timber from different species consist unique grain and figure. Veneer is obtained either by peeling or slicing the wood. In order to make sure the peeling and the slicing maintain the wanted grain and figure of the wood, it is important to calculate the cutting angle accurately.”

In essence, the customer no longer merely concerns about the quality and durable factors in the product. Aesthetic design may increase the market demand. This perspective is aligned with the view proposed

by Ratnasingam (2004), whereby he stated that “the furniture sold is based on art of stage design.” In other words, the product manufacture in this industry focused on value added for articulating the customers’ lifestyle rather than focusing on the quality of the products itself (Ng & Thiruchelvam, 2011). Corresponding to the art of state design, Mr. A commented that the veneer has great decorative value in the furniture sector. The manufacture of the veneer not limited in coating with the wood, or particle board. In this context, Mr. A annotated:

“Veneer can be glued onto both heat resistant glass and the core panel. The combination of these three components strengthens the structure and gives higher art-of state value. Indeed, our company is currently manufacturing the Veneer glass board. This product received great responses from the American and European customers. In fact, this product helps us to open the new market segment.”

Engaging in innovation activities is to open a new market segment as to improve the company’s market demand and market position in the wood based industry. In essence, company’s innovation is driven by the turbulent market condition (high competition), and customers’ demand. The objective of the company in pursuing innovation strategy is to open up a new market segment and improve company’ market position.

Theme 3: Innovation types and modes

Prior research showed that innovation in wood-based industry involved actively both in product and process innovation. For instance, Ng and Thiruchelvam (2011) have found that there are about two third of the innovators were actives in both product and process innovation. In this case, Mr. A indicates the product innovation implementation in his company with the following remarks:

“The new product is created by re-combination of existing component and the acquisition of the new material.”

In addition, Mr. A also indicates the process innovation implementation in his company as follows:

“The new production technique is introduced in order to get the new product creation. Our company has done the modification of the production techniques as to suit to the new product manufacture.”

The above statement made by Mr. A has in fact illustrated that both product and process innovation have been employed in his firm. Product innovation is complementary to the innovation process. The new product introduction involves change in the production techniques. For instance, the coating technique for the new product requires high heat, and the production steps are different than the other product production stages.

Reichstein and Salter (2006) found that product and process innovation decision in UK manufacturing firms are complementary. Extensively, radical product innovation is complementary to the innovation process. Furthermore, they also found a positive correlation between incremental process and product innovations. In this case, Mr. A stated that the new product is introduced simultaneously with the implementation of new production techniques. The findings undoubtedly implied the substantial relationship between product and process innovation.

On the other hand, innovation mode applied in Mr. A's company is in 'architectural mode'. He annotated that:

"The new product is created by using existing machine, a combination of new and existing raw material, and modifying production technique. Particularly, the new materials for this new product are glass, and timber wood. The new production techniques are the coating and peeling techniques. By using existing machine, and some existing ingredients (such as glue), we produce by combining the glass with tree bark using existing machine, but with new production techniques (high heat plus pressure coating technique). Later, we glue the (glass with tree bark upper layer) with a piece of wood board - existing product (as the lower layer)."

Architectural innovation here refers to "re-combination of existing components in order to obtain a new product design or a new technique in production process" (Kreinsen, 2008). Mr. A stated about the use of existing machine in the new technical process- high heat plus high pressure to manufacture the new product. In essence, this innovation is architectural process innovation. On the other hand, Mr. A mentioned about the use of new material combine with some of the existing product to give a new product design has indeed showed that the company is implementing architectural product innovation.

Theme 4: Innovation sources

Innovation sources in this case study represent customers, suppliers, competitors, government institutions, educational institutions, and trade

shows or the exhibitions. "Source" for innovation implies that the actors or events that provide insight or information to generate the innovative idea. In the interview, however, Mr. A has mentioned that government and education institutions and skill workers were not the main actors in contributing information to stipulate the innovation in the furniture manufacturing firms. The evidences may be narrated, thus:

"We have only interacted with the peers in the same sector while attending the Wood Furniture Association gathering. However, the knowledge sharing within the peers in the same sector is limited."

"Limited government effort and the involvement of educational institution in promoting the innovation activities infirm."

"The lower management staffs are not the major actors that engage in the innovation process."

Incidentally, the reason of the government institutions not involved in the company's innovation process is due to the fact that the company did not be aware about the government promotion or project which is related to the innovation. Furthermore, the internal staff - lower management staff (such as clerk, or secretary), and the skill worker are not actively participating in the innovation decision. Mr. A stated top management staff only actively involved in the innovation decision.

In contrast, Mr. A remarked that the owner is the key actor for the innovation generation. The idea of the new product development came from the owner. Mr. A stated that "the owner search the information online, and get the idea from the website. Furthermore, Mr. A contributing to the new product development process. As regards to Mr. A, he has pointed out his contribution to new product development as follows:

"Owing to the greater working experience in this manufacturing company, I have involved in the greater part of the management decision and operation process. Indeed, I have also involved in the company's innovation process."

Instead of the actors involved in generating innovative idea, the exhibition and trade shows have also played important role in creating the innovative idea. Mr. A annotated that "Our Company time to time arranges trips for the key employees to attend the trade show, exhibition of the furniture." By attending trade shows and exhibitions, the knowledge of the staff is enhanced which facilitates the innovative ideas in turn.

In addition, customers play a significant role in encouraging firm's innovation activities. According to Kriensen (2008), furniture sector is characterized as fashion-oriented industry. In this point of view, furniture sector players are the main customers for the company in this study. Thus, the new design and the functional feature of a product which is manufactured in this company has encountered with the rapidly changing customers' demand. Correspondingly, the customer is the main actor in contributing information to the company's innovation process. As regards to this context, Mr. A has stated that the new design idea for the product predominantly comes from the customer.

Theme 5: New knowledge formation in wood based company

The term of "innovation" always related to the terms of knowledge creating and diffusion (Robertson & Smith in Kreinsen & Jacobson, 2008). Specifically, through creating and diffusing the knowledge, the company is now said to be innovating. The OECD taxonomy (2011) defined the knowledge creation by using R&D intensity. Implicitly, OECD definition has indeed suggested that R&D activities are involving the major knowledge creation.

Kreinsen, *et. al.* (2005), however, argued that R&D data should not be the only empirical capture of knowledge formation in the industries. They suggested that, researcher should focus to capture the varied realms of knowledge formation in the industries. In addition, they have characterized the knowledge formation in the low-tech industries that is predominantly based on "practical" or "application-oriented".

"Practical" or "application-oriented" is distinct from the "theoretical" or "scientific" knowledge. This knowledge is created through "doing, using, and interacting mode" (Jensen, Johnson, Lorenz & Lundvall, 2007). In this case study, Mr. A informed that:

"Before starting to introduce this new product, we had experimented many times in order to get the correct material ingredients and production techniques. Throughout the trial and error process, we could finally find out the right way in manufacturing the new product."

The above statement made implied that Mr. A applied the practical knowledge to create the new product. They had tried many times to find the new way in the process making for creating the new products. Throughout "trial and error process", they learned a valuable lesson, and thus, by learning the mistake that has been made, they tried to improve

the techniques eventually until successfully creating the new product through learning in the process.

Kreinsen and Schwinge (2011) advocated that knowledge formations in low-tech industries strongly lied to the “structure path-dependency”. In essence, there are three levels of knowledge used in the low-tech industrial context. Basically these three levels are trans-sectoral level, sectoral level, and local level of knowledge. Trans-sectoral knowledge refers to “the market, institutional conditions that transcending the sectoral specific knowledge, whereby sectoral knowledge refers to sectoral specific and the established technological paths. In addition, local knowledge refers to the individual firm, or actors that embrace the existing knowledge and dimension from various dimensions.

As a matter of fact, in this case study, Mr. A stated that:

“Owner did the searching from the website and discovered the new product demand from the market. Instead of searching online, through visiting the trade show and exhibition, we could get an idea in the new product creation.”

“Specifically, trade show and exhibition attended is mostly regarded as the furniture trade show and exhibition. On the other hand, website searching is predominantly resorted to in decorative furniture or creative furniture website.”

He thus disclosed that the innovation knowledge gain by the owner was from the ‘furniture sector’. In this case study, the participant company is manufacturing the part of the furniture products. Thus, it is closely related with the furniture sector. The latest trend in the furniture sector has the direct effect on the product design for this company. Accounting to the closely linked with furniture products, the owners search the information through internet and attending the trade shows and exhibitions are signify that they received or acquired the knowledge at the “global level”, and later transform the knowledge into the innovation activities in their company’s manufacturing product.

In regarding transform action of the knowledge, Mr. A opined that

“In order to use the knowledge gained, one must have experience. Experience is important in transforming the knowledge gain into useful tools for the company.”

Mr. A.'s words have clearly revealed that knowledge transforming in company's innovation activities has to depend on the current stage of experience or in other words, practical knowledge possesses. In precise terms, "knowledge transform activity is relying on transforming the new knowledge gain by re-combining the existing practical experience." Explicitly, Kreinsen, *et. al.* (2005) denoted actor's knowledge is the pre-condition of the firm to transform the knowledge of the innovation activities. Kreisen, *et. al.* (2005) claimed that actor's knowledge and firm resources are both important internal capabilities of firms in transforming the knowledge effectively. In the sub-question section, Mr. A has further clarified that firm's resources, both the financial and machinery equipment, are important to transform the knowledge to the innovation activities. He noted:

"Our company has a complete set of machine to manufacture this new product. We have about 20 years of experiences in this area. We have steady financial condition and thus it gives the advantage for us, that we are able to purchase the complete set of machinery."

Regarding the scope of sectoral knowledge, Mr. A did mention that, they have limited interaction and knowledge sharing with the local competitors. Therefore, it is concluded that, in sectoral level, the knowledge dissemination between the peers are not encouraging.

LIMITATION OF THE STUDY

The case study basically discussed about the pattern of innovation conducted in the wood-based manufacturing firm. In this study, the researchers have adopted single case study approach. As Jensen and Rodgers (2001) have stated that this type of case study approach is to investigate the "objective of the studies of one research entity at one point in time." Nonetheless, by using this approach, the investigation of the topic is captured in detail, yet the result generated from this study cannot be generalized across the sectors in a developing economy.

In order to overcome the limitation issues in this case study, the researchers suggest that the future research should conduct the study in low-tech sectors and compare the innovation pattern, driver, and the role played by knowledge within the sectors. For instance, the future researchers can study the textile sector, food sector, and wood sectors by using multi-case study approach. By such an action, one can marvelously contribute to the body of knowledge and exposes to the entrepreneur class as to how the other low-tech sector innovates in their business activity.

CONCLUSION

The present case study research findings on innovation in the wood-based manufacturing firms outlined above detect interesting observations. Firstly, the innovation pattern in the wood-based manufacturing firm involved both products and process innovation. Indeed, product innovation is complementary with the innovation process in manufacturing firms. Sequentially, product innovation came first in the process, and followed by the process innovation. Both of the innovation types contributed to the new product development. Secondly, innovation mode for each type of innovation is closely related. For instance, in this case, both process and product innovation are in the architectural mode.

Thirdly, innovation in wood-based manufacturing firm is driven by the market demand and competition. Findings implied that the demand of the market and competition both induced the innovation activities. Finally, the findings from the case study have indicated that knowledge plays an important role in innovation. There are two levels of knowledge contributed to the innovation generation in the case study firm. These two levels of knowledge are trans-sectoral knowledge and local knowledge. The source of trans-sectoral knowledge is from the trade shows and exhibition, whereas the sources for local knowledge are from the experience posed by actors (internal employees and owner). Principally, the internal resources (capacities) are functional as the important factor as to transform the local knowledge and trans-sectoral into the innovation actions.

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