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Model of Inventions to Commercial Products for Thailand Innovator*

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Abstract: This research aimed to develop a model of invention to commercial products for Thailand inventors. The research was used qualitative research methodology, and grounded theory as research strategy. The key informants were classified into 2 groups; the first was innovators who had innovations to develop for commercial products which were outstanding, popular and creative in national and international level. The second was the customers who used the products which was commercial products and supported by National Innovation Office, derived from purposive sampling and snowball sampling. The data was collected by in-depth interview.

The research findings were that there were three stream process of taking invention to commercial products; Stream of the process consists of upstream midstream and downstream. In Upstream, the model of taking invention to commercial products in Thai entrepreneurs started from the customer's problem or Problem Based Customer: PBC. The entrepreneurs created the products by the problem and need of the customers. The innovation or products should be able to solve the customers' problem. In the Midstream, the research found that the entrepreneurs who create innovation or commercial products should be able to response the customers' need exactly. The innovation should be creative by using the research and development: R&D, to design, simplify, implement, improve to gain a prototype of commercial products. In Downstream, the research found that the channel for commercial distribution was very important. The target groups who used the products were specific in terms of niche marketing. To let the customers to use the products, the best channel for products distribution was the EXPO or Exhibition Fair for the products. The products' information should be accessed by the customers. The model of innovations to commercial products for Thai entrepreneurs is called Triple C; Commercialization Model composed of Customer: C, Creative: C, and Channel: C.

The research suggested that, the government should support by extending the channel of products distribution. In addition, the legal on patent for innovation should be legislated. Moreover, the entrepreneurs in Thailand should take the innovation for use and evaluate to confirm the products.

Keywords: Invention; Commercial products; Innovators.

I. INTRODUCTION

World Economic Forum: WEF, (2016) reported the annual ranking of competition ability on economy by the criterion of competitive advantage on 30 September, 2015. The report of 140 countries all over the world under the Global Competitiveness Report 2015-2016, it was found that Thailand between 2006 – 2016 was at the 32nd rank from 140 countries. The rank criterion of competitive advantage were as follow: (World Economic Forum, 2016; National Science Technology and Innovation Policy Office, 2015; The office of the National Research Council of Thailand (NRCT), 2013)

1. Basic function – the basic function of the country composes of 4 components concern the institution such as basic structure, macro economy, health, and basic education. Thailand is at the 42nd of 140 of the world ranking.
2. Function of Efficiency Shift up – this function is the main component to increase the efficiency of the country. There are 6 components; training and advance education, efficiency of the market, efficiency of labor market, financial market development, technology readiness, and size of market. Thailand is now at the 38th of 140 countries.
3. Function of innovation and business potential – this function is to make a competition potential. There are 2 components; expert or the business potential being and expert or innovation potential being. Thailand is now at the 48th of 140 countries.

The Thailand's effort to develop the country resulting in better ranking was done by using machine instead of the manpower. (Global competitiveness index: GCI) Science is continuing used for research and design. However the government still need to support applying knowledge for developing the commercial products. There was mechanism of education enhancement from the institutions and research center to the private sector to decrease the limitation and stimulate the commercial products. The organization can provide the technology information and develop the qualified personnel and cooperate among the government organizations, private sectors and international sector.

The government raises the necessary method for law enforcement on patent for the benefit of commercial products development. National Innovation Agency (NIA) was established to support and develop an innovation in order to achieve better and stronger system and organization of innovation resulting in the advantage of country competition. (Jondkham, 2012; The Federation of Thai Industries, 2014; National Science Technology and Innovation Policy Office, 2015).

However, National Science and Technology Development Agency, Office of the Higher Education Commission (OHEC), Office of the Vocational Education Commission (OVEC), Department of Intellectual Property, The Federation of Thai Industries, Office of Energy, Energy Policy and Planning Office - Ministry of Energy, cooperate to push the strategy of knowledge utilization in term of commercialization and add up the competitiveness of innovations in the world market. (Permpoontaweasap, 2015 ; National Science Technology and Innovation Policy Office, 2015).

Even though both the government and private sector supported the process of transform innovations to commercial products, the numbers of innovations to commercial products are still tiny and not be able to add up the value to country. During the year 2015-2016 the ranking of country was still at the 32nd of the world ranking which was one rank lower than the one in the year 2013-2014. (World Economic Forum,

2016) Office of the Higher Education Commission (OHEC) or Office of the Vocational Education Commission (OVEC) that was responsible for knowledge building and innovations development using student's knowledge and skill during studying achieved the number of successful innovations.

Office of the Vocational Education Commission (OVEC), Ministry of Education, is responsible for training the semi-skill, skill, technique and technology to manpower of the country. The competency standard should be harmonized to the economy, culture, environment labor market, and the technology advancement of the country. It is also responded the labor market's need and self-employment. The production of manpower in any career, the learners should be trained in practical for working and applied in working as well. The curriculum also identified the learners to gain knowledge, attitude and skill to apply for working and responding the labor market. The innovations from the project work identified the success or learning achievement of the learners according to the philosophy of vocational education. (UNESCO, 2000; Office of the Vocational Education Commission, 2014).

From the OVEC innovation expo data between 2004 to 2015, the selected innovation from regional level to national level were 9,042 innovations. Of that number, 1181 innovations got patents but were not able to reach the commercial products. Moreover, the acts or law of patent of transfer right of the commercial products are not available. (Som-udorn, 2015 The innovations were guaranteed on quality and ready for launching to commercial products but lack of the approved model to take innovations to commercial products immediately after production. The model can help the new entrepreneurs in vocational education or vocational innovators to produce truly commercial products. (Bureau of Vocational Educational Research and Development, 2014).

As mentioned, the systematic research to identify the model to take innovations to commercial products for the vocational innovators or new entrepreneurs in Thailand will lead to gain competitiveness on economy of the country. This study aimed to develop the model to take innovations to commercial products for the innovation entrepreneurs in advance.

II. RESEARCH METHODOLOGY

This research used a constructivism paradigm as a research methodology. The interaction between the researcher and research objectives was used to find the agreement and create a model. The knowledge sharing and discussion on information in terms of qualitative research, the researcher will create the grounded theory or construct knowledge from the study of social phenomenon. (Strauss & Corbin, 1998) It is believed that there are varieties of knowledge, reality existed in human which is valuable as the experience and culture or environment and relationship in human being. The method of knowledge construction in this research is constructivism paradigm. (Cresswell, 2013).

The researcher investigated the knowledge in terms of tacit knowledge from the stakeholder. The data from stakeholder was analyzed, then synthesized to create the theory and presented to explicit knowledge that was a grounded theory. (Creswell, 2007).

Key Informants

The 21 key informants were divided into 2 groups; the first was 10 key informants and the second was 11 key informants. The key informants were derived from confirming and disconfirming sampling of Miles &

Huberman. (1994) The selection of key informants in qualitative research from the innovators and the users of innovations were as follow:

Group 1 was 10 innovators who had produced innovation to commercial products with identity, and well known in creativity in national and international level. These 10 key informants were selected from the expert from Office of Vocational Education Commission, Ministry of Energy, National Research Council of Thailand in provincial, regional, and national level. The 10 key informants work for the organization that support the innovation creation such as The Federation of Thai Industries, The Securities Exchange of Thailand, Thailand Productivity Institute, National Innovation Agency, and Bureau of Vocational Educational Research and Development.

Group 2 was 11 key informants from the users of commercial products who were supported in academic and budget from National Innovation Agency or approved by the award in national, international level and the innovations were marked on the patent between the year of 2012-2015.

The researcher used Theoretical Sampling for sampling to collect and analyze data of the research. The number of key informants could not be identified in advance. The data analysis should be operated many times until the data was complete. The qualification of 21 key informants needed to be related with the research objectives and the data was to be saturated. Purposive Sampling was also used to consider the qualification of key informants to related with the research objectives including Snowball Sampling to gain adequate data by the experts to the others. (Creswell, 2007; Miles, & Huberman, 1994).

Research Instruments and the assessment of Research Instruments

The research instrument was an in-depth interview. Interview form was used to collect data. (Patton, 1990; Maykut & Morehouse, 1994; Berg, 1998).

The assessment of research instruments was done by triangulation method. The triangulation method of assessment had 3 different methods; observation, in-depth interview and literature review. (Denzin, & Lincoln, 2008; Patton, 1990; Creswell, 2009).

Data Processing and Collection

The researcher collect data by recording the answer of interviewees. The record was decoded and written in CD and computer and was printed finally.

The first step was to identify the 21 key informants by 1 week before the appointment for an interview.

The second step was to access the key informants to collect data. The researcher informed the key informants to give data voluntarily. The key informants were able to freely withdraw from the key informants of the research. The researcher informed the research objectives, process of data collection, and advantage of the research to the key informants. The advantages included the knowledge of model to commercial products, and the problem of developing innovations. The telephone appointment was used directly to the key informants.

The third step was to open opportunity of the key informants to give data, idea under the belief of key informants' qualification as the grounded theory study.

The fourth step was collect data by observation, interview, and literature review during the academic conference including the informal data collection.

The fifth step was to notice the data from the key informants by observation, note taking, photographs, sound recording and documentary.

The sixth step was to sort the data and finely describe the data as soon as the data collection finished to avoid the bias of the researcher.

The seventh step was to keep the data operated in safety place to protect data application by the others. The in-depth interview was done during February 2014 to November 2016 from 21 key informants.

Data Analysis

This research analyzed the data by translating the finding from in-depth interviewing. After that the researcher created the theory by theoretical sensitivity and also used computer program of ATLAS.ti version 7.0 trial version for data analysis management system. (Juangtrakool, 2008; ATLAS to Scientific Software Development, 2011) This research operated 3 steps of data analysis as follow: (Strauss & Corbin, 1998).

1. Open coding – this was the step of coding to make concepts, conceptual categories and themes. There were many codes for this step. (Saldana, 2009) The researcher read texts for three times from the interview to understand the context and then the researcher identified the code by underlining the important issue in the 4th round.
2. Axial coding – this step identified the characteristic of data to take innovations to commercial products. It showed the process and success model of taking innovations to commercial products. After the open coding step, the underlined data was taken to identify the code from the interviewees.
3. Select coding – this step was to take theme of data to describe the context or phenomenon of innovation development to commercial products.

From three steps, the researcher summarized and conformed the evidence which was harmonized and disagreed with the theory. This was to construct the new knowledge by systematic development and clarified conceptually coherent explanations. (Glaser & Strauss, 1967).

Academic Strength Presentation

The researcher used member checking technique of prolonged engagement and triangulation and the continuing observation for familiarity to the data of innovations. In 2014-2015, the researcher participated the seminar, worked as guest speaker, was selected to be a judge in innovation competition in northern region, discussion, associated, joined the workshop, participated national and international meeting on innovation and commercial products.

Research Ethics

The researcher realized the ethics of the researcher and used the principle of Bergand (Berg, (2004) and Researcher Ethic of National Research Council of Thailand (2015).

III. DISCUSSION AND CONCLUSION ON DATA ANALYSIS

Model of taking innovations to commercial products were as follow: Start by creating and developing the innovations to response the need of customers. In the research, in-depth interview was used by the key informants who were innovators and customers. The key informants, both innovators and customers, provided the same idea. This reflected the need of customers was very important for creating and developing the innovations. This was harmonized to the theory of creating innovations to be accepted and developed for commercial products. (Geoffrey, 1991; Rogers, 1983; Christensen, 1997; Schumpeter, 1934) The innovations or inventions should be suited with the niche marketing and solved the problem of customers in any group. The main idea of business model, the customers was the gold mine of business. The problem identification for the target group or customers such as the need, behavior or customer persona would be served directly for the customers as well.

After knowing the customers' need, the creativity and process of Research and development: R&D methodology including the design to produce products with usable, good looking, easy to use were necessary to the innovators. The implementation in loop by designing, implementing and developing until the products was complete to be a prototype. From in-depth interview, the key informants both innovators and customers had the same idea which was harmonized to Cooper, & Edgett, (2005) that start at developing the commercial products from the creativity and create the possibility using science and technology and niche market . The initiative step, the budget for trying out the products was not high. The experiment was in the laboratory and led to build business case or lab-scale development. The information of marketing, production and others were studied to gain a prototype, marketing and production possibility. The next step was the development step or pilot scale. The pre commercial was done and scale up in larger amount in the market. The data was analyzed for commercial products or nor depended on the testing and validating. The evaluation led to commercialization finally. This was the research methodology of Research and Development: R&D methodology.

The question to solve problem for customers was the main idea for creating innovations to commercial products for the innovators in Thailand. The conceptual framework and design with creativity would add value and quality of the products, not even the problem solving. The in-depth interview from key informants, the idea of key informants was harmonized to the research of Pinrod (2015), Chaiprasit (2010) and Boonyam (2011). The research identified the creation and development of innovation should take the knowledge, skill and creativity of innovators to apply for adding value for the products.

Moreover, the value and quality of the products was important as well. The key informants had the idea in the same direction. The innovators should create the valuable and qualified products to lead to the commercial products. This was harmonized to the research of A. Osterwalder and Pigneur. (2010), Regina, et., al. (2011), Chesbrough & Rosenbloom (2002) and Srisuphan (2014) The value proposition of innovations was able to add value for customers. This was the main function of decision making to consume the products of the customers instead of the competitors. The value of products might be the innovations or new approach or special qualification such as novelty, product quality or service, product design, or individual response for customers. brand, price strategy, cost reduction, risk reduction, and convenience of accessing products, including easy use of products.

Beside the application of innovations to commercial products of the innovators in Thailand, the questioning skill to take innovations to commercial products was very important. Were there the competitors? What was the value of innovations? What services made the customers use the products? Where did the products manufacture? Where was the service center? Were the design and service making satisfaction to customers? How large was the target group of products? Were there any problems of presenting or servicing products to customers? What was the cost of delivering products? What was the service and how to serve the customers? Those questions were harmonized to the research of David (2010).

The last process of developing model to take innovations to commercial products of the innovators in Thailand was the distribution channel for the customers and trying out the products. The expo of products distribution was used. The key informants both innovators and customers had consistent comment. This referred to the niche market or channel of product distribution was able to open opportunity of the customers to select the products and try out. The products should be tried out to evaluate the need of customers and make decision to buy products at last. The products should be usable and easy to use. The offline channel for product distribution was done by EXOP. This idea was harmonized to the research of Srisuphan (2014) which found the distribution and delivering products were very important to take innovations to commercial products to earn more income.

The conclusion of the research on creating model for taking innovations to commercial products for innovators in Thailand called as *Triple C: Commercialization Model*. The model consisted of three keys components; Customers, Creative, and Channel. The first C is Customer. The process of taking inventions to commercial products initiated at the Problem Based Customer: PBC. The innovators created the products by the need of customers and be able to solve the problem of customers. The second C is Creative. The innovators created the products by the need of customers and the products should solve the problem of customers and the products should be usable. After that the Research and Development: R&D methodology took the creativity in designing the products to easy use, modernization, gained quality and added value to the products. The products were tried out by customers and developed for better quality and gained the prototype of products. After the products was improved and got ready for distribution, the distribution channel for the customers to buy, use the products in niche marketing should be done. The third C is Channel. The products should be presented to customers. The most suitable way was to provide the expo. The expo was able to present the products and access the products to the customers. The products would be known to public or the target group.

From three processes of the model; Upstream Midstream and Downstream. The research was suggest that the government should support the distribution channel of innovations to make products more popular and let the customers to use and try out the products. Moreover, the law related to the patent of innovations should be made for the innovators in Thailand.

For further research, the entrepreneurs of innovations should take innovations to access to the customers for using and evaluated the products. This led to confirm the innovations that was usable and gained the quality. The research limitation was that the key informants should extend to other group of innovators and customers. The more innovators and customers in other field of innovations will make the research more complete.

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