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Article

New Product Development Framework based on University-Community Engagement: Case Study of Thailand OTOP Development for Elderly Consumer

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Abstract: This research project is one of the University-community engagement projects to study and initiate One Tambon One Product (OTOP) development in the three provinces of Chiang Mai, Lumphun and Lampang. This collaborative product development led to three new and innovative products for OTOP. This research defined and selected the elderly consumer groups from three northern provinces of Chiang Mai, Lumphun, Lampang. This study uses a survey and focus group discussion to identify the buying attitude of 1,275 elderly consumers toward the OTOP product. The quantitative analysis and the AHP technique were applied to identify the group of OTOP products selected for development. The potential top products were identified from the surveys. Then the value creation technique from local culture was employed to innovate the new products. This research developed a framework consisting of the three strategic stages of development. The cross-collaboration team are the primary enabler. The OTOP cooperative ecosystem was tested and found that this ecosystem can reciprocally benefit all the staff, including help configuring the organisation's context and its entrepreneurship.

Keywords: New Product, Analytic Hierarchy Process (AHP), Product Development, One Tambon One Product (OTOP)

1. Introduction

University-community engagement helps initiate new product development for universities to support local businesses and improve educational quality (Lehmann et al.,2009). Several new product development programs have been developed from the civic engagement program to enhance university engagement (Stenning & Miyoshi 2008). The networks of the university and community can significantly empower the

innovation process through collaborative and value co-creation. This collaborative product development and innovation can occur at different stages of the New Product Development process and can be substantially effective when online data are acquired and supplemented directly (Sawhney et al., 2005). Many researchers have proposed the product-development research and framework, emphasising different rationales for product development (e.g., Battistoni et al., 2013) involving proactive product development and tools. This research aims to present the methodology and framework of new product development interrelated with the University-community engagement mechanisms. This research illustrates how collaborative innovation is initiated and produces new product innovation for the local government-led initiative for local product development program called OTOP.

One Tambon One Product (OTOP) was initiated in 2001 to support the local economy by increasing entrepreneurial skills at the local "grassroots" level to generate higher income. This OTOP program increases the market and business of the OTOP (Denpaiboon & Amatasawatdee, 2012). This OTOP program helps enable the Thailand government to enhance and synergise the business with the social element of the sustainable development of Thailand (Brown, 1985). This program involves and induces many collaborative projects to improve the competitiveness of the OTOP product. Several OTOP product development programs have been implemented through collaboration between Thailand universities and the registered local OTOP entrepreneur or cooperative system. This OTOP program helps support and allows the locals to improve quality and upgrade their products (Natsuda et al., 2012). The OTOP program increases the value-added of local resources by incorporating the local culture into the product. The OTOP products are typically innovated based on the local culture concept and created from the local community resources. Several OTOP products are developed from naturally agricultural materials in the community (Joompha & Pianthong, 2018). Many handicraft OTOP products have been improved in style and quality. Many OTOP products have currently exported to global market. The OTOP product value thus creating self-reliance creativity, supporting the local labour and human resource development. However, all the OTOP product development programs have been run and supported by the Community Development Department Ministry of Interior with limited resources.

In order to enhance the product development of the OTOP, this research illustrates how the university-community engagement program can be involved and related to the new OTOP product development project to improve the value and scale of the product, especially for the new market. The OTOP product development all OTOP product groups are mainly designed for general customers with assorted markets. Since Thailand is becoming an ageing society, the business opportunities for the elderly is significantly increasing. However, up to present research knowledge, no research explains and presents the framework for increasing the OTOP business for this emerging elderly market. Therefore, this research aims to illustrate the methodology of OTOP product development, especially in the elderly consumer market in Thailand, which is increasing steadily. This research first defined and sampled the elderly consumer group from three northern provinces of Chiang Mai, Lumphun and Lampang. The survey and focus group methods were applied to the randomly sampled 1,275 elderly consumers to assess their buying attitudes toward the OTOP product. The results of customer requirements were used to derive the concept and develop the product target. This research presented the customer-focused, and collaborative framework by extending the actors and their role from the traditional product development paradigm to the new framework. The next section provides the literature reviews on the new product development. Section 3 presents the details of the framework of the proposed methodology for developing the new OTOP product. The last section provides a summary and discussion for future research.

2. Literature Review

The new product development process has come across and involves different business functions from strategic management, engineering, and marketing (Schilling & Hill, 1998). Successful designs must result in a commercial product, reach the marketplace, and generate an economic return. Several frameworks for the new product development process have been presented in the literature. For example, Schilling & Hill (1998) provide four basic strategic levels of technology, the organisational context, the construction and use of teams, and the use of tools for the new product development process. Recently (Brown & Eisenhardt, 1995) provided a good reference and summary for the new product development process, from idea generation and market analysis to product design and development until commercialisation. Even though the tool and technique used to derive product concepts are crucial for the project's success, the most important determinant of the new product's success is the concept of product advantage, i.e., the product's intrinsic value and unique benefits for the customers.

Similarly, the attractive cost regarding the quality and innovative features are also the critical success factors (Brown & Eisenhardt, 1995). Various study of new product development tools and practices shows that the success factors analysis has been used as one of the best practices and tool to identify the product function. However, the success of those practices depends on several factors. The factor of product characteristics must align with the market needs and cultural context. This research emphasised and adopted the process of acquiring customer needs in order to successfully drive the new OTOP product. The customer focus is the vital part of the product development and the information derived from the customer is crucial for this research to derive the product concept.

For a well-structured organisation like a company, strategies may exist to align the new product development process with current resources and competencies. Methodology and tools applied could be different depending on the organisation's competence, nature of the product, market and customer. However, the locals developed OTOP products mostly unstructured, lacking organisation, low levels of technology, and no teams. The locals lack the resources and competence to use the new product development tools for the process. In order to help improve the locals, such as through OTOP product development, Schilling & Hill (1998) addressed that the university-community engagement could be one of the mechanisms for a modern university to both retrieves the traditional civic role of the university and reciprocally enhances the education.

Moreover, the university has a unique opportunity to contribute to the economic vitality of the regions they serve (Bozic & Dunlap, 2013). Hence this research hypothesises that the university-community collaboration can be one of the pathways for the new product development in an environment like the OTOP program, where resources and competence are limited. Thus, through the work-based educational experiences, both instructor and student can serve a good role of innovator for the OTOP product development program. Both instructor and students can apply theoretical and applied knowledge to the OTOP needs of the new product design, new process creation, and standardised management practices. Therefore, this research then defines the new strategic levels of actors beyond that traditional framework.

Past studies found the market opportunity of OTOP can be improved based on the right strategy and selection of the drivers for the sales, which depend on different markets. However, this finding shows that the success of OTOP may depend on its size, age, and entrepreneurship. These are the general set of indicators or factors that drive the sale and export of the enterprise. It can be difficult to obtain a driver or enabler for the OTOP to adopt, especially for the new product development process. Therefore, this again indicates that the four basic strategies (Schilling & Hill, 1998) and the new product development process tools summarised by (Brewster et al., 2018) may not be theoretically applied by the OTOP. Hence this research will develop a new system of strategy that can enhance the new product development process by using collaborative resources and competence from the university as the enabler.

Several reports summarised and identified the indicators or factors related to the OTOP business management success. However, the many reports do not account for the inputs on consumer attitudes toward the product. In addition, the report or model on OTOP consumer behaviour is limited. Many reports demonstrated how to increase the scale and value of the specific OTOP product group, i.e., wood handicrafts (Phriwanrat, 2014) and processed food (Palikhe et al., 2019). Even if those results can be applied to increase the OTOP value, they are only applicable to specific products that may not relate to consumers' inputs, such as buying attitudes. There exist important factors for knowledge management that can contribute to the success of the five-star OTOP businesses in Thailand (Thammasang & Poonikom, 2016; Tuamsuk et al., 2013).

Nonetheless, those reported factors are unrelated to consumer inputs or the market's buying opportunity. Thus, the current research suggests that we lack information on the drivers or factors that relate to or consider information on the consumer inputs, such as buying behaviour for the OTOP product. Recently, Phanphet et al. (2019) reported that there exists a factor that can drive the sale of the OTOP Product in the elderly consumer market. It affirms that the analysis and acquisition of customer demands must be implemented strategically and orderly at an early stage. Hence, this research developed the framework that incorporates consumer needs and presented the analysis methodology for identifying the factors that can be used with the marketing strategy and concepts and cover all five major groups of the OTOP products. This research adopted the tool of the analytic hierarchy process (AHP) to define the priority of product set for new development. This AHP was developed in early 1970 by Phanphet et al. (2019) and has been applied and adopted widely to analyse the complicated decision making of multi-criteria types. The AHP is a systematic and structured approach to the pairwise comparison of the preferences among the alternatives. The decision-maker predefines different criteria. The AHP approach identifies expert opinions based on relative importance under pairwise comparisons with the alternatives.

The decision is then derived and reported in the total overall score computed for each alternative (Phanphet et al., 2019). The application of AHP for industrial product development is numerous (Kahn, 2014). However, the application of AHP in selecting OTOP products for development is very limited.

A limited OTOP product development strategy report considers all OTOP product groups' structures. Kasabov (2016) used the AHP technique only for the herbal product group to define the marketing strategies of Five-Star (OTOPs). Even though the authors considered and presented the marketing strategies for OTOP entrepreneurs, the data were collected and analysed simply from a single decision-maker, the presidents of the OTOP herbal-product enterprises in Songkhla province. The general finding of (1) widening the range of product sizes offered, (2) increasing the distribution channels, (3) publicising more about the products and promotional activities were provided. However, the study results are only applicable to a single sector of OTOP product herbal. Hence, this research developed the procedure for applying the AHP to prioritise which OTOP product among all groups that should be focused on new product development. Then the product development process, verification, and validation were carried out and proceeded as described by the following procedures.

3. Materials and Methods

Currently, the OTOP products are generated and produced by 7,255 Tambon (sub-district) located throughout Thailand. There are five groups of OTOP products which are (i) food, (ii) cloth, apparel, and accessories, (iii) beverages, (iv) herbal products, and (v) utensils, Decorative items and Souvenirs. The Thai Government must focus these five groups on improving their quality, function and aesthetics. These five groups are defined as the scope of the product. It will be developed and focused on the OTOP product development. This family of product scope is conferred using the collaborative cross-team consisting of the representatives from the Community Development Department Ministry of Interior, university professors and students, including the communities involved in the project. As described previously, this research will adopt the concept of the product advantage in developing the new product. The product characteristics, including product function and flexibility, must meet the consumer's needs and perceptions, especially in the elderly consumer market. For instance, the perceived quality, reason-to-buy, price and brand are common perceptions of consumers that must be accounted for during the product design phase (Aaker, 1991).

Consumers also consider quality awareness (Fornell et al., 1996) and product quality (Bei & Chiao, 2001). Thus, this research used a focus group methodology with IT enablers to determine the customer needs and perceptions. This research also identified factors that associate with the perception of the OTOP product, which can be used to increase the buying opportunity of the elderly consumer. Next steps, this research framework will prioritise those five OTOP groups. This research proposed and adopted the AHP to summarise and prioritise those alternatives. In the view of the AHP concept, these alternatives depicted at the lowest level of the model structure of AHP can identify which of those five OTOP groups product group. It will help put the final boundary of the product development scope to be clearly defined. This systematic and strategic approach helps identify which OTOP category defined as alternatives shall be focused on and emphasised. This prioritisation will combine and align with the championship OTOP system to rank and identify which group of products that shall be strategically focused. The university-community collaborative assessment on the customer needs will lead to new creativity for new market since the local resource and proud are reflected during the cross-team meeting. After the product realisation phase, the specification and prototype are created. The product verification and validation are followed.

The product innovation and business strategy are co-defined from the university-community engagement program. Several pieces of training and skill development of product and process are conducted to assess the product feasibility and economic vitality of the newly developed product. This research adopted the university-community collaboration to construct the ecosystem for the new OTOP product development where resources and competence are limited. Thus, through the case-based and work-based training, several university professors and undergraduate students of different disciplines have served as innovators for the OTOP product development. The professor applied their theoretical and knowledge to the OTOP new product design, new process creation, and standardised management practices, including packaging and marketing strategy. Therefore, this research then involves and defines the new strategic process and extends actors' scope beyond that traditional framework.

The research methodology starts by identifying the preferences and needs of the elderly concerning those five OTOP product groups. The output of the first stage becomes the input for the following stage. The driver and enabler are defined at different stages depending on the stage of the development. The cross-collaboration team is the main enabler who defines the product scope and inputs all the requirements

from the government regulation, supporting programs and policy. The university-community team are very important in acquiring and summarising the customer preferences and needs. The team then adopted the AHP technique to define and prioritise the specific product development categories and product advantage concept. Product development, verification, and validation are simply embedded in the second stage to form the product portfolio. The competence of the university professors and students used to drive the innovative product through the collaborative efforts and team. At the last stage of product creation, the portfolio and business activity were initiated and enabled by the cooperative-based system of the community. This research developed the framework according to the following hypothetical procedures as described in Figure 1 below:

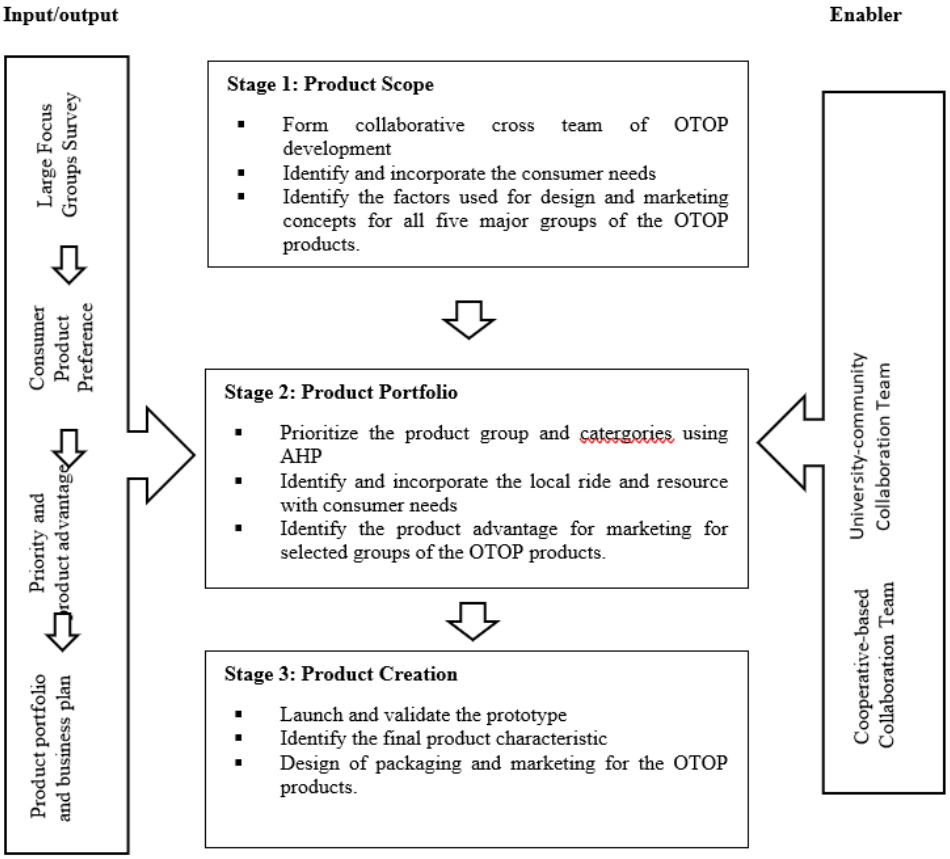

Figure 1. The framework for new OTOP product development

Figure 1 consists of the three strategic stages of development, e.g., Stage 1: Product Scope, Stage 2: Product Portfolio and Stage 3: Product Creation. The OTOP cooperative ecosystem was tested and found to reciprocally benefit all the staff, including help configuring the organisation's context and entrepreneurship. These cooperative-based teams enable the lacking factor and create the driver for the sale and export of the enterprise, as suggested by (Leonidou et al., 2002; Ogunmokun & Ng, 2004). This research depicted the framework as follows.

3.1. Stage 1

Product Scope-Identify the factors used for design and marketing concepts for all five major groups of the OTOP products. The cross-collaboration team started by defining the scope of product development based on those five main groups (i) Food, (ii) clothes, apparel, and accessories, (iii) Beverages, (iv) Herbal products, and (v) Utensils, Decorative items and Souvenirs. These five groups were defined as five alternatives for the cross-collaboration team consisting of the representatives from the Community Development Department Ministry of Interior, university professors and students, including the communities involved in the project.

The customer needs, perceptions, and the sale opportunity in the new market of the elderly group need to be acquired and synthesised. This research considered all 5 groups or categories of the OTOP products.

The collaboration team adopted the large focus group and survey across the three provinces. This research first defined the unit analysis as a product group instead of an individual product. The consumer perception data was collected by using the large survey and focus group method. The sample of 1,275 elderly consumers with 552 males and 723 females was obtained from three northern provinces of Chiang Mai, Lumphun and Lampang. Each respondent was asked and assessed their needs and preferences on buying attitudes concerning each OTOP product group. The responses were coded with nominal preference scales of three levels consisting of [Interested to buy], [Neutral], and [Not interested].

Quantitative analysis, cross-tabulation, Chi-square and regression techniques were used to develop the statistical model to identify which factors contribute to the consumers' preferences and attitudes. The buying preferences may differ among different consumer demographic characteristics. This research developed and tested statistical models to different explanatory factors drawn from the literature. The model building and model validation were also carried out and reported. Figure 2 depicts the data collection steps and identification of the consumer needs.

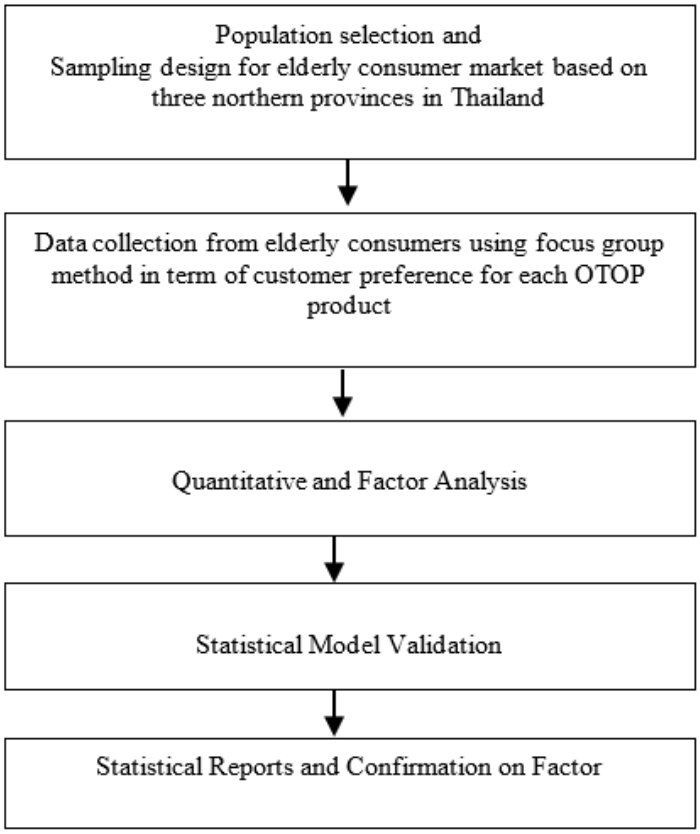

Figure 2. Customer Perception Identification

3.2. Stage 2

Product Portfolio-Prioritize the product group and categories using AHP. This research used the AHP technique to identify the priority of the OTOP group based on multi-attribute criteria (Suttipong et al., 2019). The research started with identifying the preferences and needs of the elderly consumer for each of those five OTOP product groups. The unit analysis was first specified using the product group. The priority of each group was obtained based on the data collected from a total of 1,275 elderly consumers of 552 males and 723 females sampled from three provinces. Each respondent was asked to pairwise report their needs and preferences on buying attitudes for each OTOP product group. The AHP technique was then used to derive the weights and priority of each product group. The authors consulted with the OTOP expert panels and developed four main criteria for justifying the alternatives. The criteria consist of (i) the Business contribution value to the OTOP program, (ii) Opportunity for new product development, (iii) Self-Sustainability of OTOP entrepreneurs, and (iv) Environment contribution value to society. Each group

of OTOP products defined as an alternative was then evaluated according to those criteria. The product group priority was summarised. Figure 3 depicts the overall steps of the research.

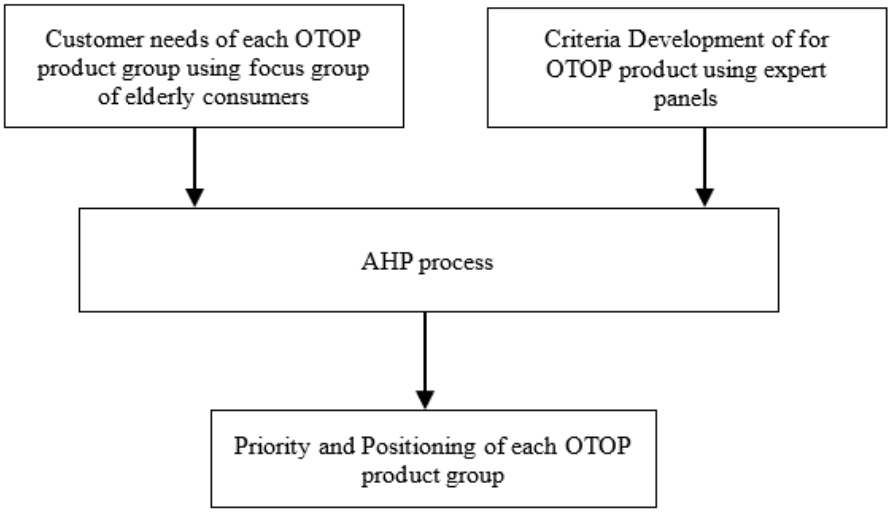

Figure 3. The AHP process of prioritising the OTOP product group
Adopted from Suttipong et al. (2019)

During this stage of development, the expert panels and literature review were used to define the four main criteria of BOSE model: Business contribution value to the OTOP program, the opportunity for new product development, Self-Sustainability of OTOP entrepreneurs, and Environment contribution value to society. This model was developed to find success factors, knowledge management processes, and effective production management. According to the business sustainability management perspective, the environment indicator was incorporated, and perceived quality and environment awareness of elderly consumers were derived from the focus group. These criteria are then used to calculate the priority of the OTOP product group for the development. For example, more details can be referred to Suttipong et al. (2019) and Phanphet et al. (2019) the factor analysis.

3.3. Stage 3

Product Creation- Identify the final product characteristic, packaging and marketing for the OTOP products. At this stage, the cross-collaboration team developed the sequential, holistic product creation approach to market realisation. The process started by defining the specific product in each group of OTOP products selected.

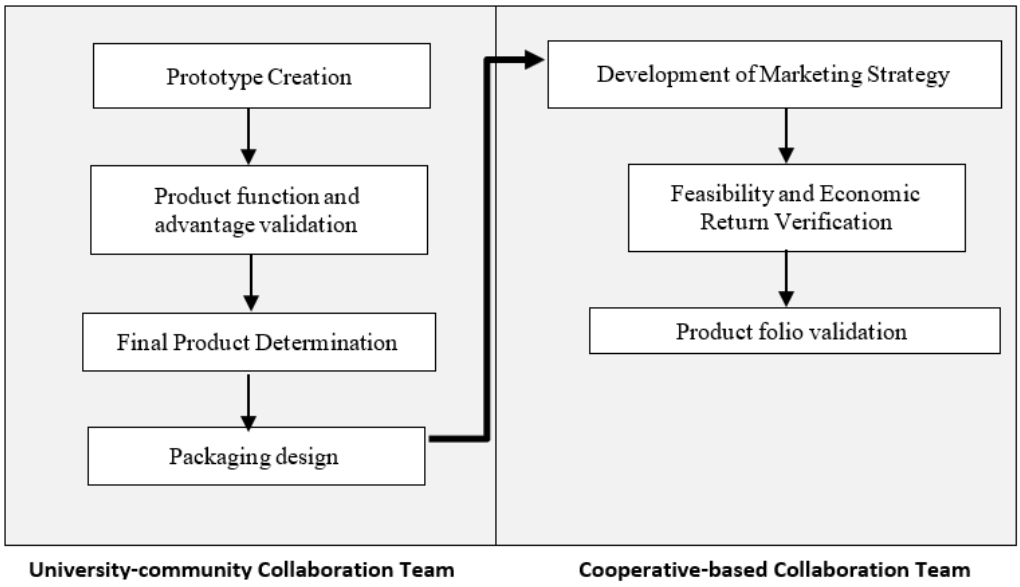

Figure 4. The sequential and holistic approach of the OTOP product creation

There is a total of 3 innovative products selected for market testing. The prototype and product function evaluation are carried out through the University-community Collaboration team. After the Final product is conferred, the marketing activities are carried out through the Cooperative-based Team. The cooperative system is the ecosystem that drives the organisational structure of the OTOP and configures the organisation's context and entrepreneurship. These cooperative-based teams enable and drive the marketing performance of the OTOP. Figure 4 depicts the overall steps of this stage.

4. Results and Discussion

The paralleled research shows that the Utensils, Decorative items and Souvenirs group received the highest buying preferences from the elderly consumer segment, followed by Beverage, Cloth and Apparel. The attitude of the buying preference of the final model of the analysis was done and presented in Figure 5.

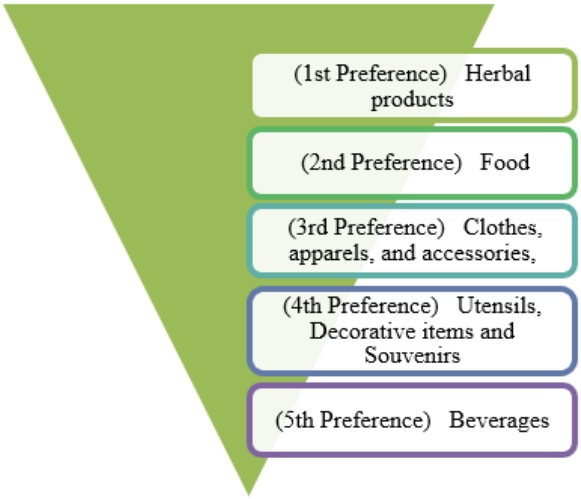

Figure 5. The elderly consumer product preference and needs

Figure 5 displays there is strong evidence that the elderly prefer the OTOP product group of the following order (1st Preference from Elderly Consumers): Herbal products; (2nd Preference from Elderly Consumers): Food; (3rd Preference from Elderly Consumers): Clothes, apparels, and accessories; (4th Preference from Elderly Consumer): Utensils, Decorative items and Souvenirs and (5th Preference from

Elderly Consumer): Beverages. Next, the product advantage and the prototype of five innovative products were initiated based on the collaborative efforts between the university and communities.

However, the assessment of customer needs using AHP indicates that the overall priority of the product group that should be developed is different from the customer preference. The research team has created the criterion for the AHP technique to be applied to develop the priority of each product group. Since the success of the product and business opportunity depend on several factors, this research employed expert panels and literature to develop and define four main criteria of Business contribution value to the OTOP program. The opportunity for new product development, Self-Sustainability of OTOP entrepreneurs, and Environment contribution value to society. Each group of OTOP products was evaluated according to these criteria, and the results of product group priority were described in Figure 6. Figure 6 depicts the overall output from Phase 2 with priority. 1st Preference for Product Development: Utensils, Decorative items and Souvenirs; 2nd Preference for Product Development: Beverages; 3rd Preference for Product Development: Clothes, apparel, and accessories; 4th Preference for Product Development: Herbal products; 5th Preference for Product Development: Food

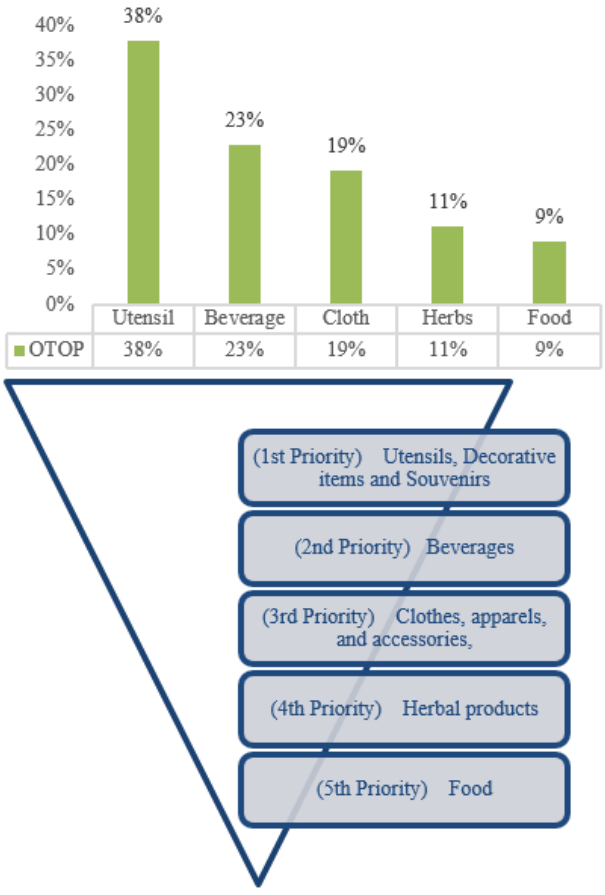

Figure 6. Priority weights of OTOP product group.

The collaboration team have deployed several focus groups to validate the product function and its advantages and determine the final product characteristics. The packaging and the marketing were then given and carried by the communities' cooperative system. The final three innovative products are tested and sold in the market. The business continuity and the economic returns are evaluated and measured. The OTOP program endorsed the details of the product and its specification. The study results showed that this presented framework of the OTOP development represents the practical methodology to improve the OTOP product for the new emerging elderly consumer market in Thailand.

5. Conclusions

This University-community engagement project proved effective and provided a framework for practitioners who want to initiate new OTOP product development. The framework of this research was tested within the three provinces of Chiang Mai, Lumphun and Lampang using the collaborative product development program. At least one new and innovative products in each group of OTOP were able to be identified and developed. This defining and selecting of the elderly groups sampled from three provinces of the northern region are vital to the input of the phase stage of product scope. This research defined the product scope and customer preferences from the large survey in Chiang Mai, Lumphun and Lampang. The quantitative analysis based on the results of large systematic focus groups with the application of the AHP technique led to identifying the top-ranked groups of OTOP products that need to be strategically emphasised. The analysis results lead to a strategic action plan for product development to be initiated. Then the value creation technique from local culture was employed to innovate the new products based on the collaborative team. The final innovative products were tested and sold in the market generating economic returns for the communities. The OTOP regulators and offices endorsed the details of product and its specification.

The actual results of the study support that this presented framework of the OTOP development represents the practical methodology to improve the OTOP product for the new emerging elderly market in Thailand. The construct reliability of the proposed framework was also validated during the phase 1 and 2 implementations. This proposed framework can be adopted by researchers in different provinces and helps the Thai government support and run the OTOP program product development policy effectively. However, the effectiveness of the OTOP product development policy deployment also depends on the entrepreneurs' business management. This research constructed the ecosystem where the cooperative units of the communities are used to configure the organisation structure for running the product development and marketing activity. The results of economic return represent the model validation which can be proven effective. This study's results can apply to the product in the elderly market other than in the north of Thailand.

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