

THE DEVELOPMENT OF PRODUCT DESIGNED FROM NATURAL MATERIALS

Pornpimon Sakda*, Bovan Krourat and Wararat Watthanachanobon

Rajamangala University of Technology Rattanakosin, Thailand

ABSTRACT

***Corresponding author:**

Pornpimon Sakda
pornpimol.sak@rmutr.ac.th

Received: 2 May 2020

Revised: 30 June 2021

Accepted: 8 July 2021

Published: 2 December 2021

Citation:
Sakda, P., Krourat, B. and
Watthanachanobon, W. (2021).

*The development of product
design from natural materials.*

*Humanities, Arts and Social
Sciences Studies 21(3):
601-608.*

This research aims to develop community products from natural materials for Sukasem Occupation Group, Bang Len Subdistrict, Bang Len District, Nakhon Pathom Province by evaluating opinions toward community product form and survey purchasing behavior and factors affecting the purchasing of designed and developed community products. Research tools include 1. Semi-structured interview form, 2. Evaluation form of product characteristics and, 3. Satisfaction questionnaire. Data Analysis using statistics are as follows: Percentage, Mean and Standard Deviation. The results showed that the group needs to develop these products, women's handbag, shoes, hat, bookmark, and spa packaging. The expert evaluation results found that the utility of the product was at a high level ($\bar{x} = 3.78$; S.D. = 0.41), followed by the beauty at a high level ($\bar{x} = 3.75$; S.D. = 0.44). Suitable materials at a high level were shoes, hat, and spa packaging ($\bar{x} = 3.74$; S.D. = 0.44). The survey of purchasing behavior and factors affecting the purchasing of designed and developed community products found that most sample groups had the highest demand for shoes (40%) followed by women's handbag (20%), hat (18%), spa packaging (15%) and bookmark (7%). The factors that resulted in purchasing of the designed and developed community products were the products with unique designs from the general products in the market. The unique design products were ranked at the highest level ($\bar{x} = 4.78$; S.D. = 0.42). Followed by a variety of applications, it was classified at the highest level ($\bar{x} = 4.61$; S.D. = 0.49); a selection of suitable materials for use was at the highest level ($\bar{x} = 4.60$; S.D. = 0.49); beautiful patterns that match the needs of consumers were ranked at the highest level ($\bar{x} = 4.59$; S.D. = 0.49). Finally, the products that still showed the uniqueness of the handicrafts were ranked at the highest level ($\bar{x} = 4.56$; S.D. = 0.50).

Keywords: Products; natural; water hyacinth; Ban Sukasem Occupation Group

1. INTRODUCTION

National development through various projects run by government-controlled organizations is the driven unit to promote and support people's quality of life to have careers, well-being, jobs, and income by using resources in the community to create value products for sale. For example, One Tambon (meaning sub-district) One Product (OTOP) project, takes care of outstanding products from each community with potential, knowledge and different resources. It can group people in each community together in order to

create job opportunities. In the past, relevant agencies have campaigned for each community to group by occupation or by enterprise to create value-added-on local resources to increase product sales in different areas. The result of emphasizing help for career groups and enterprise groups caused Thailand to have many professional groups and enterprise groups at a higher rate, respectively. Another important problem is due to market competition, especially OTOP products. Many of the OTOP products in the market have the same style, shape, and form. Thus, it is easy to duplicate and imitate, which creates confusion among consumers and can damage economic value and the reputation of many prototype products. Prachatai (2006) mentioned the products being promoted under One Tambon One Product (OTOP) that caused some businesses to be about to collapse because of chronic problems resulting from oversupply, similar to or duplicate products in the same sub-districts, the province as well as in other regions resulting in a price war. As a result, some entrepreneurs sold products at par to drawback investments; some sold less than their capital to eventually liquidate. Also, the domestic market was quite stagnant due to the economic slowdown and the purchasing power of domestic consumers was relatively low, causing entrepreneurs to be interested more in exports. The main focus for exports is the image of the product in that they should have outstanding potential, show uniqueness and identity as well as create consumer confidence. They are important factors not less than the products. Creating a good image of products by giving importance to the design of the packaging can create distinctive, unique and reliable products and create a stimulus for consumers to purchase more than the same products in the market. Withatanang (2015) concluded that basketwork products were considered to be traditional Thai handicrafts that inherited local knowledge from past generations to the present through the process of various methods to be used as tools, functional appliances for everyday life. As time has changed, new technologies have a greater role in life; basketwork products have been changed to suit the modern era with new models, new implementation and modern materials other than local and natural materials to be more exotic. Basketwork product models have been developed and built continuously. At present, the form of basketwork products can increase income for families and communities and can become a small business that can be seen everywhere in the market. So the relevant departments have to give importance to this type of product. Basketwork products are a part of the "One Tambon One Product (OTOP)" project established by the government in order to let the community bring their local knowledge to create unique work by establishing village and urban funds under the country's economic and poverty alleviation policy. The project started by stimulating the government's grassroots economy, focusing on developing and promoting businesses in the community or community enterprises to have their own income, can be self-reliant and have a better quality of life. The government also requires each community or district to have at least one type of product that uses local knowledge or local resources in the production and develops that local knowledge to create commercially beneficial products. The community should connect in a systematic way to increase co-development.

Ban Sukasem Occupation Group, Bang Len District, Nakhon Pathom Province has many knowledgeable teachers in handicrafts such as weaving, weaving water hyacinth, bamboo weaving, etc. All of the materials are natural. If there is an integration of that knowledge together to create new and different products distinct from other groups, it will help increase revenue for the group. This research aims to have participation from group members to create a product development plan for a career based on the use of resources within the community and local knowledge, promoting unique products as community products and using those community products as a selling point with further development to increase production value to benefit the community, leading to sustainable self-reliance. Leesuwan (1992) gave the idea of inheritance and existence of arts and crafts which locally could utilise artwork to create the products; it was equal to inherit traditional arts and crafts. It was also adding value to local resource materials to be worthwhile. For example, souvenir products can sell at a good price because tourists are consumers with high purchasing power, so it can create a career for local workers who are unemployed after the harvest season. The research team, therefore, has the idea of integrating collaboration between researchers and entrepreneurs according to the needs of entrepreneurs (stakeholders), which will promote research and development of innovation on packaging, products, production processes, upgrade the product standard, increase the competitiveness and upgrade the levels of entrepreneurs in the design and development of products by using natural materials with the standard on the community products, based on community participation which will benefit the community and can make the community self-reliant in the future.

2. RESEARCH OBJECTIVES

1. To study the possibility of product design from Natural Materials in Ban Sukasem Occupation Group.

2. To design and develop products from natural materials following community product standards based on participation.
3. To evaluate the opinions about products from natural materials that are designed and developed.

3. RESEARCH METHODOLOGY

The Development of Product Design from Natural Materials in Ban Sukasem Occupation Group, Bang Len Sub-District, Bang Len District, Nakhon Pathom Province

1. The main participants were the chairperson of the Ban Sukasem Occupational Group, group members and community members who were able to provide information based on educational objectives. There were 10 people from specific selection and select group members and the community as suggested by the group president (Snowball Sampling).
2. The tools used in the research were 1. The semi-structural interview form of a small group meeting, needs and ways to develop a new product of the group 2. Checklist for finding community product formats (2D drawings) and 3. Checklist for finding community product formats (3D drawings)
3. Methods of research / Data collection
 - 3.1 Analyzing, synthesizing relevant information from literature reviews and small group meetings as the basis for the design.
 - 3.2 Summarizing of community product types that will be designed and developed with groups and communities.
 - 3.3 Drawing a 2-D sketch and 3-D Sketch of different types of products. Letting the group select the product type that meets their needs by using the checklist to find the product model of the community (2D drawing) and the checklist for finding the product model of the community (3D draft).
 - 3.4 Creating a Mock-Up model to study and analyse and correct various defects before creating a prototype product with development.
 - 3.5 Preparing materials and equipment for product prototype development with the group.
 - 3.6 Developing prototypes of products together with group members to go to the process of evaluation by experts and consumers.

The Evaluation of opinions on designed and developed community product

1. Population and examples were 5 from experts/design developers/community developer that was specified according to specified criteria: to have expertise or experience in community product design, can apply local knowledge to product development.
2. The tools used in the research were the product characteristics evaluation form, according to community product standard criteria by setting the grade level and criteria for checking product characteristics by community product standard criteria of Water hyacinth products (39/2003), which has 5 points as follows: The score 5 means the highest, The score 4 means high, The score 3 means medium, The score 2 means low and the score 1 means the lowest.
3. Methods of research / Data collection
 - 3.1 Experts assessed the characteristics of community products that are designed and developed according to the product feature evaluation form to create a prototype selected to be used in the market trial
 - 3.2 The improvement according to the suggestions and produce work for submitting an evaluation of product quality certification for the community.
4. Quantitative data analysis: the researchers used statistic, percentage mean and the standard deviation to analyze data by specific items and collecting all aspects and presenting them in a table format with description. The criteria in the analysis to assess from the mean range as follows:

Mean 4.51 - 5.00 means the product has the most suitable form
 Mean 3.51 - 4.50 means the product has a very suitable form
 Mean 2.51 - 3.50 means the product has a moderate form
 Mean 1.51 - 2.50 means the product has a less suitable form
 Mean 1.00 - 1.50 means the product should be improved

The Survey of purchasing behaviors and factors affecting on purchasing designed and developed community products

1. Population and examples are 100 general consumers that have been chosen by chance at events that the group has been invited to exhibit.
2. The tools used in the research were the consumer satisfaction questionnaire on community product designs that were designed and developed. The score has 5 levels as follows: The score 5 means the highest. The score 4 means high. The score 3 means moderate. The score 2 means low and the score 1 means to the lowest.
3. Methods of research / Data collection
 - 3.1 Bring the product prototype to be exhibited with the exhibition / sell
 - 3.2 The research sample evaluates the satisfaction with the designed and developed community product model.
 - 3.3 Compile, analyze, and summarize evaluation results.
4. In Quantitative data analysis the researcher used statistic, percentage mean and the standard deviation to analyze data by specific items and collecting all aspects and presenting them in a table format with description. The criteria in the analysis to assess from the mean range as follows:

Mean 4.51 - 5.00 means the product has the most suitable form

Mean 3.51 - 4.50 means the product has a very suitable form

Mean 2.51 - 3.50 means the product has a moderate form

Mean 1.51 - 2.50 means the product has a less suitable form

Mean 1.00 - 1.50 means the product should be improved

4. RESEARCH RESULTS

The result of designing and developing the product model of community based on local knowledge in handicrafts of Ban Sukasem Occupation Group, Bang Len Sub-District, Bang Len District Nakhon Pathom Province

The results of the brainstorming meeting concluded that the group proposed guidelines for material development, new production processes and product formats by using water hyacinth as the main raw material. Since it is a plant that is readily available locally and combined with dyeing and weaving techniques. Techniques for weaving cotton fibers and water hyacinth fibers can develop products in 5 categories which are 1) women's handbags 2) shoes 3) hats 4) bookmarks and 5) spa packaging (Figure 1). To present the overall concepts of all products is Folklore lifestyle by using natural materials as the main components of the products, designing a look relevant to the local way of life, cutting with a simple appearance and conveying a sense of folklore as well.



Women's Handbag



Shoes



Hat



Bookmark



Spa Packaging

Figure 1: Water Hyacinth Products

Evaluation results of opinions on community product models

1. The evaluation of opinions on the community product of women's handbag found that the utility of the product was at a high level ($\bar{x} = 3.79$; S.D. = 0.41), followed by beauty ($\bar{x} = 3.75$; S.D. = 0.44) and the durability in use ($\bar{x} = 3.74$; S.D. = 0.44) and the least average side was the material in use which was at high level ($\bar{x} = 3.73$; S.D. = 0.44).
2. The evaluation of opinions on the community product of shoes found that the durability and strength in use is the most suitable level ($\bar{x} = 3.81$; S.D. = 0.39), followed by the product utility ($\bar{x} = 3.80$; S.D. = 0.40) and the beauty and materials in use had the same average value ($\bar{x} = 3.74$; S.D. = 0.44).
3. The evaluation of opinions on the community product of hat found that the utility of the product was at high level ($\bar{x} = 3.82$; S.D. = 0.38), followed by the same average of beauty and durability in use at high level ($\bar{x} = 3.78$; S.D. = 0.41). The least average aspect was the material in use of the product which was at high level ($\bar{x} = 3.74$; S.D. = 0.44).
4. The evaluation of opinions on the community product of bookmark found that the materials used were suitable at high level. ($\bar{x} = 3.73$; S.D. = 0.45), followed by the utility of the product averaging at high level ($\bar{x} = 3.71$; S.D. = 0.49). The average of beauty was at high level ($\bar{x} = 3.54$; S.D. = 0.62). The durability of the product was at high level ($\bar{x} = 3.47$; S.D. = 0.67).
5. The evaluation of opinions on the community product of spa packaging sets found that the utility of the product averaging at high level ($\bar{x} = 3.79$; S.D. = 0.41), followed by the durability of the product at high level ($\bar{x} = 3.76$; S.D. = 0.43). The average of beauty is at high level ($\bar{x} = 3.75$; S.D. = 0.44). The least average aspect was the material in use of the product which was at high level ($\bar{x} = 3.74$; S.D. = 0.44).

The evaluation results are shown in Table 1.

Table 1: Average, Standard Deviation and the Level of Opinions on Community Product Models

Assessment Details	Handbag		Shoes		Hat		Bookmark		Spa Packaging	
	\bar{x}	S.D.	\bar{x}	S.D.	\bar{x}	S.D.	\bar{x}	S.D.	\bar{x}	S.D.
Evaluation criteria for the utility of the product	3.79	0.41	3.80	0.40	3.82	0.38	3.71	0.49	3.79	0.41
1. The products are comfortable to use	3.78	0.42	3.81	0.40	3.83	0.38	3.74	0.46	3.77	0.42
2. The design is related to the main utility of the products	3.84	0.37	3.86	0.35	3.87	0.34	3.73	0.51	3.85	0.36
3. The products have the characteristics of being strong, durable, easy to maintain and store	3.71	0.45	3.71	0.45	3.77	0.42	3.66	0.49	3.74	0.44
4. Products are related to size, proportion of users	3.86	0.35	3.83	0.38	3.88	0.33	3.74	0.47	3.86	0.35
5. The products have characteristics that tell the actual use, usefulness, convenience, consistent with the products	3.74	0.44	3.75	0.43	3.77	0.42	3.67	0.52	3.74	0.44
6. The products meet the needs of users, consumers, prices and production costs	3.79	0.41	3.82	0.39	3.80	0.40	3.73	0.46	3.79	0.41
Beauty evaluation criteria	3.75	0.44	3.74	0.44	3.78	0.41	3.54	0.62	3.75	0.44
1. The products have unique expression of creativity in design, shape, pattern, and unique usage	3.62	0.49	3.64	0.48	3.64	0.48	3.51	0.58	3.62	0.49
2. The products formatted are accurate, are compatible with the overall components	3.71	0.45	3.70	0.46	3.74	0.44	3.60	0.55	3.71	0.45
3. Colorful appearance with interesting patterns and decorations	3.87	0.34	3.86	0.35	3.92	0.27	3.57	0.66	3.86	0.34
4. The products have the suitability of the overall form. The harmony of materials, patterns, colors, shapes, complete with all the elements	3.69	0.47	3.69	0.47	3.75	0.43	3.46	0.63	3.70	0.46
5. The products have a consistent shape and not distorted, looks strong	3.82	0.38	3.80	0.40	3.84	0.37	3.60	0.62	3.82	0.39
6. The products have a symmetrical size which is suitable for actual use	3.76	0.43	3.77	0.42	3.81	0.40	3.52	0.67	3.76	0.43
Evaluation criteria for durability in use	3.74	0.44	3.81	0.39	3.78	0.41	3.47	0.67	3.76	0.43
1. The products have integrated production including replacement materials, suitable attachment are compatible with other material and does not cause the work to lack natural beauty	3.78	0.41	3.84	0.37	3.79	0.41	3.34	0.75	3.81	0.40
2. The products are durable in normal use	3.60	0.49	3.71	0.45	3.68	0.47	3.40	0.64	3.62	0.49
3. Maintenance is not complicated	3.84	0.37	3.89	0.32	3.87	0.34	3.66	0.58	3.84	0.37

Table 1: Average, Standard Deviation and the Level of Opinions on Community Product Models (Continued)

Assessment Details	Handbag		Shoes		Hat		Bookmark		Spa Packaging	
	\bar{x}	S.D.	\bar{x}	S.D.	\bar{x}	S.D.	\bar{x}	S.D.	\bar{x}	S.D.
Evaluation criteria for materials	3.73	0.44	3.74	0.44	3.74	0.44	3.73	0.45	3.74	0.44
1. Production materials are strong, durable, flawless, smooth, straight, suitable for the product and they are local materials that comes mainly from nature	3.70	0.46	3.71	0.45	3.73	0.45	3.68	0.47	3.71	0.45
2. The structure size is suitable for production	3.66	0.47	3.70	0.46	3.69	0.47	3.66	0.47	3.67	0.47
3. The material production process is suitable for application in product creation	3.76	0.43	3.76	0.43	3.76	0.43	3.76	0.43	3.76	0.43
4. The materials used are safe for the body and non-destructive for the environment	3.70	0.46	3.70	0.46	3.70	0.46	3.70	0.46	3.70	0.46
5. The production process is convenient and suitable for the material	3.84	0.37	3.84	0.37	3.84	0.37	3.84	0.37	3.84	0.37

The results of the survey of purchasing behavior and factors affecting the purchasing of community products that are designed and developed

The survey of purchasing behaviors and factors affecting the purchasing of designed and developed community products found that most of the participants were female, 59.02 percent, and 40.98 percent were male, most of them were aged between 35-44 years, 32.79 percent, followed by those aged between 25-34 years, 25.41 percent, and those aged between 45-54 years, representing 22.13 percent. Most of them were company employees, 36.89 percent. Some of them are civil servants / state enterprise employees and students, their numbers were equal at 13.93 percent and the rest of them owned a personal business, 13.11 percent.

1. The satisfaction with the product model found that the participants were satisfied with the shoes type for the first rank, with the highest average value ($\bar{x} = 4.57$; S.D. = 0.50). The second rank was women handbag ($\bar{x} = 4.50$; S.D. = 0.50). The Third rank were hat and spa packaging by getting the same average value ($\bar{x} = 4.49$; S.D. = 0.53). The last rank was bookmark ($\bar{x} = 4.39$; S.D. = 0.49) as shown in Table 2.

Table 2: Average, Standard Deviation and the Level of Satisfaction with the Product Design and Development

Product form	Opinion Levels					\bar{x}	S.D.	Sequence
	Highest	High	Medium	Low	Lowest			
1. Women handbag	61 (50.00)	61 (50.00)	0 (0.00)	0 (0.00)	0 (0.00)	4.50	0.50	2
2. Shoes	70 (57.38)	52 (42.62)	0 (0.00)	0 (0.00)	0 (0.00)	4.57	0.50	1
3. Hats	62 (50.82)	58 (47.54)	2 (164)	0 (0.00)	0 (0.00)	4.49	0.53	3
4. Bookmark	47 (38.52)	75 (61.48)	0 (0.00)	0 (0.00)	0 (0.00)	4.39	0.49	5
5. Spa	62 (50.82)	58 (47.54)	2 (164)	0 (0.00)	0 (0.00)	4.49	0.53	3

2. The survey of purchasing behaviors and factors influencing purchasing, found that the product design factors were unique from general products in the market and they had the highest average with the highest level ($\bar{x} = 4.78$; S.D. = 0.42) Due to the designed and developed products, woven fabric from water hyacinth fibers were used as a main raw material in product development that was not produced widely in the market. There are only a few community enterprise groups that can weave water hyacinth fibers and production restrictions including requiring high expertise in weaving. The aspect of having a variety of usage forms was ranked at the highest level ($\bar{x} = 4.61$; S.D. = 0.49). In terms of choosing the suitable materials for use it was ranked at the highest level ($\bar{x} = 4.60$; S.D. = 0.49). The beautiful patterns that match consumer needs was ranked at the highest level ($\bar{x} = 4.59$; S.D. = 0.49). The uniqueness of the handicrafts was ranked at the highest level ($\bar{x} = 4.56$; S.D. = 0.50) as shown in Table 3.

Table 3: Number, Percentage, Average, Standard Deviation and the Level of Opinion of the Participants on Purchasing Behavior and Factors Influencing Purchasing

Purchasing behavior and influencing factors in purchasing	Opinion					\bar{x}	S.D.	Interpret
	Highest	High	Medium	Low	Lowest			
1. There are beautiful patterns that match consumer needs	72 (59.02)	50 (40.98)	0 (0.00)	0 (0.00)	0 (0.00)	4.59	0.49	Highest
2. There are various forms of use	75 (61.48)	47 (38.52)	0 (0.00)	0 (0.00)	0 (0.00)	4.61	0.49	Highest
3. The design of the product is unique from other products in the market	95 (77.87)	27 (22.13)	0 (0.00)	0 (0.00)	0 (0.00)	4.78	0.42	Highest
4. There is a selection of suitable materials for use	73 (59.84)	49 (40.16)	0 (0.00)	0 (0.00)	0 (0.00)	4.60	0.49	Highest
5. The products still show the uniqueness of the handicrafts	68 (55.74)	54 (44.26)	0 (0.00)	0 (0.00)	0 (0.00)	4.56	0.50	Highest

5. SUMMARY AND DISCUSSION

The development of community products by using natural materials of Ban Sukasem Occupation Group, Banglen Sub-district, Banglen District, Nakhon Pathom Province, has processes in material development, production processes and product formats based on the communities' thinking by using water hyacinth as the main raw material. It is a plant that is readily available locally and combined with dyeing and weaving knowledge, weaving cotton fibers blended with water hyacinth fiber in developing 5 types of products 1. Women's handbags 2. Shoes 3. Hats 4. Bookmarks and 5. Spa packaging. The production is based on the idea of reflecting the local folklore by using natural materials as the main components of the products and designed to have a look that is relevant to the local way of life, simple appearance and conveys a sense of folklore as well. It is consistent with the research of Pattaranon (2010) that studied the development of local basketry handicraft products by using Participatory action research methodology: a case study of Baikapho, Thung Po Subdistrict, Chulaporn District, Nakhon Si Thammarat Province which has the main approach in the development of product by using of the waste left over from making Baikapo fan to develop his products. The research also related to Srisan (2006) study on product design and development from papyrus in the northeastern region which has been developed and applied by using papyrus together with other strong materials to produce new products, the research found that good new products can be created as well.

The form of community products designed and developed was evaluated in materials used, beauty, durability and utility. Evaluation criteria were applied to cope with the concept of product design elements (Na-Chumphae, 2007; Sudsang, 2005), the results can be summarized as follows:

1. The evaluation of product opinions on the pattern of community product: the utility of the product Women's Handbag is suitable at a high level, followed by beauty, durability in use and materials.
2. The evaluation of product opinions on the pattern of community product: durability in use of shoes is suitable at a high level, followed by the utility of the product followed by the materials used and beauty.
3. The evaluation of product opinions on the pattern of community product: the utility of the product Hat is suitable at a high level, followed by beauty and durability in use and the material used.
4. The evaluation of product opinions on the pattern of community product: the materials used for Bookmark were suitable at a high level, followed by the utility of the product and beauty and durability in use.
5. The evaluation of product opinions on the pattern of community product: the utility of Spa packing is suitable at a high level, followed by the durability in the use and beauty and the materials used.

Therefore, this research can conclude that the products designed and developed in the overview have on average a high level in many areas. It is in compliance with the research of Charoenwichianchay (2006) who concluded the research findings that most of the manufacturers and general public are satisfied with the design, pattern of home decoration that the researcher designed. There are also needs to continue utility of the product, there should be added presentation so they can show more about utility of product. Most of the sample group were satisfied the most with the shoes category, followed by women's handbags, hats, spa packaging and bookmarks. The factors influencing the purchasing found that the designed products that are unique from general products in the market are at the highest rank, followed by having a variety of usage forms. It is

followed by materials for use and beautiful patterns that match the consumer needs. Finally, products have to show the uniqueness of the handicrafts.

ACKNOWLEDGMENTS

This research has received research funding from The National Research Council of Thailand (NRCT). The researchers would like to thank Rajamangala University of Technology Rattanakosin for support of the research operation until completion according to the objectives. Also, the researchers would like to express their special thanks to the chairman of Baan Sukasem Occupation Group, Bang Len Subdistrict, Bang Len District, Nakhon Pathom Province and all group members.

REFERENCES

Leesuwan, V. (1992). *Handicrafts*. Bangkok: Bannangsue Publisher. [in Thai]

Na-Chumphae, S. D. (2007). *Effect of Technology on Design*. Bangkok: Odeon Store Publisher. [in Thai]

Pattaranon, J. (2010). *The Development of Local Basketry Handicraft Products by Using Participatory Action Research Methodology: A Case Study of The Group Baikapo, Thung Pho Subdistrict Chulabhorn District, Nakhon Si Thammarat Province*. Master of Education Thesis: Art Education Graduate school Srinakharinwirot University. [in Thai]

Prachatai. (2006). *OTOP, Who Will Benefit, Tracking Thaksinomics Impacts Grass-Roots*. [Online URL: <https://prachatai.com/journal/2006/02/22272>] accessed on November 25, 2018. [in Thai]

Srisan, S. (2006). *Design and Development of Products from Papyrus in the Northeastern Region*. Ubon Ratchathani: Faculty of Applied Arts and Design, Ubon Ratchathani University. [in Thai]

Sudsang, N. (2005). *Industrial Product Design Research*. Bangkok: Odeon Store Publisher. [in Thai]

Charoenwichianchay, W. C. (2006). *Pattern Design, Home Decor Products, Fabric Category of OTOP Products, Pathum Thani Province*. Pathum Thani: Faculty of Fine Arts, Rajamangala University of Technology. [in Thai]

Withatanang, W. (2015). Development on standards of basketry product for export. *VRU Research and Development Journal Science and Technology* 10(2): 67-83. [in Thai]