APPLYING SOCIAL NETWORK ANALYSIS TO PRODUCTION DEVELOPMENT OF LOCAL HAND-WOVEN GROUP IN THAILAND

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ABSTRACT

The objectives of this research were to study social network analysis for production development of Hand-Woven Group in material procurement, production, product development, and marketing. This research was carried out by using mixed-methods methodology which focused on a sequential explanatory design. Data were collected through social network questionnaires, observation, and in-depth interview. Quantitative data were analyzed by social network analysis program (Uci.net and Netdraw), and qualitative data were analyzed by qualitative data analysis software respectively (Atlas.ti).

Research results indicated that the structure of weaving process involved the preparation of warp and weft cotton, making Ikat cotton, dyeing, winding the warp threads, and waving process.   Social network analysis on material procurement also found that there were 2 groups involved in this activity. For the network analysis of production activity, there were 2 persons who participated in this process. However, the research result demonstrated that there were 4 people took part in product development step. Lastly, for the marketing activity, the result of social network analysis exhibited on 2 people joined in this activity.

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Significance of problem

At present, the idea of social network analysis is widely used in the social sciences because the social network analysis focuses on the structure of interactions and the connections among the individuals from the positions and duties internally or between groups leading to the deeper understanding on the system of relationships. This results in the collaboration and work obstacles more profoundly (Wasserman, & Faust, 1994; Scott, 2017). For the social network analysis in business organization, it is applied to study in production planning and product development as well as the business group analysis and entrepreneurship (Kim, Choi, Yan, & Dooley, 2011; Dempwolf, & Lyles, 2012; Leenders, & Dolfsma, 2015). It is mainly for large and official corporate studies (Todeva, 2006). As the social network analysis used in analyzing the small business or community enterprise is very few, this research wants to create knowledge for the operations of small business organizations focusing on the villagers' business groups having applied cultural capital and local wisdom to develop their own products. By applying the concept of social networking to the operation of the group, it is possible to realize the behaviors of the groups, people who play the roles in the group operations, coordination among groups, problems and obstacles of the group, nature and cooperation that will lead to the further development of the group's operations.

Woven fabrics and fabric products of Thailand are one of the country's uniqueness that is recognized for the beauty of colors and the refinement of the patterns. It has its own unique characteristics which are influenced by customs, traditions, beliefs, and cultures in the society that have been passed down. These are handicrafts which are local wisdom of the Thai people that have been transferred until today (Conway, 2001; Bowie, 1990. That is the reason why the traditional textiles are of great value. It is preferred by consumers and is a craft that is of great importance in terms of the presentation of identity, culture, and local wisdom. It can also create jobs and generate income for local people as well as generating income for the country as an export product and a product for foreign tourists (Jatuphatwarodom, Jones, & Ouelhadj, 2018). Although weaving is distributed in every region of the country, the Ikat cotton fabric of the Ban Phuan women weaving group, Ban Mi District, Lopburi Province, has an outstanding reputation with the unique pattern of characteristics of Tai Phuan people that have inherited the weaving process and fabric pattern from generation to generation. It has been developed into a career for the new generation to generate income and preserve local wisdom to remain existing (Smackarn & Breazeale, 1988; Rodjun, 2010). However, there are still several manufacturing problems encountered in all regions of the weaving groups in Thailand such as fabric pattern development and product processing, labor shortage of weavers, production planning, public relations and marketing issues (Chudasri, & Saksrisathaporn, 2017; Distanont, Khongmalai, & Distanont, 2017; Taweewattanakitborvon, Anuntavoranich, Chandrachai, & Savetpanuvong, 2018). Even though several aid measures are provided by public agencies, many weaving groups who were unable to adapt themselves had to suffer the losses and eventually gave up their business. As for the active group, there were several types of adjustments, including the division of labor in making the production in an industrial system, development and application of fabric patterns to match market needs, use of technology to assist in weaving, and development of public relations channels using social media (Utiswannakul, 2016; Taweewattanakitborvon et al., 2018).

The approaches for studying the analysis on the past weaving problems emphasize the application of modern management principles making the obtained recommendations to come out in the way to increase management knowledge, use of decision-making aids in production, and the introduction of machinery and technology in weaving (Distanont et al., 2016; Taweewattanakitborvon et al., 2018). Although

these approaches are useful for guiding the development and adaptation of the weaving groups, these proposals require a huge increase in the skills and know-how and a lot of support from public and private agencies. Moreover, some ways are difficult to be implemented because it exceeds the capabilities of the weaving groups. Therefore, in this study, we would like to propose a practical guideline for developing the weaving group's operations and gain new perspectives in considering operational problems. The objective of this study is to study the operations of Ban Phuan Women's Woven Cloth Group in terms of raw material procurement, production operation, product development and marketing by applying techniques in social network analysis. The analysis results will provide an understanding of the functional structure of the weaving group to be used as a guideline for the operational development in the field of raw material procurement, production operation, product and market development that will result in an increase in the operational development and enhancement of the group's operational efficiency. The researcher has a main argument that the analysis of social networks will reveal the characteristics of relationships beneficial for and hindering the cooperation in the weaving group's operations in each area. The results of the social network analysis will enable them to propose a more effective way to develop the weaving group's operations.

Document review: social network analysis

Social network analysis is the study that focuses on the interactions of people, groups, organizations, or communities as a set of correlations. Each set of correlations or relationship structures will have different patterns depending on the degree of correlation in the nodes (Wasserman & Faust, 1994; Scott, 2017). The analysis of social networks is therefore the study of the structure pattern of relationships that lead to synergy or the conditions limiting collaboration. Moreover, the social network analysis will also help to understand the role of the persons in the network and the influence of the

persons in the positions to affect other members of the network and the entire network (Borgatti, Everett, & Johnson, 2018). In studying the social network analysis, there are two study methods. The first method is to study of complete network members which is suitable for groups and networks with few members and easy access to members. The second method is ego network which is suitable for larger groups and networks. This requires a sampling method to select the population in the study (Prell, 2012; Scott, 2017). In this study, a total of 35 weavers were selected for the concepts used in the social network analysis consisting of 3 concepts; the concept of centrality actor, the concept of betweenness centrality, and the concept of eigenvector centrality.

The centrality actor is the person who plays a key role and is the center of the network who knows the people in the network the most and the people in the network know him the most. He is the person who is in the position closest to other persona given the highest degree of ties to others. It makes this person the most powerful person in the network (Freeman, 1979; Hanneman and Riddle, 2005). The centrality is measured by the indegee centrality. The more that person contacts or is the center of the members, the more popularity or prestige that person will receive in the network (Prell, 2012). In studying the woven cloth group, the researcher used this concept to find leaders in each area: leaders in procurement of materials, production operation, product development and marketing to determine who is the most degree of centrality actor, how it play an important role in the group, how they can performs the roles according to their positions in that group, how they are responsibilities and are able to manage the work for the group to run smoothly, and what the problems and obstacles are.

The betweenness centrality is the determination of position of the network members by determining who is between the non-communicable people. The people in the middle are in a position that is advantageous to others as it is the link between the

people in the network altogether. In other words, people in the betweenness centrality are those in the shortest path that connect with others also known as geodesic or intermediary. Practically, the person in this position will be the person who can control information or work in the network making them the most influential person in the network (Freeman, 1979; Wasserman and Faust, 1994). Being applied to the weaving group studied, it was found that who played the roles in weaving group management most.

The eigenvector centrality refers to the measure of a person's role as to whether or not it is close to the centrality actor. This will make it known to the people who have a role inferior to those in the central position. Since this person in this position is the one closest to the powerful, he is the person who receives orders or brings information to be published in the network (Bonacich, 2007; Prell, 2012). This idea will be useful for research on the operation of the Ikat cotton weaving group. The person in this position is usually the junior supervisor who controls the work, receives orders from supervisors, and has close contact with supervisors and operators. Therefore, he plays a huge role in the control and transfer of knowledge in work.

Research methodology

This research had a sequential explanatory design (Edwards, 2010; Hollstein, 2014). The quantitative data collection was on the social network data by studying the elements of social networks in terms of people who are centrality actors, betweenness centrality, and eigenvector centrality. It was collected from all 35 members of the Ikat cotton weaving group. For the qualitative data collection, the observation and in-depth interviews were done on 10 persons. For the tool used in social network analysis, the researcher used the computer program UCI.NET 6.2 (Borgatti, Everett, & Freeman, 2002) and then presented the data in the form of sociogram using the Netdraw program. For the qualitative data analysis, it was made by using Atlas.ti Version 7.12.

Research results

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Ban Phuan Women's Woven Cloth Group was founded in 2000 and located in Ban Mi District, Lopburi Province. The operation is in the form of community enterprise. This weaving group belongs to the Thai Phuan ethnic group having inherited the knowledge of weaving from their ancestors who immigrated from Xieng Khwang, Lao People's Democratic Republic more than two hundred years ago (Smackarn & Breazeale, 1988, Cheesman, 2015). Early weaving was weaving for everyday use and religious ceremonies. Later, the promotion was given from the government to establish a community enterprise in order to provide people with a career and stable income. Although it currently has about 60 members, only 35 persons involved in weaving. In the past, a single weaver would weave every step of the way. Later, when the demand for woven fabric increased, they could not wove in time. Therefore, the weaving had been divided according to expertise like an industrial production system (Chanorn, 2016), which increases production more.

Study results on the social network analysis of Ban Phuan Women's Woven Cloth Group

Part 1: Social network analysis in the material procurement

The material procurement of the weaving group includes finished thread. The purchased thread is both warp and weft. At earlier period, the thread was bought from the shops in Ban Mi District. However, it was later ordered directly from the factories in Bangkok by building the structure of the material procurement network as 35 according to the number of group members. All members are connected and linked both directly and through other members of the network. The structure pattern of the network is multi-centered representing that the material procurement is distributed among the group members. Some members are involved in the procurement of materials themselves. However, the person who is the most important in the material procurement is President of Group A. Other persons who play the

roles in the material procurement are b, d, e, f, i, j,   n, o, p, u, v, z, aa as in Figure 1.
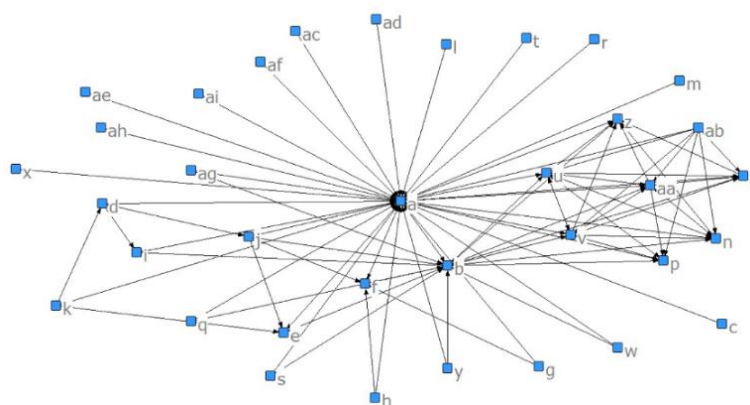

Figure 1 Structure of material procurement network

From Figure 1, Member a and Member b are the top two members with the highest indegree centrality as Member a and Member b are in the positions of the group's President and Assistant President responsible for ordering thread and dyes for the group members requesting the group to invest for. Other members including d, e, f, I, j, o, p, u, v, z, aa are members who are weaving and investing in the purchase of thread from the sources for buying thread and distributing among the shops in the community. The members having the high centrality are a, b, f, u, v, z, aa. These members act as a bridge or a mediator in purchasing the materials on behalf of other members. The President (a) and Assistant (b) will be responsible for purchasing thread for others investing for other members. Member f is the agent in buying the thread for the members who make the Ikat cotton. Meanwhile u, v, z, aa will act as the agents in buying thread for the members who weave. Other members without the betweenness centrality will buy the thread by themselves. The members entering the eigenvector centrality following the group's

Assistant President including b, n, o, u, v. These group members contact to purchase raw materials by themselves because they are close to the sources for ordering the thread. Sometimes when the President wants to use a small amount of a specific color thread, he will contact the group members to help ordering the purchase. At the same time, the members may also purchase thread through the group's President.

Part 2: Social network analysis in the production planning

Production planning is an analysis and determination on future plans for what to be produced, when and how many. The part of production planning of the weaving group consists of planning for thread preparation, designating patterns for those who make the Ikat cotton as well as assigning patterns for the weavers. Nearly all of the planning activities are initiated by the group's President and Assistant. From the analysis of raw material management network, the Figure of network structure is obtained as shown in Figure 2.
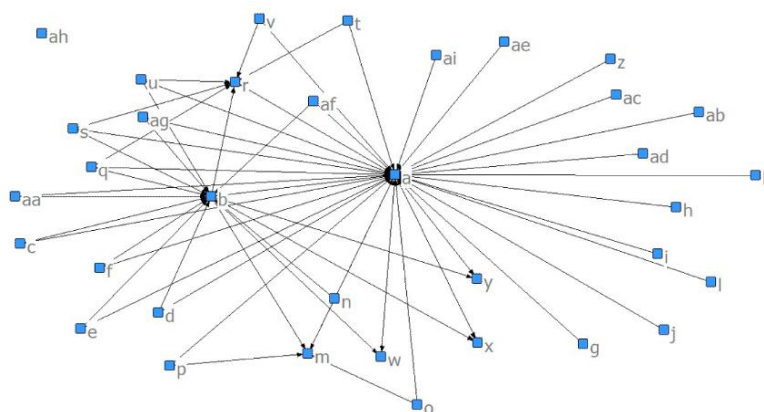
Figure 2 Production planning network structure

Figure 2 shows the size of production planning network structure of 34 with one member not involved in the production plan. Almost all members are connected both by direct connection and through other members of the network. The structural pattern is centered on four major production planning centers a, b, m, r, indicating that the network has a centralized production plan. The rest of the members produce according to the orders of the members who plan the production. Members a and b are the top two members with the highest indegree centrality as Members a and b are the leading members responsible for almost every step of production planning especially in planning on making the Ikat cotton pattern and planning on weaving. Some of the members including m and r are members with the lower centrality. Member m is an important member of production planning as m is responsible for warp which is the position that can be done alone in a group allowing them to control their work and have the bargaining power in working with the group. Member r is the member that can plan the production. Since r is a weaving member but non-patterned, it is possible to weave faster than patterned weave. There are 2 members with high centrality, a and b. Both members have the greatest role in planning and coordinating planning with other members. The production planning network is a centralized network structure allowing the work order quickly. The members with the most value to the centrality, b, m, r show that in production planning, the President will consult with b the most. According to the interview on the group's President, it is found that the Assistant President is a person who plays a role in coordinating the overall production planning of the group while m, the President, is in close consultation and production planning,. As m works in a position that others cannot do, he is consulted and planned closely together. Member r is the person with whom the president has to contact and assign a specific responsibility for weaving.

Part 3: Social network analysis in the product development

The product development especially in fabric development to be popular in the market is one of the important matters of the Ikat cotton weaving group. The group usually invents new patterns but preserving the ancient patterns and then finding other patterns to create a perfect combination desirable in the markets. From network analysis in product development, the network structure can be depicted as follows.
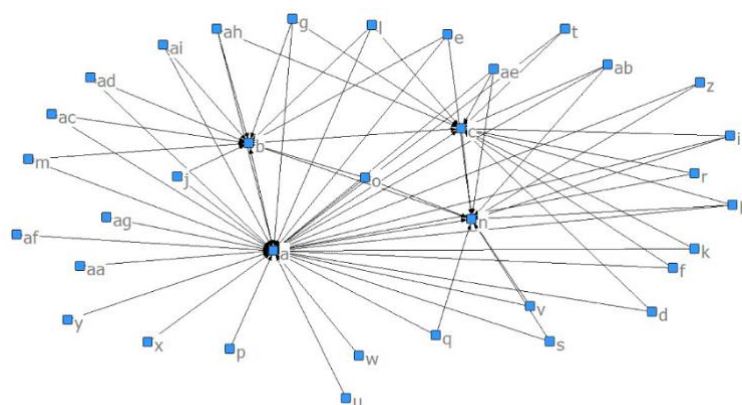
Figure 3 Product development network structure

Figure 3 presents the product development network structure of 35 according to the number of group members. All members are connected and linked directly both by direct connection and through other members of the network. There are 4 members with the centrality; a, b, c, n. The product design of the weaving group is made up of 4 people. a is the Group's President playing the most role. There are 2 members with the highest betweenness centrality; a and b. This indicates that the President and Assistant are the coordinators or mediators in connecting two other product designers in the group; c and n. Finally, the members with the most indegree centrality are (excluding the President) c and n as the design of new products requires the person making Ikat to carve out the pattern and let the weavers quickly weave them in order to see whether the fabric

pattern comes out as a pattern or not. Then, the adjustments will be made indefinitely until getting the pattern as the customer wants. Thus, the product design work needs to do as a team with the consultation, opinion giving, and helping one another until the job has been completely done.

Part 4 Social network analysis in the marketing

The marketing networks include linking group products to customers across different channels, building a marketing network to enable customers to engage and trade continuously by creating marketing channels for the weaving group to be able to sell their products through multiple channels. This will generate more income for the weaving group. From marketing network analysis, the network structure can be depicted as follows.
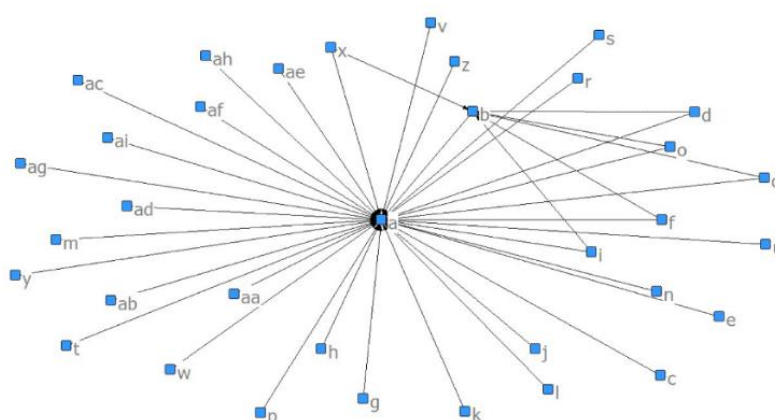

Figure 4 Marketing network structure

Figure 4 shows the structure of the marketing network. The nature of the network structure is less centralized or almost a centralized network.

The person who plays the key role in marketing network is a, the Group's President. Such customer groups are caused by word-of-mouth

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publicity. The person with the second role is the Assistant President who helps the president in dealing with the one-time customers or local customers who come to buy fabrics during the festive season. From Figure 4, 2 members are found to reach the centrality; a and b. It shows that for the group's activities in marketing and contacting with customers, only 2 people involved; the President who contacts customers in different provinces and the Assistant President who contacts local customers. From the structure of the group in the marketing network, only 2 people involved. There is also no betweenness centrality members as they do not have to act to coordinate or as a mediator linking to other members of the group. On the part of members who have access to the indegree centrality, it appears that the highest-value member is b who is only engaged in marketing activities with the group's Presidents.

Conclusion and discussion on the results

This research aims to study the social network structure and to analyze the social network in the operation of Ban Phuan Women Woven Cloth Group in the material procurement, production, product development and marketing. The results showed that in the social network analysis of material distribution, there were two types of distribution; the President and the group members buy raw materials separately from different places. They had to buy the materials at a high price due to separate buying. The social network analysis of production planning found that it was centered on the group's President and the Assistant President. In the social network analysis in product development, few people are involved resulting in very little product development. Finally, the social network analysis in marketing found that only two people involved in this development. Most of the customers buy the products from personal relationships and use word-of-mouth methods. Therefore, no systematic new marketing channels are developed. According to the results of this study, the discussion can be made as follows.

1. In the material procurement, the study results showed that the material supply of the group was thread and dye which can be divided into two parts; procurement by group's President and procurement by group's members. This is a separate buying in small quantity resulting in high prices of materials. According to the study of many textile fabric groups in Thailand, the problem in buying materials at high prices can be solved by grouping altogether to buy in large quantities. This will result in savings in purchasing materials (Chathiphot, 2012).

2. In terms of production planning of the Ikat cotton weaving group, it can be seen that the production of Ikat cotton weaving is more complex because it can be broken down into several steps unlike in the past that one person did every step. Later, when the demand for Ikat cotton weaving increased together with the promotion to become a community product, the community enterprise was formed causing the group to separate production into sub departments into the industrial system. Someone who has expertise in any field will always perform that role. The work is divided into smaller steps. In several steps, there should be an effective production management system in order to produce more. This is consistent with the research of Prempree, Chanchon, & Wannajun (2014) studying the management of textile production that requires a systematic production management with a rigorous planning process in order to deliver work from one step to another on time. This will reduce costs and the time wasted. Some researches suggest for industrial production management systems to be used in assisting the production planning and for the tools to be used in the decision-making to make production more efficient (Jatuphatwarodom, Jones, & Ouelhadj, 2018). However, the studied Ikat cotton weaving group still does not have a systematic production management. No operation is recorded and there is no tight work plan. Everything uses the memory

system entirely. Sometimes there is a problem of errors in the production planning. This is consistent with the research results in the development of the local weaving industry which found that the major weakness of the weaving group in Thailand is due to the lack of knowledge in production planning and the lack of systematic data recording making production planning errors and higher costs of weaving (Distanont, Khongmalai, & Distanont, 2017).

3. For the issue of product development of the Ikat cotton weaving group, the study found that people who play a key role in product development are leaders and group members totaling 4 persons while other members are not involved at all. In addition, in product development, the design of various pattern is also being invented and developed by using the ideas of a few members making the development of the pattern slow. This is different from Soodsang (2015) research finding that product design, especially in traditional weaving, requires the brainstorming to form multiple ideas and get the best products. Furthermore, consumer behavior has a great influence on product design. If consumers do not like or do not meet their needs, they may try buying once and may not buy anymore. Therefore, product development has to be in line with the target consumer behaviors as much as possible in order to be able to exactly meet the needs and will eventually lead to a decision to buy the products (Chudasri, Walker, & Evans, 2020). Therefore, developing the product without the focus on the participation of other members and not being aware of the needs of consumers are the major weaknesses of the operations of the studied weaving group.

4. Regarding the problems in the ability to develop patterns of fabrics, from the results of social network analysis, it was found that only one person could carve cloth pattern in the group with the specialization in tying the ancient Thai Phuan patterns. If there is an application, it is not possible to do much. It took a long time for people to engrave patterns and sometimes they could not be engraved causing them to lose orders in the latter and no customers came to order new patterns causing the group to lack opportunities to increase their income. Unlike many weaving groups that are successful and have high sales, it is found that in this group there will be people who are skilled and able to carve the pattern according to the needs of many customers. This will enable the group to generate revenue from the development of new designs that can meet customer needs (Chunthone, 2014; Prajonsant, 2016; Pantung, 2017; Dulayasutcharit, Keawset, & Chanthapo, 2018).

5. For the marketing issues of the weaving group, the study results showed that the key players in marketing and customer acquisition were the Group's President and Assistant. It was operated by only 2 persons and there was no active marketing to acquire new customers. However, the results of the study showed that the majority of public relations channels used by the President and Assistant were word of mouth which was a very limited channel. This is because good public relations must be able to reach the target audience with correct buying requirements. Especially for woven fabrics with very beautiful patterns, products must be presented in different ways through media and public relations that can show the beauty of the products (Chudasri, & Saksrisathaporn, 2017). This is the reason why the marketing of the studied woven cloth is unable to reach the target group widely.

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