



Received: 10 October 2023

Revised: 13 December 2023

Accepted: 4 January 2024

DEVELOPING VALUE CHAIN MANAGEMENT OF COMMUNITY BUSINESS PROCESSING MULBERRY PRODUCTS IN YALA, THAILAND

Chompunuch SRIPHONG¹, Piyada MANEENIN¹ and Sasadee KAMPHANGDEE¹

¹ Faculty of Management Sciences, Yala Rajabhat University, Thailand;
chompunuch.s@yru.ac.th (C. S.); humor000@gmail.com (P. M.);
sasadee01@hotmail.com (S. K.)

Handling Editor:

Professor Dr. Wing-Keung WONG

Asia University, Taiwan

(This article belongs to the Theme 1: Business Performance, Competitiveness, and Sustainability)

Reviewers:

- | | |
|--|----------------|
| 1) Associate Professor Dr. Theerawat HUNGSAPRUEK | PSU, Thailand |
| 2) Assistant Professor Dr. Wissawa AUNYAWONG | SSRU, Thailand |
| 3) Dr. Nuanluk SANGPERM | KU, Thailand |

Abstract

This research aims to 1) study the value chain management of mulberry processing community businesses in Yala, Thailand and 2) develop a mulberry processing community business in the province according to the value chain management model. Data were collected through group interviews and focus group discussions. Interviews were conducted with five group leaders, and development efforts were undertaken with four members of the selected group. The research also involved interviews with five marketing intermediaries, observations, and the distribution of questionnaires to 100 sample consumers using convenience sampling. Content analysis was employed to analyze qualitative data, while descriptive statistics were utilized for quantitative data analysis. The findings revealed that members are responsible for purchasing raw materials and delivering goods themselves. Most of them sell their products through marketing intermediaries. Members also handle income and expense accounts while continuously enhancing the production skills of group members. The development of the value chain focuses on enhancing the efficiency of all value chain activities, with particular emphasis on production, marketing and sales, and human resource management activities. Following the development initiatives, the group experienced a 25 percent increase in income and attracted more customers, particularly through online sales channels such as Facebook. The group also streamlined its internal business processes. Furthermore, group members acquired online marketing skills and expanded their product range to include items like mulberry buns and mulberry juice mixed with dates. However, group members need to maintain vigilance and continually refine their activities within the business value chain.

Keywords: Value Chain Management, Community Enterprise, Processing Mulberry Products

Citation Information: Sriphong, C., Maneenin, P., & Kamphangdee, S. (2024). Developing Value Chain Management of Community Business Processing Mulberry Products in Yala, Thailand. *Asian Administration and Management Review*, 7(1), 43-53. <https://doi.org/10.14456/aamr.2024.5>

Background and Significance

Today's business operations face changes in the dynamic business environment, and competitive conditions are increasing in intensity. Entrepreneurs who can adapt to change and effectively manage business operations demonstrate good productivity and service quality. Their businesses remain in demand and are well-received by customers, leading to stability and survival in the market. The modern management concept that connects the value of various business activities, transforming inputs into products or services with value for customers, is known as the value chain. Therefore, this concept enables entrepreneurs to analyze the operational capabilities of the entire business system, ultimately creating a competitive advantage (Hongvattanajainam & Luanchamroen, 2022). Managing the business value chain is instrumental in solving problems and enhancing all types of activities, from upstream to midstream and downstream, as well as framing the value chain appropriately to generate value and enhance the competitive edge of a business (Maneerat & Jaroenwisana, 2022). When a business possesses the ability to compete effectively, the result is improved business performance (Jantasart et al., 2022). Previous studies by researchers have found that value chain management has a direct and positive influence on business performance (Sriphong et al., 2022). Naturally, achieving good performance is the desired goal of every entrepreneur. Therefore, efficient management of the value chain is a critical aspect of running a successful business.

The operation of small businesses by members of the community is referred to as community business. Some groups are registered as community enterprises, which are operated by local members, and aim for self-reliance by creatively managing community capital. According to the National Economic and Social Development Plan of Thailand, there is a strong focus on developing these businesses to expand the grassroots economic foundation, fostering economic opportunities and an entrepreneurial society (Office of the National Economic and Social Development Board, 2021). Small-scale community businesses play a crucial role in boosting local economies and contributing to an increase in the gross domestic product (Nurjaya et al., 2021). Acknowledged as sources of employment and income in developing countries (Scholtes et al., 2018), governments prioritize support for these businesses, enhancing competitiveness through skill development, funding, public relations, and marketing strategies (Teguh, 2021; Nawawi et al., 2020). However, to ensure the sustainability of community entrepreneurs and maintain ongoing business operations, the focus must extend to innovation, the utilization of technology, social learning, and knowledge sharing within the community (Sinha & Ola, 2021). This should continue until members of community businesses are committed and work together in a sustained manner. Additionally, the government sector must provide infrastructure support that aids in the operation of community businesses (Nithichaianan & Chidchob, 2022).

In Yala Province, Thailand, numerous community businesses process agricultural produce, but mulberries are an underutilized crop. A preliminary survey reveals a lack of studies on the business development of mulberry processing community businesses in Yala. Existing reports suggest that community enterprises in Thailand need improvements in production, product development, distribution, and technology adoption (Jintana & Puripanik, 2020). Understanding the entire business operation, from raw materials to customer delivery, allows executives to identify strengths and areas for improvement, aligning with the demands of the business value chain analysis. The value circle, a modern technological management concept, empowers entrepreneurs to comprehensively analyze the business operation system, leading to enhanced competitiveness and better performance (Panomupatam, 2022). Given the significance of value chain management for businesses, it is imperative to address the operational challenges currently faced by mulberry processing community businesses. This involves aligning the country's economic and social development trajectory with the practical application of research findings in value chain management for tangible benefits. Hence,

education and business advancement within the mulberry processing community in Yala must be guided by the value chain management model. This approach is crucial and will yield positive outcomes for community businesses, including heightened competitiveness and improved operational performance. Furthermore, it entails the creation of a community business model for mulberry processing, developed under value chain management principles. Such a model can be extended to benefit other community enterprises, thereby augmenting economic value and fortifying grassroots communities as an essential foundation for the country's economic growth.

Literature Review

Value Chain

The value chain breaks down organizational tasks into specific activities. Executives must carefully study and analyze these activities to establish connections and coordinate efforts that result in the creation or delivery of value through products and services to customers. Essentially, it's a concept that interlinks various value-adding steps within the process of producing a product or delivering a service. This encompasses everything from the introduction of raw materials into the business to the final delivery of products or services to customers. The activities within the value chain are categorized into two groups: Primary Activities and Supporting Activities. 1) Primary activities, or main activities, pertain to the core functions of the business, including product development, marketing, and after-sales service. There are five specific activities: inbound logistics, operations, outbound logistics, marketing and sales, and service. 2) Support activities play a crucial role in enhancing the efficiency and effectiveness of primary activities. They encompass four key factors: infrastructure, human resource management, technology development, and procurement (Porter, 1985).

Balanced Scorecard

A Balanced Scorecard (BSC) is a management system that employs key indicators as a pivotal mechanism. It can be described as a management tool that aids in translating strategies into actionable steps. Grounded in measurement, it enables the organization to maintain consistency across all dimensions and concentrate on elements crucial to the organization's success. It entails considering four distinct perspectives, rather than focusing solely on the financial aspect. These consist of the financial perspective, the customer perspective, the internal process perspective, and the learning and growth perspective (Kaplan & Norton, 2006).

Academic studies have established a strong relationship between value chain management and performance in business operations. In essence, business operators must meticulously analyze the value chain, examining the activities that can create products or services superior to those of their competitors. This analysis provides insights into their ability to execute activities within the value chain and uncover opportunities to deliver value to consumers in the current competitive environment. Entrepreneurs should also strive to enhance the efficiency of all value chain activities, which can result in a competitive advantage and increased profitability (Prasetyo & Dzaki, 2020).

Research Framework

Based on the literature review mentioned above and a significant gap in existing research on the development of value chain management in the mulberry processing community business in Yala and its outcomes. Therefore, this research set out the research framework as shown in Figure 1.

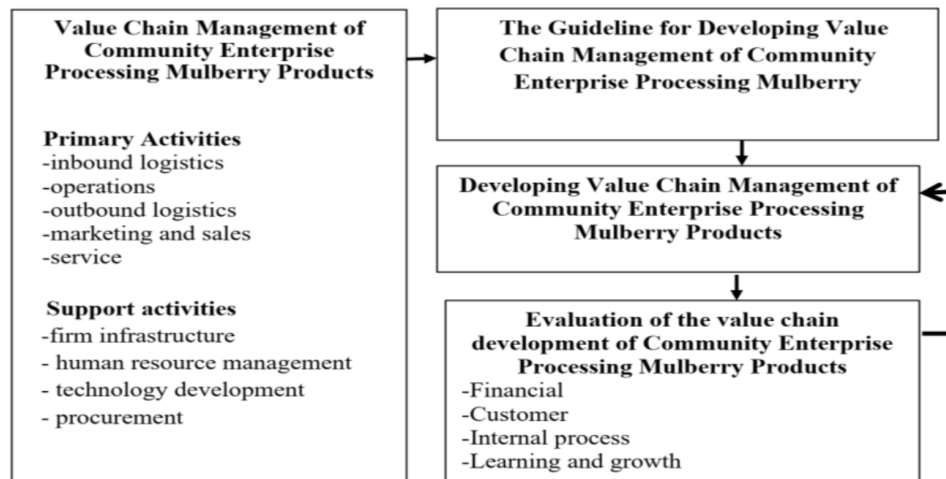


Figure 1 Research Framework

Research Methodology

This study is a mixed-method approach, encompassing both qualitative and quantitative research methods.

Data Collection in Qualitative Research

- 1) Study the value chain management of five mulberry processing community businesses in Yala by conducting interviews with group presidents and engaging in non-participant observation to observe the activities within the value chain of group members at their respective locations.
- 2) Select one group to participate in development by group discussion and selection between the research team and government officials.
- 3) Study guidelines for developing value chain management of mulberry processing community business. They were selected through group discussions with four actively involved members and interviews with five marketing intermediaries
- 4) Develop the value chain management of the mulberry processing community business in collaboration with four community members, following the joint guidelines. Data were collected through group interviews and participatory observation.
- 5) Evaluate the value chain development of the selected mulberry processing community businesses through group interviews with four members and non-participant observation and collect information from the group's business documents.

Check the information for accuracy and completeness of content with a three-dimensional examination of the data methodology, data collection methodology, and researcher aspects.

Qualitative research tools:

- 1) Semi-structured interview form and observation form: These related to the management of nine value chain activities: (1) inbound logistics, (2) operations, (3) outbound logistics, (4) marketing and sales, (5) services, (6) infrastructure, (7) human resource management, (8) technology development, and (9) procurement.
- 2) Group discussion recording form and semi-structured interview form: These were used to establish guidelines for developing value chain management in the selected mulberry processing community businesses.
- 3) Semi-structured interview form and observation form: These were employed to assess the practice of developing the value chain in the selected mulberry processing community businesses.
- 4) Semi-structured interview form and observation form: These were used to evaluate the value chain development in the selected mulberry processing community businesses, focusing on the financial, customer, internal process, and learning and growth aspects.

Data Collection in Quantitative Research

Conducted market testing for newly developed processed mulberry products (steamed mulberry buns and mulberry mixed with date palm juice) to assess consumer satisfaction. Validated the questionnaire with three professors using the index of item-objective congruence (IOC), where each item scored above 0.5. Data collection involved 100 participants from 5 stores of marketing middlemen, employing a convenience sampling method. This sample size aligns with a sample group as acceptable for product testing (Lawless & Heymann, 2010).

Quantitative research tools: The questionnaire on consumer satisfaction with processed mulberry products consists of four parts: Part 1: Personal information. It is a closed-ended multiple-choice question with two items. Part 2: Satisfaction with the steamed mulberry buns with five items, Part 3: Satisfaction with mulberry mixed with date palm juice with five items. Parts 2 and 3 are closed-ended questions on a 5-level rating scale: highest, high, moderate, low, and lowest. This totals 10 questions, and Part 4: comments or suggestions. It is an open-ended question. The quality of the research tool was assessed by three experts to verify its content and structural validity. The revised questionnaire was then tested with customers who were not part of the sample, and the reliability value was calculated using Cronbach's coefficient method, resulting in a value of 0.802. According to George & Mallery (2016), an alpha coefficient greater than 0.700 is considered acceptable. Therefore, the questionnaire demonstrated reliability within the acceptable criteria.

Data Analysis

Qualitative data analysis uses content analysis, while quantitative data analysis uses percentages, mean, and standard deviation.

Research Results

Value Chain Management of Mulberry Processing Community Business in Yala

From an interview with the president of each mulberry processing community business group in Yala and through non-participant observation, along with documents recording group business information, it was revealed that the value chain management group engaged in various activities within the value chain as follows:

1) Primary activities, which involve operations directly adding value to raw materials and products. There are five specific activities as follows:

1.1) Inbound logistics: It was found that only three groups source mulberries from members' farms, storing them in a facility freezer. Transportation of raw materials, including mulberries and other necessary items, is handled by the group president and members, occurring 1-2 times monthly.

1.2) Operations: This stage involves the production of processed products using mulberries from all groups. It is a collective effort carried out by all members. Normally, production occurs 1-2 times a week, increasing during high demand. Each group emphasizes consistent taste and cleanliness with ample production equipment.

1.3) Outbound logistics: All groups directly sell their products to customers and also distribute products through marketing intermediaries. The delivery responsibility with the group president or designated members occurs daily for customer orders and 1-2 times weekly for intermediaries.

1.4) Marketing and sales: On average, the groups establish retail prices with a 25% profit margin. They utilize both direct and indirect distribution channels. Additionally, they offer trade discounts of 10-15% to intermediaries.

1.5) Services: The group offers product delivery services and customizes products according to the specific tastes of customers.

2) Support activities which are various operations that help support the primary activities to proceed well, consisting of four activities as follows:

2.1) Infrastructure: Each group emphasizes internal collaboration with assigned duties for each member. Detailed daily records of income, expenses, and consignments. Monthly informal meetings for financial review and ongoing business use.

2.2) Human resource management: Each group provides compensation to members in the form of wages for their product contributions. Morale upkeep with parties and visits during special occasions or illnesses. Additionally, encourages knowledge and skill enhancement through government-organized training.

2.3) Technology Development: Each group utilizes the LINE application, for internal communication and customer interactions. Additionally, they presence on their Facebook Fanpage to showcase and sell products.

2.4) Procurement: Some groups initiate their investments by pooling resources from members, while others rely solely on funding from the group president. Primary raw material, mulberry, sourced from member farms or neighboring provinces. Various materials and equipment are procured locally and from suppliers in Bangkok, with raw material procurement occurring 1-2 times monthly.

Guidelines for Developing Value Chain Management of the Mulberry Processing Community Businesses

Based on group discussions with community business members and interviews with marketing intermediaries, the identified areas for emphasized development within the value chain encompass three key activities:

1) Operational activities: The development of new products to complement the existing range, including mulberry juice, mulberry jam, and mulberry three flavors, must distinguish them from the existing ones available in the market. In addition, implement rigorous quality control measures to meet specified standards.

2) Marketing and sales activities: Boost sales through strategies like market testing and expanding online distribution channels. This involves engaging in product consignment projects through live-streaming channels facilitated by government agencies. Establish an engaging Facebook Fanpage with a Chatbot feature for automated customer support. Additionally, collaborate with government agencies to create public relations materials, promote the group's presence in stores, and produce video content showcasing products.

3) The human resource management activities persist in fostering the knowledge and skills of all members in product production, achieved through the establishment of a Facebook page Fanpage, and Chatbot.

Development of Value Chain Management of Mulberry Processing Community Businesses

1) Operational activities: From group discussions with group members, the group agreed to develop and produce a new product, namely steamed mulberry buns and mulberry mixed with date palm juice as shown in Figure 2 and Figure 3:



Figure 2 Steamed Mulberry Buns



Figure 3 Mulberry Mixed with Date Palm Juice

In addition, the survey on consumer satisfaction with steamed mulberry buns and mulberry mixed with date palm juice revealed that 12% were male and 88% were female. Among them, 61% were aged 20-40, and 39% were over 40, as detailed in Table 1 and Table 2:

Table 1 Satisfaction of consumers with mulberry steamed buns

Satisfaction	\bar{X}	S.D.	Level
1) Taste	4.14	0.36	High
2) Appearance	4.00	0.75	High
3) Size	4.33	0.29	High
4) Quality	4.26	0.43	High
5) Price	3.96	0.52	High
Total	4.13	0.63	High

Furthermore, a significant majority of consumers, comprising 34%, shared the opinion that the mulberry steamed bun filling should possess a coarser texture to better appreciate its consistency.

Table 2 Consumer satisfaction with the mulberry mixed with date palm juice

Satisfaction	\bar{X}	S.D.	Level
1) Taste	3.61	0.24	High
2) Color	3.95	0.32	High
3) Size	3.87	0.29	High
4) Quality	4.08	0.43	High
5) Price	3.44	0.61	Moderate
Total	4.13	0.63	High

Furthermore, a significant majority of consumers, comprising 42%, shared the opinion that mulberry mixed with date palm juice does not have a long-lasting taste and has a lighter color compared to mulberry juice that is not mixed with date palm. Additionally, 35% stated a preference for mulberry juice that is not mixed with other fruits, while 15% of consumers expressed concerns about the product's pricing.

Results from the Development of Value Chain Management of Processed Mulberry Community Businesses

From group interviews with members, it found that the results of value chain development are as follows:

- 1) Financial aspect: The original group income, which ranged from 8,000-9,000 baht per month, has increased to 10,000-11,000 baht per month due to enhanced online sales.
 - 2) The customer aspect: While the group maintains the same number of marketing intermediaries, there have been 45 new customers acquired through the live broadcast channel of government agencies and orders made through the group's Facebook Fanpage.
 - 3) Internal processes: Each member now possesses the capability to produce every product and can function as an administrator, facilitating order reception and online customer support.
 - 4) Learning and growth: Group members have significantly improved their technological skills, excelling in social media for advertising and sales. Active participation of all members in suggesting product developments and introducing new flavors to broaden market opportunities.
- The research findings can be summarized as shown in Figure 4.

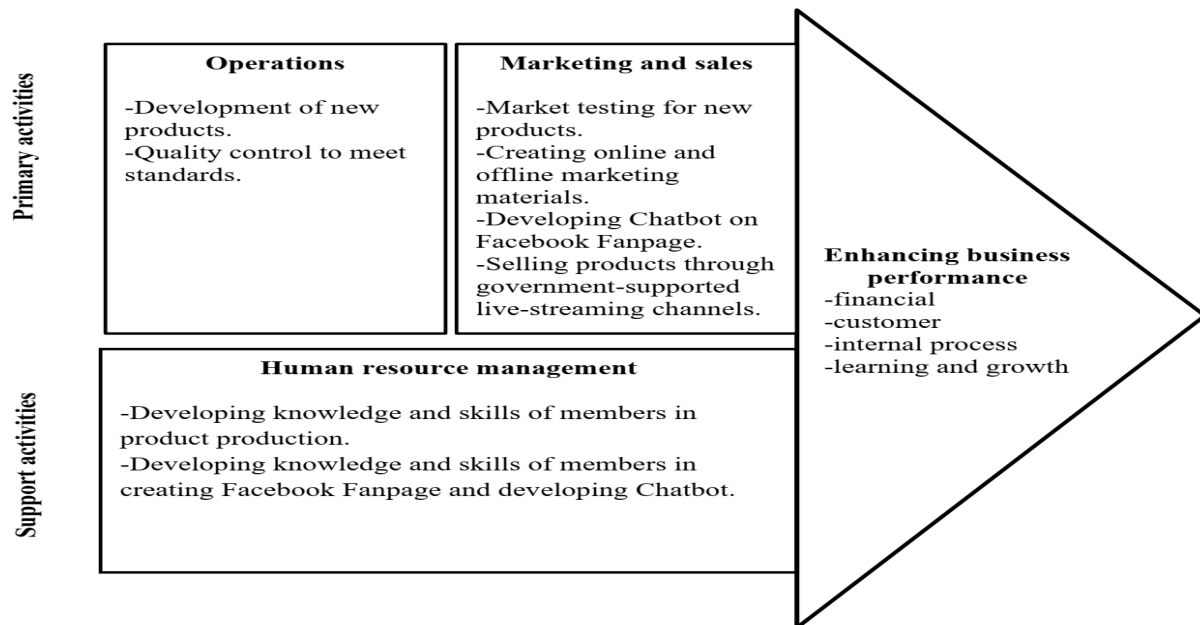


Figure 4 The Research Findings

Conclusion and Discussion

The scope of value chain management in the mulberry processing community business in Yala includes inbound logistics, operations, outbound logistics, marketing and sales, services, firm infrastructure, human resource management, technology development, and procurement. These activities are vital for manufacturing, marketing, income generation, and profit allocation among members, ensuring long-term sustainability. Moreover, studies indicate that activities within the value chain directly enhance business value, differentiating products or services, reducing costs, and efficiently meeting customer needs (Awan et al., 2022). Various elements within the value chain contribute to creating additional value and providing a competitive advantage to businesses (Jun & Rowley, 2019).

The selected mulberry processing community business emphasizes the development of operational or production activities, marketing and sales, and human resource management. This strategic focus aligns with research emphasizing innovative production methods and skill development as key elements in elevating a business's value chain (Widhayanantanarom & Ayasanond, 2021). Studies also highlight the direct impact of marketing proficiency on business performance (Chao et al., 2022) and underscore the crucial role of effective human resource management for sustained optimal business performance (Waiyawuththanapoom et al., 2022; Phrapratanporn et al., 2019). After implementing the value chain development guidelines, positive outcomes were observed: Financial aspect: increased income. Customer Aspect: attracted more customers. Internal processes: improved production efficiency and marketing operations. Learning and growth: group members demonstrated enhanced proficiency in using social media as a platform for advertising and sales. These positive results stem from optimizing activities within the value chain, delivering enhanced value to customers in processed mulberry products. This aligns with studies affirming the value chain's appropriate application for sustainable organizational performance (Yodkaew et al., 2021). Research also emphasizes the positive contribution of every value chain activity to business success (Watcharakiettaisak et al., 2019).

Suggestions

1) Group members should prioritize and continuously monitor all activities within the value chain of the business to ensure that every activity is interconnected to deliver consistent results,

providing value in the form of products to customers. This should be done while adapting to various external environments that may change.

2) When developing new products, it is essential to gather opinions from consumers, utilizing the power of public opinion through crowdsourcing. Collaboration with technology and food science experts is crucial to develop products that are both suitable in taste and quality. Additionally, market testing should be conducted before mass production for market distribution.

References

- Awan, U., Sroufe, R., & Bozan, K. (2022). Designing Value Chains for Industry 4.0 and a Circular Economy: A Review of the Literature. *Sustainability*, 14(12), 7084.
- Chao, M., Seo, M., & Kim, J. (2022). Impacts of marketing capabilities on competitive advantage and business performance: Application of IPMA. *The Korean Journal of Franchise Management*, 13(1), 19-33.
- George, D., & Mallery, P. (2016). *IBM SPSS Statistics 23 Step by Step: A Simple Guide and Reference*. 14th ed. New York: Routledge.
- Hongvattanajainam, S., & Luanchamroen, S. (2022). Strategic management approach to create a competitive advantage in the Thailand 4.0 of SMEs, the automation service provider in Thailand. *Ph.D. in Social Sciences Journal*, 12(3), 561-574.
- Jantasart, R., Buchaiyaphum, T., Promngam, P., Sengupta, G., & Yimcharoenpornsak, N. (2022). Causal relationship factor competitiveness supply chain operations for entrepreneurs' performance in the new normal. *Interdisciplinary Sripatum Chonburi Journal*, 8(2), 16-30.
- Jintana, S., & Puripanik, T. (2020). A Problem, Limitations and Approaches for Strengthening of Community-Based Enterprises in Thailand. *Journal of Politics, Administration and Law*, 12(3), 179-194.
- Jun, I., & Rowley, C. (2019). Competitive advantage and the transformation of value chains over time: The example of a South Korean diversified business group, 1953-2013. *Business History*, 61(2), 343-370.
- Kaplan, R., & Norton, D. (2006). *Alignment: Using the Balanced Scorecard to Create Corporate Synergies*. Massachusetts: HBS Press.
- Lawless, H., & Heymann, H. (2010). *Sensory Evaluation of Food Science Principles and Practices*. 2nd ed. New York: Ithaca.
- Maneerat, P., & Jaroenwisana, K. (2022). Value Chain Model for Value Addition of Local Ingredients to Gastronomy Tourism's Activities in Phuket Province. *Journal of Multidisciplinary in Humanities and Social Sciences*, 5(3), 813-825.
- Nawawi, M., Ali, A., Irawan, B., Ahmad, B., Mukramin, S., Marsuki, N., Umanailo, M., & Kaya, I. (2020). The Village Kalesang Program as a Poverty Alleviation Community. *International Journal of Scientific & Technology Research*, 9(3), 3103-3107.
- Nithichaianan, N., & Chidchob, T. (2022). The Guidance to Develop Capabilities and Competitiveness of Community Businesses to Support Community Economies Toward Stability and Sustainability: A Case Study of Community Businesses in Kap Choeng District, Surin Province. *Research and Development Institute, Loei Rajabhat University*, 17(59), 84-92.
- Nurjaya, N., Affandi, A., Erlangga, H., Sunarsi, D., & Jasmani, J. (2021). The effect of product promotion and innovation activities on marketing performance in middle small micro enterprises in Cianjur. *Budapest International Research and Critics Institute-Journal*, 4(1), 528-540.

- Office of the National Economic and Social Development Board. (2021). *The Thirteenth National Economic and Social Development Plan Framework*. Bangkok: Office of the National Economic and Social Development Board.
- Panomupatam, C. (2022). Product Innovation and the Primary Activities of the Value Chain that Affect to Performance of Community Enterprises Operating Herbal Products in Thailand. *Journal of Social Innovation and Mass Communication Technology*, 5(2), 64-77.
- Phrapratanporn, B., Wararatchai, P., Aunyawong, W., & Rashid, N. (2019). Enhancing Supply Chain Performance of SMEs in Thailand Using the Integrated Personnel Development Model. *International Journal of Supply Chain Management*, 8(5), 176-186.
- Porter, M. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: Free Press.
- Prasetyo, P., & Dzaki, F. (2020). Institutional performance and new product development value chain for entrepreneurial competitive advantage. *Uncertain Supply Chain Management*, 8(4), 753-760.
- Scholtes, F., Neff, D., & Lampe, F. (2018). The Role and Sources of Agency and Self-Employment Over the Life Course: Micro-Entrepreneurs in Kampala, Uganda. *Journal of Developmental Entrepreneurship*, 23(4), 1-21.
- Sinha, R., & Ola, A. (2021). Enhancing business community disaster resilience: A structured literature review of the role of dynamic capabilities. *Continuity & Resilience Review*, 3(2), 132-148.
- Sriphong, C., Kachonkitiya, N., & Esor, A. (2022). Value Chain Management and Business Performance of One Tambon One Product Businesses in the Southernmost Province of Thailand. *Journal of Positive School Psychology*, 6(4), 8706-8702.
- Teguh, S. (2021). Innovation Capability and Sustainable Competitive Advantage: An Entrepreneurial Marketing Perspective. *Journal of Asian Finance, Economics and Business*, 8(5), 127-134.
- Waiyawuththanapoom, P., Thammaboosadee, S., Tirastittam, P., Jermstittiparsert, K., Wongsanguan, C., Sirikamonsin, P., & Aunyawong, W. (2022). The role of human resource management and supply chain process in sustainable business performance. *Uncertain Supply Chain Management*, 10(2), 517-526.
- Watcharakiettisak, T., Lertyingyot, S., & Ritthaisong, Y. (2019). Business Success Model Development for Micro Enterprise. *Journal of Business Administration, The Association of Private Higher Education Institutions of Thailand*, 8(2), 118-141.
- Widhayanantanarom, P., & Ayasanond, C. (2021). The Approach to Develop Value Chain Management of Ready Coconut Milk Business. *Journal of Logistics and Supply Chain College*, 7(1), 141-156.
- Yodkaew, N., Pongyeela, A., & Kumsuprom, S. (2021). Factors Affecting the Sustainable Performance of Rice Cooperative in Thailand. *Journal of MCU Peace Studies*, 9(6), 2424-2439.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the

editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.



Copyright: © 2024 by the authors. This is a fully open-access article distributed under the terms of the Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).