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*RICE Journal of Creative Entrepreneurship and Management (RJCM)*
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**About Us**

*RJCM* is an international journal for academics and scholars at the higher education level to communicate and share their viewpoints and academic work with fellow professionals in the areas of creative entrepreneurship and management as practiced in their fields of specializations in social sciences. Currently, it is classified as Tier 2 in Thai-Journal Citation Index (TCI).

*RJCM* publishes three numbers per volume annually and welcomes contributors to submit their manuscript in January, May, and September of each year. We accept both academic and research papers in social sciences from contributors. The papers are double-blind three-peer-reviewed in each volume and published online-plus-print thrice a year.

The length of the unformatted manuscript in WORD can be 15-25 pages in length including references. The contents of the manuscript should include (1) a title with the author's name, affiliate, email address and telephone contact, (2) an abstract of 150 words with 3-5 keywords, (3) an introduction, (4) a rationale and background of the study, (5) research objectives, (6) research methodology, (7) data collection procedure, (8) data analysis, (9) results and discussion, (10) research limitation (if any), (11) conclusion, (12) acknowledgement(s) (if any), (13) the author's biography of about 50-80 words, 14) references, and (15) an appendix or appendices (if any).

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**Table of Contents** **Page**

**Note from the Editors of *RJCM* Volume 5 Number 3**

Dear *RJCM* Readers,

You are now with our third issue in Year 5 of *RICE Journal of Creative Entrepreneurship and Management* (*RJCM*). This issue contains seven articles in the areas of culinary management, marketing, educational management, and applications of digital technology.

In this issue, we have two papers on culinary management: *"Improving Chinese Chives Recipe in Accurate Mixture of Riceberry Flour and Lettuce Seaweed"* (Article 3), and *"Packaging Design of Tea and Snack Product Sets Based on the Identity of Kudeejeen Community in Bangkok"* (Article 5). One paper reports the market value of upcycled product development: *"The Market Value of Upcycled Home Decorative Furniture Products from Denim: A Case Study of Hiran Ruchi Subdistrict Community in Bangkok"* (Article 7). *Two* papers are on educational management –*"A Study of Entrepreneurship Teaching and Learning in Thailand: Applications of Ethnographic Interviews"* (Article 1), and *"The Needs for Teacher Development of Vocational Colleges in Thailand to Enhance Entrepreneurial Leadership"* (Article 2). The other two papers deal with current issues in applications of digital technology*: "Consumers' Perception of E-Service Quality by Internet Service Providers: A Focus on Satisfaction and Loyalty"* (Article 4), and *"Internet of Things (IoT) Technology for a Creative Intelligent Interactive Classroom"* (Article 6). We also have an essay on sharing professional viewpoints on the issue of rural carbon management in China. These papers report interesting findings and current issues in the areas under study.

Our paper contributors in the third issue of 2024 are researchers from six higher education institutions in the central part of Thailand and China: (1) Chulalongkorn University, (2) Dusit Thani College, (3) Dhurakij Pundit University, (4) Assumption University, (5) Bansomdejchaopraya Rajabhat University, (6) Ramkhamhaeng University, and (7) Chongqing University of Science and Technology.

The editors-in-chief hope that the research findings and current developments reported in these papers will be interesting to both researchers and practitioners in similar fields of study. The *RJCM* editorial team and the authors would appreciate our readers' comments about these articles, if possible. We always welcome contributions from those who may wish to be part of our *RJCM* network.

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**Address from RICE Director**

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Dear *RJCM* Readers,

We have currently witnessed more of the role of AI in the paths of work and life worldwide. Business developments and education practices rely more on AI as smart assistants to reach the ultimate goals either on sustainability or continuous growth in human abilities in all fields of work and study. However, despite the positive claim on the applications of the information technology for the great good of mankind, there has been public agitation with the ethical use of human-like devices. Business developers as well as scholars are affected by AI in its transformative ability to generate creative and academic work as desired. Cybercrimes and fraud cases are flourishing to benefit those who use AI for ill purposes. In both business and education, people need to communicate cautiously with their counterparts, colleagues, and students in new AI-oriented contexts. Such disruptions have led to new business models for entrepreneurs and new teaching-learning modes as innovations that inevitably come with necessity and time.

As new innovative developments evolving out of the huge circle of technology applications, developers, scholars and researchers have conscientiously worked toward their goals by adding new knowledge and research findings to the existing source of knowledge and specialization. In this regard, the articles contributed to *RICE Journal of Creative Entrepreneurship and Management* in the AI era will reveal new dimensions under investigation in the business/ academic communities at both the local and international levels.

I feel much obliged to all the authors for contributing the betterment of their work to academic communities. Your research in different fields of creative entrepreneurship and management certainly supports sharing and bridging academic interests of all stakeholders.

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# A Study of Entrepreneurship Teaching and Learning in Thailand: Applications of Ethnographic Interviews

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**Abstract**

The objective of this research was to investigate the existing conditions of entrepreneurship teaching and learning in Thailand. The informants were 10 experts in the field of entrepreneurship teaching and learning at the higher education level, selected by a homogeneous sampling method. The research instrument was the semi-structured interview on the existing conditions of entrepreneurship teaching and learning in Thailand. The obtained data were analyzed by content categories. The findings revealed that the conditions of entrepreneurship teaching and learning in Thailand were based on blended learning. Lecturers commonly combined lecture-based methods with practical applications through case studies, field trips and guest lectures by leading business entrepreneurs or the Office of Social Enterprise Promotion. Instructional materials, such as textbooks, documents, and examples of senior business plans were complemented by international literature and research publications. External activities, particularly field trips and guest lectures, were integrated, alongside the use of video clips and online resources. The measurement and evaluation included cognitive domain tests and psychomotor domain assessments through case studies and business plans. Lecturers also used a criterion-referenced grading system for scores from practical activities and examinations.

***Keywords:*** *Conditions of teaching and learning, entrepreneurship, ethnographic interview*

## 1. Introduction

In general, entrepreneurs have been recognized for their vital role as the primary drivers of production. They gather and manage factors, such as land, natural resources, labor, and capital, leveraging their knowledge and skills to bring products or services to the market. Without entrepreneurs, there would have been no impetus for business activity, and economic systems would have faltered. Moreover, the lack of entrepreneurial expertise could have hindered business success. Tangsongcharoen (2015) reported that globally, 8 out of 10 new entrepreneurs embarked on their ventures faced failure within the initial 18 months of operation.

Thailand has promoted entrepreneurship to drive the economy, reduce unemployment, and increase income channels from abroad. However, the country seemed to lack a clear-cut policy for cultivating new generations of entrepreneurs at the higher education level. This was due to policymakers prioritizing child and family development, improving education quality,

and fostering skills, attitudes, beliefs, and supporting the new generation to participate in politics according to the boundaries of culture (UNCTAD, 2018).

Entrepreneurship education has been present in Thailand since the 1970s and implemented through rapid evolution. According to the Global Entrepreneurship Monitor (GEM), which surveyed 232 countries over seven years, entrepreneurship education significantly impacted entrepreneurial activity in 54 countries. This led to better entrepreneurial potential (Sun, Lo, Liang, & Wong, 2017), resulting in a more noticeable effect on current entrepreneurship. This fostered interest among the new generation in becoming entrepreneurs from a young age, as they perceived opportunities for success in life. Consequently, agencies aimed to support the development of a new generation of entrepreneurs, such as UNCTAD (United Nations Conference on Trade and Development), which prepared a policy manual for new generations of entrepreneurs. Particularly in developing countries, entrepreneurship was in need of governmental support. It was advisable to establish an institute to develop the potential of new generations of entrepreneurs, which would lead to job creation. Expanding the economy with the assistance of new generations became an important principle affecting sustainable development (UNCTAD, 2018).

Currently, entrepreneurship curricula have been offered at both undergraduate and graduate levels, integrating entrepreneurial science content into every educational system to foster an entrepreneurial mindset from a young age (Pilkova, Holienka & Rehak, 2014). Universities in Thailand introduced curricula related to entrepreneurship, allowing higher education students to embrace the entrepreneurial idea. Governmental support for entrepreneurial education highlighted its positive impact on economic development through business start-ups, leading to the creation of more jobs (Fox & Pennington, 2009). In this regard, entrepreneurship could stimulate economic growth and increase national income.

At present, numerous methodological techniques are available in qualitative research, including observing and recording behaviors or interactions that have occurred. However, all models rely on the researchers placing themselves in the position of participant observers, residing with a group of people or a studied community. This process has taken considerable time to gain familiarity and trust, facilitating access to in-depth information (Posita, 2019). Research can be conducted without physically entering the studied community but by being among a group of people or the community itself. Field data are collected swiftly through the application of ethnographic interviews, a qualitative research method used by social scientists. Anthropologists and other researchers have used it to gain insights into individuals or groups within a specific cultural context. The primary objective of the interview is to gain a comprehensive understanding of participants' views, experiences, beliefs, and behaviors within a cultural framework. Three main types of interview questions have been adopted in ethnographic research: (1) descriptive questions, allowing the informant to elaborate on events or situations they have experienced in detail; (2) structured questions, prompting the informant to provide examples or explanations of process steps related to occurring events or situations; and (3) opposite questions, helping the informant distinguish the relevant occurrence from other events or situations (Spradley, 2016). To the researchers of the present study, ethnographic interviews represent an interesting and appropriate qualitative methodological technique for research in entrepreneurial teaching and learning conditions.

Based on the ethnographic interview method reported by Spradley (2016), the researchers aimed to use it to investigate the teaching and learning conditions of entrepreneurship curricula offered in Thailand. It was expected that the obtained results could serve as a guideline for developing the social entrepreneurship curriculum at the undergraduate level.

## 2. Research Objective

The research objective was to investigate the existing conditions of entrepreneurship teaching and learning at the higher education level in Thailand.

## 3. Research Methodology

This qualitative research used expert informants and adopted the ethnographic interview method to obtain data on the existing conditions of entrepreneurship teaching and learning at the higher education level in Thailand.

### 3.1 Informants

Ten informants were experts in entrepreneurship teaching and learning at the higher education level: five lecturers from government higher education institutions and five lecturers from private higher education institutions, selected by the homogeneous sampling method, regarding their similar backgrounds or experiences (Miles & Huberman, 1994). The selection criteria were: (1) entrepreneurship teaching experience for at least three years, and (2) academic work or experience as a speaker on topics related to entrepreneurship or being a business owner.

### 3.2 Research Instrument

The researchers applied semi-structured interview questions on entrepreneurship teaching and learning in Thailand. The quality of the research instrument was verified by presenting the interview form to the expert-advisor to check the content validity and consistency of the interview questions. The final version was improved in language clarity to convey intended meanings. Three interview questions dealt with three main issues (1) teaching and learning activities, (2) instructional media, and (3) measurement and evaluation:

(1) What are the characteristics of teaching and learning management in the classroom for the subjects you teach?
(2) What are the features of the media used for teaching in your subjects?
(3) How are measurement and evaluation carried out for your subjects?

## 4. Data Collection and Analysis

The researchers contacted and coordinated with the expert informants to review the questions in advance and schedule a date and time for the online interview using the Zoom meeting. In addition, the researchers requested permission to record video and audio during the interview.

The researchers used content analysis to analyze the interview data and interpret issues related to the entrepreneurship teaching environment in Thailand.

## 5. Research Results

The results of the data analysis on the existing conditions of entrepreneurship teaching and learning in Thailand were obtained from interviews with ten lecturers in entrepreneurship curricula at higher education institutions. There were three main issues: (1) teaching and learning activities, (2) instructional media, and (3) measurement and evaluation.

### 5.1 Teaching and Learning Activities

Based on the interviews with ten lecturers in the entrepreneurship field, most lecturers used a blended learning approach. Initially, lectures focused on presenting fundamental concepts and theories. Subsequently, practical application was facilitated through case studies, including field trips, guest lectures, YouTube videos, and document distribution. This allowed students to grasp entrepreneurial challenges. These lecturers often divided students into groups for case studies and analysis sessions. They also tasked groups with developing business plans for a final presentation before closing the course. Thus, entrepreneurship teaching combined lectures and case studies, emphasizing active learning. Two excerpts of interviews with the lecturers exemplify their responses:

- Lecturer of Entrepreneurship Curriculum-1

*"All lecturers convened to discuss their problems collectively and strategize solutions. Sometimes, they incorporated video clips from YouTube showcasing social issues, like aiding stray dogs or donating bread to children, for analysis and discussion. Lecturers predominantly emphasized the activity-based approach, occasionally arranging field trips, such as visits to Doi Tung, followed by analysis and group discussions. Groups, typically consisting of five to six students, were assigned weekly case analyses to assess their understanding of the material taught."*

- Lecturer of Entrepreneurship Curriculum-5

*"The initial phase was a lecture, focusing on concepts and theories, followed by case studies for student analysis. Subsequently, students worked in groups to brainstorm ideas, utilizing both paper and video case studies, before providing their opinions and compiling group reports. Students then summarized their opinions and presented them to the lecturer. The lecturer offered suggestions, facilitated corrections, and requested revised reports. Group sizes do not exceed five students."*

### 5.2 Instructional Media

Based on the interviews with lecturers in the entrepreneurship field, most lecturers used various instructional media, including textbooks, teaching materials created by themselves, and publications from both national and international sources. These materials were often presented using the Microsoft PowerPoint program. Additionally, they incorporated study visits to community enterprises, invited successful business entrepreneurs or representatives from the Office of Social Enterprise Promotion, and presented video clips from YouTube, websites, and business magazines. Some lecturers also assigned senior business plans and other resources to help students with assignments

and activities for better understanding. Two excerpts of interviews with lecturers exemplify their responses:

- Lecturer of Entrepreneurship Curriculum-1

*"Sometimes, I used textbooks, case studies, or even international research to complement my teaching. I occasionally invited speakers involved in business to present about their experiences or representatives from the Office of Social Enterprise Promotion to provide information."*

- Lecturer of Entrepreneurship Curriculum-6

*"Sometimes, I used business plans from previous students or various gaming equipment. I didn't often use video clips but preferred sharing my experiences or inviting alumni who have succeeded in their careers as guest speakers. Additionally, I sometimes used PowerPoint presentations."*

### 5.3 Measurement and Evaluation

According to the interview results, the lecturers used objective and subjective tests, varying formats each semester. The objective test was to measure the cognitive domain; while case studies and business plans were common in measuring the psychomotor domain. Evaluation typically involved a grading ratio, including midterm and final examinations, along with activities like case studies or business plans. The lecturers also considered class participation. The evaluation followed a criterion-based approach. They often created rubrics for grading case studies or business plans. Two excerpts of interviews with the lecturers exemplify their responses:

- Lecturer of Entrepreneurship Curriculum-1

*"For me, I break down 100% as follows. The first 10% is how much they engage with me and understand the points I teach. Another 30% is for activities. The remaining 60% is for mid-term and final examinations, split evenly at 30% each. In terms of activities, I assess them based on four aspects: feasibility for business, presentation, innovation, and interestedness, without descending scores in the feasibility section. Presentation ability is scored using a rubric. Each lecturer has different measurements. I vary the types of examinations all the time, including written, multiple choice, or a combination, providing a better understanding of student comprehension. For applications and opinions, a more subjective approach is favored. I evaluate learning results based on criterion-referenced evaluations."*

- Lecturer of Entrepreneurship Curriculum-3

*"Primarily, we focus on test scores, both midterm and final examinations. We assign group work to students, and they receive accumulated scores from this section. Typically, the midterm is worth 30 points, the final is worth 30 points, or sometimes the midterm is worth 20 points. Written tests are used in most examinations. In terms of exercise scores, students will be assigned to do group work based on case studies. Lecturers will consider their process, overall performance, and presentation. We have criteria for grading and explain them to students, and students' learning results are mainly based on criterion-referenced evaluations."*

## 6. Discussion of Results

According to the content analysis, the researchers found two major findings for discussion as follows:

### 6.1 Teaching and Learning Activities

The results revealed that most lecturers were in favor of a blended learning approach. This method entailed initial concept-based lectures on various entrepreneurial topics, followed by practical application through case studies including field trips, guest lectures by business entrepreneurs, and the use of online resources like YouTube videos, and handouts. These lecturers organized group activities to consolidate acquired knowledge. The obtained findings aligned with research by Sudkaew (2018), which identified two learning formats: (1) Formal learning that involves expert-led lectures and workshops, allowing students to experiment and practice under guidance; and (2) Informal learning that supports real-world experience through internships or projects, facilitating direct learning experiences and skill development. This approach was in accordance with Hart (2018) which focused on practical learning, and Martin et al. (2013) holistic approach to entrepreneurship teaching, which emphasized lectures, guest speakers, and online resources.

### 6.2 Instructional Media

The informants reported the use of instructional media, including textbooks, documents, and research materials sourced both domestically and internationally. These materials were supplemented by field trips, guest lectures by successful entrepreneurs or representatives from the Office of Social Enterprise Promotion, and the use of online resources, such as YouTube videos, websites, and business magazines. Furthermore, lecturers assigned senior business plans and other teaching materials. These approaches aligned with what was described in the Full Text of the Policy on College Students' Innovation and Entrepreneurship 2019 (China Mobile Communications Corporation, 2019), which emphasized creating an entrepreneurial atmosphere conducive to successful business startups. Teaching materials encompassed a range of media platforms, from social media like Weibo, WeChat, and QQ to traditional media like newspapers, exhibitions, and posters, aiming to disseminate information on national policies and market trends in real time. The lecturers also invited successful entrepreneurs to share their experiences in support of students' knowledge and motivation. These practices were earlier suggested by Radipere (2012) for entrepreneurial education, which emphasized experiential learning outside the classroom through field trips, internships, community engagement, and business consulting, providing students with practical exposure to entrepreneurship.

### 6.3 Measurement and Evaluation

Based on the lecturers' responses, they dominantly adopted both objective and subjective tests to evaluate students' cognitive domain. For evaluating the psychomotor domain, case studies and business plan assignments were commonly used. In terms of measurement, scores were obtained from midterm and final examinations, as well as activities including case studies and business plan assignments. The lecturers also considered class participation scores. Their grading was based on criterion-referenced evaluation, and lecturers often created rubrics for grading case studies or business plans. These practices aligned with Radipere (2012), who noted

similar evaluation methods in South African universities, emphasizing exams, assignments, and business plan development. Pretorius (2001) also preferred evaluating desirable learning outcomes for entrepreneurship, including entrepreneurial success, knowledge, skills, and business planning. Pittaway & Edwards (2012) particularly highlighted the prevalence of business plans and reports as common evaluation methods in entrepreneurship education, followed by such traditional methods as examinations. The summative assessment concluded students' performance, indicating their level of entrepreneurial capabilities.

### 6.4 Methodology in this Research

This study used ethnographic interviews, a typical qualitative research method in anthropology and other social sciences to collect detailed information about a specific culture or social group. The objective was to comprehend individual perspectives, behaviors, and experiences within a cultural context. The distinctions between traditional interviews and ethnographic interviews are explicated as follows:

**Interview Objectives:** Traditional interviews, typically structured, gather specific information or opinions on predetermined topics and can be used across various research contexts, such as market research, journalism, or academic studies. In the ethnographic interview section, the goal is to comprehend the cultural context, behaviors, and experiences of a particular group or community, focusing on exploring participants' perspectives within their natural environment.

**Interview Settings:** Traditional interviews can occur in controlled settings like formal offices, research laboratories, or over the telephone, providing a structured environment separate from informants' daily lives. Conversely, ethnographic interviews are conducted in the participants' natural environments, such as their homes, workplaces, or community spaces, facilitating a holistic understanding of their lives and activities.

**Interview Structures:** Traditional interviews always follow a standardized structure with predetermined questions and a clear agenda, aiming to efficiently collect specific information. In contrast, ethnographic interviews are more open-ended and flexible, with less structured questions that allow participants to freely express their opinions. The focus is on capturing the depth and nuance of the experience.

**Length of Interviews:** Traditional interviews usually have a shorter duration, with interactions limited to the scheduled interview time. In contrast, ethnographic interviews can span an extended period, sometimes involving multiple field visits. This longitudinal approach enables researchers to observe changes and variations over time.

**Interview Context**: Traditional interviews focus on extracting specific information from the interviewee, often without delving into the broader cultural or social context. In contrast, ethnographic interviews emphasize understanding the interviewee within their cultural context, and exploring the meaning behind their behaviors, beliefs, and practices.

Therefore, the study on the conditions of entrepreneurship teaching and learning in Thailand utilized ethnographic interview for the researcher to comprehend the teaching and learning environment, including interactions between students and teachers, and the various factors influencing teaching and learning. This approach facilitated a comprehensive understanding of the natural teaching and learning environment.

## 7. Conclusion

As shown in the findings of the study, the conditions of entrepreneurship teaching and learning in Thailand were identified by ten experts in the field of entrepreneurship teaching and learning at the higher education level as based on blended learning. Lecturers tended to combine lecture-based methods with case studies, field trips and guest lectures by leading business entrepreneurs or the Office of Social Enterprise Promotion. Instructional materials, such as textbooks, documents, and examples of senior business plans were provided from resources like international literature and research publications. Particularly, external activities integrated field trips, guest lectures, the use of video clips, and online resources. The measurement and evaluation included cognitive domain tests and psychomotor domain assessments through case studies and business plans. Lecturers also used a criterion-referenced grading system for scores from practical activities and examinations. Overall, the researchers were satisfied with the applications of ethnographic interview techniques in securing the needed data on the existing conditions of entrepreneurship teaching and learning in Thailand.

## 8. Suggestions and Recommendations

### 8.1 Suggestions

Higher education institutions should strategically plan curriculum administration for entrepreneurship programs, encompassing teaching and learning methodologies, instructional media, and measurement and evaluation strategies. This ensures the fulfillment of curriculum objectives aimed at equipping students with entrepreneurial skills.

### 8.2. Recommendations for Further Research

There should be further research and development on instructional models to enhance the cultivation of entrepreneurial skills across diverse sectors in Thailand. Other relevant issues of curricula for social entrepreneurship in Thailand as perceived by developers and course instructors could shed more light on what to be done for training potential entrepreneurs. Further development on indicators and competencies for graduates of entrepreneurship programs in Thailand should also deserve researchers' attention.

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**10. References**

China Mobile Communications Corporation. (2019). Full Text of the Policy on College Students' Innovation and Entrepreneurship 2019. (Online). http://www.xuexila.com/chuangyee/zhengce/c225972.htm, July 15, 2023.

Fox, J. L. & Pennington, K. (2009). The effect on economic development of an entrepreneurship program at a North Carolina community college. *Journal of Applied Research in the Community College, 2009, 16*(2), 47-51.

Hart, T. (2018). *Practical Work: The Benefits, Challenges, and Solutions*. Cambridge: Cambridge University Press. (Online). https://www.cambridge.org/us/education/blog/2018/ 12/05/practical-work-benefits-challenges and-solutions/, December 5, 2018.

Martin, B. C., McNally, J. J. & Kay, M. J. (2013). Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *Journal of Business Venturing, 2013, 28*(2), 211–224.

Miles, M. B. & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*: Los Angles: Sage Publications, Inc.

Pilkova, A., Holienka, M. & Rehak, J. (2014). Senior entrepreneurship in the perspective of European entrepreneurial environment. *Procedia Economics and Finance, 2014, 12*, 523-532.

Pittaway, L. & Edwards, C. (2012). Assessment: Examining practice in entrepreneurship education. *Education + Training, 2012, 54*(8/9), 778-800.

Posita, C. (2019). *Science and Art of Qualitative Research: A Guide for Social Science Students and Researchers*. Eight edition. Bangkok: Amarin Printing and Publishing.

Pretorius, M. (2001). A Training Model to Enhance Micro and Small Business Start-ups in South Africa. An unpublished D Tech thesis. Tshwane University of Technology, Pretoria, South Africa.

Spradley, J. P. (2016). *The Ethnographic Interview*. Boston: Wadsworth Cengage Learning.

Sudkaew, S. (2018). A Study of the Entrepreneur Professional Skill Learning of the Office of Non-Formal Education and Informal Education in the Non-formal Context of Thailand. A Master's thesis. Mahidol University, Thailand.

Sun, H., Lo, C. T., Liang, B. & Wong, Y. L. B. (2017). The impact of entrepreneurial education on entrepreneurial intention of engineering students in Hong Kong. *Management Decision, 2017, 55(*7), 1371-1393.

Radipere, S. (2012). South African university entrepreneurship education. *African Journal of Business Management, 2012, 44*(6), 11015-11022.

Tangsongcharoen, S. (2015). Entrepreneurial Orientation of MBA Students in Bangkok. An Independent Study of Master of Business Administration. Thammasat University, Thailand.

UNCTAD. (2018). *Policy Guide on Youth Entrepreneurship*. (Online). https://unctad.org/ system/files/official-document/webdiaeed2015d1_en.pdf, June 11, 2023.

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# The Needs for Teacher Development of Vocational Colleges in Thailand to Enhance Entrepreneurial Leadership

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**Abstract**

Thailand has currently found itself at a pivotal juncture where the need for vocational workers converges with the ideals of entrepreneurial leadership. At its core, vocational teachers were the architects of this transformative process, imparting practical skills and knowledge to students. This research aimed to study the priority needs of teacher development to enhance entrepreneurial leadership among vocational college teachers. The informants were 416 consisting of vocational college directors, deputy vocational college directors, department heads, and vocational college teachers. Data were collected using a constructed questionaire and were analyzed for frequency, percentage, mean, standard deviation and priority needs index. The overall results showed that both current state and desirable state were at high level: (i) The first priority needs for vocational college teachers' entrepreneurial leadership were *prediction logics* ($PNI_{modified}$ = 0.139) in the process of analyzing goals ($PNI_{modified}$ = 0.131), and *economic responsibility and sustainability* ($PNI_{modified}$ = 0.141) in the process of analyzing target audience ($PNI_{modified}$ = 0.131). (ii) In the design phase, the first priority needs of teacher entrepreneurial leadership were *social responsibility and sustainability* ($PNI_{modified}$ = 0.160). (iii) For teacher development methodologies, *coaching* yielded the highest frequency on-the-job development method, while *networking* or professional learning community yielded the second highest frequency on off-the-job development method. (iv) In the implementing phase, the first priority needs of teacher entrepreneurial leadership were *prediction logics* ($PNI_{modified}$ = 0.144). (v) In the evaluating phase, the first priority needs of vocational college teacher entrepreneurial leadership were *creation logics in innovation* ($PNI_{modified}$ = 0.154) in the process of evaluating the quality of learning resources ($PNI_{modified}$ = 0.143), and *economic responsibility and sustainability* ($PNI_{modified}$ = 0.151) in the evaluating process of the success of the operation ($PNI_{modified}$ = 0.110).

***Keywords:*** *Priority needs, teacher development, entrepreneurial leadership, vocational college*

## 1. Introduction

Thailand is at a pivotal moment where the demand for vocational workers intersects with the need for entrepreneurial leadership, impacting its economic growth and sustainability. Traditionally, vocational workers were valued for technical skills, but as Thailand shifts toward an innovation-driven economy, blending technical proficiency with an entrepreneurial mindset is crucial. Sectors, such as automotive, electronics, and biotechnology highlight the necessity for

vocational workers to drive innovation and industry expansion. In the startup ecosystem, vocational workers contribute technical expertise to enhance product development and startup success. Given that Small and Medium Enterprises (SMEs) are vital to Thailand's economy, vocational workers with entrepreneurial attributes can offer innovative solutions and technical support. By prioritizing vocational education that fosters entrepreneurial thinking, Thailand can empower vocational workers to lead innovation, enhance SME competitiveness, and boost sustainable economic growth. (Tseng & Tang 2023; World Bank, 2022; Department of International Trade Promotion, 2022; Board of Investment of Thailand, 2021; Kuratko, 2020; Tidd & Bessant, 2018; Blenker et al., 2017.)

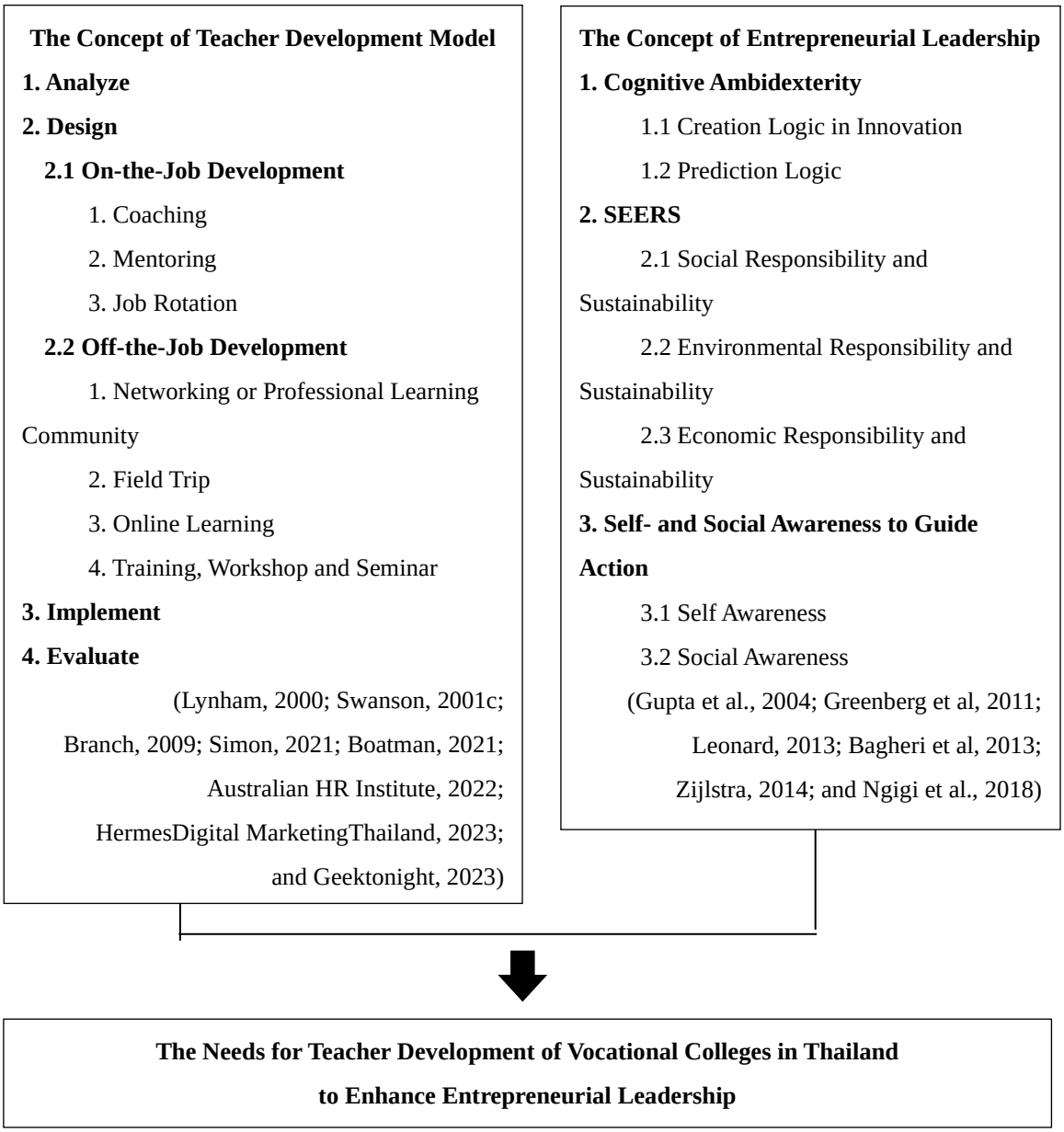
The Office of the Vocational Education Commission (VEC) in Thailand plays a crucial role in overseeing vocational education and training to meet industry demands and enhance workforce employability. VEC's initiatives, such as the Bureau of Personnel Competency Development and Vocational Entrepreneur Incubation Center, promote entrepreneurship and business knowledge among students. Vocational education is integral to Thailand's economic development, with vocational teachers imparting practical skills and industry-based knowledge. Thailand has invested significantly in vocational teacher development, focusing on technical expertise, effective teaching methods, and technology integration. Continuous professional enhancement through training programs and collaborations ensures vocational educators to remain updated with the industry trends. Additionally, vocational teacher development encourages research and innovation, fostering a culture of inquiry for continual improvement. Thailand's commitment to vocational teacher development aligns with its goal on preparing a skilled workforce for the evolving job market, contributing to sustainable economic growth. (Chaemchoy, 2022; Ministry of Education, 2021; Department of Skill Development, 2021; Office of the Higher Education Commission, 2019; Office of the Vocational Education Commission, 2019; World Bank, 2023.)

Therefore, it is important to study the needs for teacher development of vocational colleges in Thailand to enhance entrepreneurial leadership to obtain assessment results as guidelines for developing the human resources in educational institutions. This includes four phases: analyze, design, implement, and evaluate. These phases are to develop operational models that meet the needs of target groups, accessing these target groups, and using them to create new learning models aligned with the identified needs. The models are expected to promote gender intelligence, benefit learners, teachers, and school administrators, foster academic advancement and enhance the efficiency of school management. Promoting students with entrepreneurial leadership will be beneficial not only to the students themselves but also to teachers and school administrators. Such orientation, in turn, supports academic advancement and effectiveness in school management. The researchers of the present study identifed these limitations as a background to conduct research into teacher development of vocational colleges in Thailand for the purpose of enhancing entrepreneurial leadership.

## 2. Research Conceptual Framework

The researchers created a conceptual framework for the study by adopting teacher development model according to Lynham (2000c), Swanson (2021), Branch (2009), Simon (2021), Boatman (2021), Australian HR Institute (2022), Hermes Digital MarketingThailand (2023), and Geektonight (2023) in 4 phases: (i) Analyze, (ii) Design, (iii) Implement, and (iv) Evaluate. By these principles, the researchers aimed at the Entrepreneurial Leadership according to the concept of Gupta et al. (2004), Greenberg et al. (2011), Leonard (2013), Bagheri et al. (2013), and Zijlstra (2014) in 3 elements as follows: (i) Cognitive Ambidexterity, (ii) SEERS, and (iii) Self- and Social Awareness to Guide Action. The research conceptual framework is shown in Figure 1.

**Figure 1:** Research Conceptual Framework



## 3. Research Objective

The research objective was to analyze the needs for teacher development of vocational colleges in Thailand to enhance entrepreneurial leadership.

## 4. Research Methodology

This study was quantitative in nature and conducted with descriptive research methods. The researchers aimed at analyzing the priority needs in teacher development for enhancing entrepreneurial leadership of vocational colleges.

### 4.1 The Respondents

The population of this study was 433 vocational colleges under the Office of the Vocational Education Commission in Thailand. At least 203 vocational colleges were selected for the study, using Krejcie & Morgan (1970) with an error of 5 percent. A sample of 203 vocational colleges was selected using multistage and stratified sampling, as well as convenience sampling. First, 2-part regions were randomly selected from each region (Bangkok and other regions). Second, stratified random and conveience sampling were used to select sample schools from vocational colleges. The respondents included vocational college directors, deputy vocational college directors, department heads, and teachers.

### 4.2 Research Instrument

To identify the needs of teacher development for enhancing entrepreneurial leadership of vocational colleges, the researchers used a constructed questionnaire. There were 2 sections: Section 1: Demographic information of the respondents in 6 checklist items on gender, age, education level, current position, work experience in the current position, and academic standing. Section 2: The current and desirable states and teacher development models for entrepreneurial leadership in 2 parts: Part I: The current and desirable states of teacher development for vocational colleges based on the concept of entrepreneurial leadership in 45 items. The questionnaire utilized a dual-response format with a 5-rating scale structure. And Part II: The teacher development methodologies for entrepreneurial leadership in 7 multiple-choice items.

As for the instrument’s quality, five content experts were used, and Item Objective Congruence (IOC) index was calculated to examine the content validity. The items with the IOC index above 0.5 were regarded as good with no required revision. Cronbach's alpha co-efficient was 0.966, which indicated that the reliability of the questionnaire was at a very good level (Kanjanawasee, 2013).

### 4.3 Data analysis

The data obtained from the questionnaire were analyzed by using frequency, percentage, mean, standard deviation, and modified Priority Needs Index ($PNI_{modified}$) (Wongwanit, 2016).

## 5. Research Results

The results of the respondents' demographic variables showed a total of 416 individuals, comprising 216 males (51.92%) and 200 females (48.08%). The majority aged 41 to 50 years old, constituting 204 individuals (49.04%). Additionally, 206 participants (45.19%) possessed a master's degree as their highest educational qualification, while 122 individuals (29.33%) had work experience exceeding 21 years.

The results of the current state, desirable state and priority needs in teacher development for enhancing entrepreneurial leadership of vocational colleges are reported in Table 1.

**Table 1:** The Analyze Phase: The Current State, Desirable State and Priority Needs Analysis of Teacher Development of Vocational Colleges to Enhance Entrepreneurial Leadership

| Entrepreneurial Leadership | Current State | | | Desirable State | | | $PNI_{modified}$ | Rank |
|---|---|---|---|---|---|---|---|---|
| | ***M*** | **SD** | **Level** | ***M*** | **SD** | **Level** | | |
| **Analyze Phase** | | | | | | | | |
| **1. Analyzing the Goals** | **3.75** | **0.867** | **High** | **4.24** | **0.743** | **High** | **0.131** | **1** |
| 1.1 Prediction Logics | 3.67 | 0.899 | High | 4.18 | 0.728 | High | 0.139 | (1) |
| 1.2 Creation Logics in Innovation | 3.67 | 0.862 | High | 4.17 | 0.778 | High | 0.138 | (2) |
| 1.3 Social Responsibility and Sustainability | 3.70 | 0.895 | High | 4.18 | 0.788 | High | 0.128 | (4) |
| 1.4 Environmental Responsibility and Sustainability | 3.78 | 0.846 | High | 4.26 | 0.744 | High | 0.126 | (5) |
| 1.5 Economic Responsibility and Sustainability | 3.70 | 0.837 | High | 4.21 | 0.720 | High | 0.137 | (3) |
| 1.6 Self-Awareness | 3.86 | 0.855 | High | 4.35 | 0.712 | High | 0.125 | (6) |
| 1.7 Social Awareness | 3.85 | 0.853 | High | 4.34 | 0.709 | High | 0.128 | (4) |

| Entrepreneurial Leadership | Current State | | | Desirable State | | | $PNI_{modified}$ | Rank |
|---|---|---|---|---|---|---|---|---|
| | *M* | SD | Level | *M* | SD | Level | | |
| **2. Analyzing Target Audience** | **3.79** | **0.859** | **High** | **4.28** | **0.683** | **High** | **0.131** | **1** |
| 2.1 Prediction Logics | 3.75 | 0.863 | High | 4.28 | 0.698 | High | 0.140 | (2) |
| 2.2 Creation Logics in Innovation | 3.69 | 0.856 | High | 4.18 | 0.686 | High | 0.134 | (4) |
| 2.3 Social Responsibility and Sustainability | 3.78 | 0.839 | High | 4.30 | 0.678 | High | 0.137 | (3) |
| 2.4 Environmental Responsibility and Sustainability | 3.81 | 0.855 | High | 4.29 | 0.678 | High | 0.124 | (6) |
| 2.5 Economic Responsibility and Sustainability | 3.73 | 0.862 | High | 4.25 | 0.675 | High | 0.141 | (1) |
| 2.6 Self-Awareness | 3.89 | 0.849 | High | 4.35 | 0.677 | High | 0.117 | (7) |
| 2.7 Social Awareness | 3.83 | 0.875 | High | 4.32 | 0.681 | High | 0.127 | (5) |
| **3. Analyzing Required Resources** | **3.81** | **0.871** | **High** | **4.31** | **0.702** | **High** | **0.131** | **1** |
| 3.1 Prediction Logics | 3.79 | 0.886 | High | 4.33 | 0.693 | High | 0.143 | (2) |
| 3.2 Creation Logics in Innovation | 3.74 | 0.853 | High | 4.27 | 0.703 | High | 0.141 | (3) |
| 3.3 Social Responsibility and Sustainability | 3.80 | 0.852 | High | 4.30 | 0.699 | High | 0.132 | (4) |
| 3.4 Environmental Responsibility and Sustainability | 3.84 | 0.856 | High | 4.31 | 0.674 | High | 0.122 | (6) |
| 3.5 Economic Responsibility and Sustainability | 3.77 | 0.874 | High | 4.32 | 0.692 | High | 0.145 | (1) |
| 3.6 Self-Awareness | 3.90 | 0.890 | High | 4.34 | 0.706 | High | 0.112 | (7) |
| 3.7 Social Awareness | 3.81 | 0.884 | High | 4.29 | 0.748 | High | 0.127 | (5) |
| **Total** | **3.78** | **0.866** | **High** | **4.28** | **0.710** | **High** | **0.131** | |

Table 1 indicates that the overall aspects in current state of the analyze phase to develop vocational college teachers for enhancing entrepreneurial leadership were at high level (M=3.78, SD=0.866). Regarding the subdimensions of the analyze phase, analyzing required resources was at the highest average (M=3.81, SD=0.867). As for the dimensions of entrepreneurial

leadership, self-awareness was the highest average (M=3.90, SD=0.890), followed by environmental responsibility and sustainability (M=3.84, SD=0.856), and creation logics in innovation as the lowest average (M=3.74, SD=0.853), respectively. In the subdimensions of the analyze phase, analyzing target audience was at the second highest average (M=3.79, SD=0.859). In the dimensions of entrepreneurial leadership, self-awareness was the highest average (M=3.89, SD 0.849), followed by social awareness (M=3.83, SD=0.875), and creation logics in innovation as the lowest average (M=3.69, SD=0.856), respectively. As for the subdimensions of the analyze phase, analyzing the goals was at the lowest average (M=3.81, SD=0.871). In the dimensions of entrepreneurial leadership, self-awareness was the highest average (M=3.86, SD=0.855), followed by social awareness (M=3.85, SD=0.853), and perdiction logics and creation logics in innovation as the lowest average (M=3.67, SD= 0.899, 0.862), respectively.

The overall aspects in desirable state of the analyze phase to develop vocational college teachers for enhancing entrepreneurial leadership were at high level (M=4.28, SD=0.710). In the subdimensions of the analyze phase, analyzing required resources was at the highest average (M=4.31, SD=0.702). As for the dimensions of entrepreneurial leadership, self-awareness was the highest average (M=4.34, SD=0.706), followed by prediction logics (M=4.33, SD=0.693), and creation logics in innovation as the lowest average (M=4.27, SD =0.703), respectively. In the subdimensions of the analyze phase, analyzing target audience was at the second highest average (M=4.28, SD=0.683), while in the dimensions of entrepreneurial leadership, self-awareness was the highest average (M=4.35, SD=0.677), followed by social awareness (M=4.32, SD=0.681), and creation logics in innovation as the lowest average (M=4.18, SD=0.686), respectively. Also in the subdimensions of the analyze phase, analyzing the goals was at the lowest average (M=4.24, SD=0.743), but self-awareness was the highest average (M=4.35, SD=0.712), followed by social awareness (M=4.34, SD=0.709), and creation logics in innovation as the lowest average (M=4.17, SD=0.778), respectively.

In required resources, analyzing target audience, and analyzing the goals were the same priority needs ($PNI_{modified}$ = 0.131). Regarding the dimensions of entrepreneurial leadership on analyzing the goals, the first priority needs was prediction logics ($PNI_{modified}$ = 0.139), followed by creation logics in innovation ($PNI_{modified}$ = 0.138), and the last priority needs as self-awareness ($PNI_{modified}$ = 0.125). In the dimensions of entrepreneurial leadership on analyzing target audience, the first priority needs was economic responsibility and sustainability ($PNI_{modified}$ = 0.141), followed by prediction logics ($PNI_{modified}$ = 0.140), and the last priority needs as self-awareness ($PNI_{modified}$ = 0.117). In the dimensions of entrepreneurial leadership on analyzing required resources, the first priority needs was economic responsibility and sustainability ($PNI_{modified}$ = 0.145), followed by prediction logics ($PNI_{modified}$ = 0.143), and the last priority needs as self-awareness ($PNI_{modified}$ = 0.112).

**Table 2:** The Design Phase: The Current State, Desirable State and Priority Needs Analysis of Teacher Development to Enhance Entrepreneurial Leadership of Vocational Colleges

| Entrepreneurial Leadership | Current State | | | Desirable State | | | $PNI_{modified}$ | Rank |
|---|---|---|---|---|---|---|---|---|
| | *M* | SD | Result | *M* | SD | Result | | |
| **Design Phase** | | | | | | | | |
| 2.1 Prediction Logics | 3.68 | 0.891 | High | 4.21 | 0.750 | High | 0.146 | (2) |
| 2.2 Creation Logics in Innovation | 3.75 | 0.882 | High | 4.27 | 0.725 | High | 0.138 | (5) |
| 2.3 Social Responsibility and Sustainability | 3.73 | 0.822 | High | 4.32 | 0.679 | High | 0.160 | (1) |
| 2.4 Environmental Responsibility and Sustainability | 3.78 | 0.832 | High | 4.33 | 0.685 | High | 0.146 | (2) |
| 2.5 Economic Responsibility and Sustainability | 3.77 | 0.864 | High | 4.31 | 0.696 | High | 0.143 | (4) |
| 2.6 Self-Awareness | 3.85 | 0.848 | High | 4.37 | 0.696 | High | 0.135 | (6) |
| 2.7 Social Awareness | 3.83 | 0.855 | High | 4.38 | 0.705 | High | 0.145 | (3) |
| **Total** | **3.77** | **0.857** | **High** | **4.32** | **0.707** | **High** | **0.145** | |

Table 2 reveals the overall aspects in the current state of the design phase to develop vocational college teachers for enhancing entrepreneurial leadership, at high level (M=3.77, SD=0.857). In the dimensions of entrepreneurial leadership, self-awareness was the highest average (M=3.85, SD=0.848), followed by social awareness (M=3.83, SD= 0.855), and prediction logics as the lowest average (M=3.68, SD=0.891), respectively.

The overall aspects in the desirable state of the design phase to develop vocational college teachers for enhancing entrepreneurial leadership were at high level (M=4.32, SD=0.707). In the dimensions of entrepreneurial leadership, social awareness was the highest average (M=4.38, SD=0.705), followed by self-awareness (M=4.37, SD=0.696), and prediction logics as the lowest average (M=4.21, SD=0.750), respectively.

As for the dimensions of entrepreneurial leadership, the first priority needs were social responsibility and sustainability ($PNI_{modified}$ = 0.160), followed by prediction logics and environmental responsibility and sustainability ($PNI_{modified}$ = 0.146), and the last priority needs as self-awareness ($PNI_{modified}$ = 0.135).

**Table 3:** The Development Methodologies in Entrepreneurial Leadership of Vocational Colleges in Thailand by Frequency (f), and Percentage (p)

| Entrepreneurial Leadership | Issue | On the Job Development | | | | Off the Job Development | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Coaching | Mentoring | Job rotation | **Total** | Networking or Professional Learning Community | Field Trip | Online Learning | Training, workshop, and Seminar | **Total** |
| **1. Prediction Logics** ($PNI_{modified}$ = 0.146) | f | 152 | 34 | 23 | 209 | 35 | 44 | 21 | 49 | 149 |
| | p | 42.46 | 9.50 | 6.42 | 58.38 | 9.78 | 12.29 | 5.87 | 13.69 | 41.62 |
| **2. Creation Logics in Innovation** ($PNI_{modified}$ = 0.138) | f | 128 | 40 | 28 | 196 | 57 | 33 | 23 | 40 | 153 |
| | p | 36.68 | 11.46 | 8.02 | 56.16 | 16.33 | 9.46 | 6.59 | 11.46 | 43.84 |
| **3. Social Responsibility and Sustainability** ($PNI_{modified}$ = 0.160) | f | 120 | 37 | 24 | 181 | 52 | 36 | 24 | 34 | 146 |
| | p | 36.70 | 11.31 | 7.34 | 55.35 | 15.90 | 11.01 | 7.34 | 10.40 | 44.65 |
| **4. Environmental Responsibility and Sustainability** ($PNI_{modified}$ = 0.146) | f | 114 | 35 | 30 | 179 | 42 | 35 | 27 | 39 | 143 |
| | p | 35.40 | 10.87 | 9.32 | 55.59 | 13.04 | 10.87 | 8.39 | 12.11 | 44.41 |
| **5. Economic Responsibility and Sustainability** ($PNI_{modified}$ = 0.143) | f | 111 | 41 | 29 | 181 | 47 | 29 | 25 | 51 | 152 |
| | p | 33.33 | 12.31 | 8.71 | 54.35 | 14.11 | 8.71 | 7.51 | 15.32 | 45.65 |

| Entrepreneurial Leadership | Issue | On the Job Development | | | | Off the Job Development | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Coaching | Mentoring | Job rotation | Total | Networking or Professional Learning Community | Field Trip | Online Learning | Training, workshop, and Seminar | Total |
| **6. Self-Awareness** ($PNI_{modified}$ = 0.135) | f | 102 | 50 | 28 | 180 | 44 | 36 | 29 | 51 | 160 |
| | p | 30.00 | 14.71 | 8.24 | 52.94 | 12.94 | 10.59 | 8.53 | 15.00 | 47.06 |
| **7. Social Awareness** ($PNI_{modified}$ = 0.145) | f | 108 | 40 | 30 | 178 | 57 | 28 | 22 | 52 | 159 |
| | p | 32.05 | 11.87 | 8.90 | 52.82 | 16.91 | 8.31 | 6.53 | 15.43 | 47.18 |
| **Total** | f | 835 | 277 | 192 | 1304 | 334 | 241 | 171 | 316 | 1062 |
| | p | 35.29 | 11.71 | 8.11 | 55.11 | 14.12 | 10.19 | 7.23 | 13.36 | 44.89 |

Table 3 reports the methods for developing entrepreneurial leadership of vocational college teachers in Thailand. The highest frequency overall in the teacher development methods to enhance entrepreneurial leadership was coaching for on-the-job development, while networking or professional learning communities was favored for off-the-job development.

In the subdimensions of entrepreneurial leadership, coaching to cultivate prediction logics had the highest frequency 152 (42.46%), followed by training, workshop, and seminar frequency 49 (13.69%), and field trip frequency 44 (12.29%), respectively. As for creation logics in innovation, coaching had the highest frequency 128 (36.68%), followed by networking or professional learning communities frequency 57 (16.33%), and mentoring and training, workshop, and seminar with frequency 40 (11.46%), respectively. In social responsibility and sustainability, coaching to cultivate prediction logics had the highest frequency 120 (36.70%), followed by networking or professional learning communities with frequency 52 (15.90%), and mentoring frequency 37 (11.31%), respectively. In terms of environmental responsibility and sustainability, coaching had the highest frequency 114 (35.40%), followed by networking or professional learning communities with frequency 42 (13.04%), and training, workshop, and seminar frequency 39 (12.11%), respectively. As for economic responsibility and sustainability, coaching had the highest frequency 111 (33.33%), followed by training, workshop, and seminar frequency 51 (15.32%), and networking or professional learning communities with frequency 47 (14.11%), respectively. In self-awareness, coaching had the highest frequency 102 (30.00%),

followed by training, workshop, and seminar frequency 51 (15.00%), and mentoring frequency 50 (14.71%), respectively. In social awareness, coaching had the highest frequency 108 (32.05%), followed by networking or professional learning communities frequency 57 (16.91%), and training, workshop, and seminar frequency 52 (15.43%), respectively.

**Table 4:** The Implementing Phase: The Current State, Desirable State and Priority Needs Analysis of Teacher Development to Enhance Entrepreneurial Leadership of Vocational Colleges

| Entrepreneurial Leadership | Current State | | | Desirable State | | | $PNI_{modified}$ | Rank |
|---|---|---|---|---|---|---|---|---|
| | ***M*** | **SD** | **Result** | ***M*** | **SD** | **Result** | | |
| **3. Implementing Phase** | | | | | | | | |
| 3.1 Prediction Logics | 3.76 | 0.837 | High | 4.31 | 0.708 | High | 0.144 | (1) |
| 3.2 Creation Logics in Innovation | 3.76 | 0.820 | High | 4.29 | 0.682 | High | 0.139 | (3) |
| 3.3 Social Responsibility and Sustainability | 3.81 | 0.832 | High | 4.31 | 0.691 | High | 0.129 | (5) |
| 3.4 Environmental Responsibility and Sustainability | 3.77 | 0.825 | High | 4.29 | 0.688 | High | 0.138 | (4) |
| 3.5 Economic Responsibility and Sustainability | 3.77 | 0.844 | High | 4.30 | 0.688 | High | 0.140 | (2) |
| 3.6 Self-Awareness | 3.86 | 0.836 | High | 4.35 | 0.659 | High | 0.126 | (7) |
| 3.7 Social Awareness | 3.85 | 0.854 | High | 4.34 | 0.697 | High | 0.128 | (6) |
| **Total** | **3.80** | **0.836** | **High** | **4.31** | **0.688** | **High** | **0.135** | |

Table 4 illustrates the overall aspects in the current state of the implementing phase to develop vocational college teachers for enhancing entrepreneurial leadership, at a high level (M=3.80, SD=0.836). In the dimensions of entrepreneurial leadership, self-awareness was the highest average (M=3.86, S=0.836), followed by social awareness (M=3.85, SD=0.854), and prediction logics and creation logics in innovation as the lowest average (M=3.76, SD=0.837, 0.820), respectively.

The overall aspects in the desirable state of the implementing phase to develop vocational college teachers for enhancing entrepreneurial leadership were at a high level (M=4.31, SD=0.688). In the dimensions of entrepreneurial leadership, self-awareness was the highest average (M=4.35, SD=0.659), followed by social awareness (M=4.34, SD=0.697), and creation logics in innovation and environmental responsibility and sustainability as the lowest average (M=4.29, SD=0.682, 0.688), respectively.

As for the dimensions of entrepreneurial leadership, the first priority needs were prediction logics ($PNI_{modified}$ = 0.144), followed by economic responsibility and sustainability ($PNI_{modified}$ = 0.140), and the last priority needs as self-awareness ($PNI_{modified}$ = 0.126).

**Table 5:** The Evaluating Phase: The Current State, Desirable State and Priority Needs Analysis of Teacher Development to Enhance Entrepreneurial Leadership of Vocational Colleges

| Entrepreneurial Leadership | Current State | | | Desirable State | | | $PNI_{modified}$ | Rank |
|---|---|---|---|---|---|---|---|---|
| | *M* | SD | Result | *M* | SD | Result | | |
| **4. Evaluation Phase** | | | | | | | | |
| **4.1 Evaluating the success of the operation** | **3.77** | **0.844** | **High** | **4.31** | **0.698** | **High** | **0.140** | **2** |
| 4.1.1 Prediction Logics | 3.72 | 0.873 | High | 4.25 | 0.700 | High | 0.143 | (3) |
| 4.1.2 Creation Logics in Innovation | 3.75 | 0.863 | High | 4.29 | 0.703 | High | 0.145 | (2) |
| 4.1.3 Social Responsibility and Sustainability | 3.81 | 0.842 | High | 4.35 | 0.705 | High | 0.141 | (4) |
| 4.1.4 Environmental Responsibility and Sustainability | 3.79 | 0.824 | High | 4.29 | 0.699 | High | 0.132 | (7) |
| 4.1.5 Economic Responsibility and Sustainability | 3.74 | 0.839 | High | 4.31 | 0.705 | High | 0.151 | (1) |
| 4.1.6 Self-Awareness | 3.82 | 0.815 | High | 4.34 | 0.683 | High | 0.137 | (5) |
| 4.1.7 Social Awareness | 3.82 | 0.849 | High | 4.33 | 0.691 | High | 0.133 | (6) |
| **4.2 Evaluating the quality of learning resources** | **3.77** | **0.832** | **High** | **4.31** | **0.707** | **High** | **0.143** | **1** |
| 4.2.1 Prediction Logics | 3.75 | 0.814 | High | 4.28 | 0.686 | High | 0.139 | (5) |
| 4.2.2 Creation Logics in Innovation | 3.71 | 0.818 | High | 4.28 | 0.694 | High | 0.154 | (1) |
| 4.2.3 Social Responsibility and Sustainability | 3.79 | 0.842 | High | 4.32 | 0.719 | High | 0.139 | (5) |
| 4.2.4 Environmental Responsibility and Sustainability | 3.78 | 0.819 | High | 4.30 | 0.713 | High | 0.138 | (6) |

| Entrepreneurial Leadership | Current State | | | Desirable State | | | $PNI_{modified}$ | Rank |
|---|---|---|---|---|---|---|---|---|
| | ***M*** | **SD** | **Result** | ***M*** | **SD** | **Result** | | |
| 4.2.5 Economic Responsibility and Sustainability | 3.75 | 0.833 | High | 4.29 | 0.697 | High | 0.144 | (3) |
| 4.2.6 Self-Awareness | 3.82 | 0.845 | High | 4.37 | 0.707 | High | 0.145 | (2) |
| 4.2.7 Social Awareness | 3.79 | 0.851 | High | 4.33 | 0.728 | High | 0.142 | (4) |
| **Total** | **3.77** | **0.838** | **High** | **4.31** | **0.702** | **High** | **0.142** | |

Table 5 reveals that the overall aspects in the current state of the evaluating phase to develop vocational college teachers for enhancing entrepreneurial leadership were at a high level (M=3.77, SD=0.838). Regarding the subdimensions of the evaluating phase, evaluating the success of the operation and evaluating the quality of learning resources were at the same average (M=3.77, SD=0.844, 0.832). In the dimensions of entrepreneurial leadership on evaluating the success of the operation, self-awareness and social awareness were the highest average (M=3.82, SD 0.845, 0.849), followed by social responsibility and sustainability (M=3.81, SD=0.842), and prediction logics as the lowest average (M=3.72, SD=0.873), respectively. In the dimensions of entrepreneurial leadership on evaluating the quality of learning resources, self-awareness was the highest average (M=3.82, SD=0.845), followed by social responsibility and sustainability and social awareness (M=3.79, SD=0.842, 0.851) and creation logics in innovation as the lowest average (M=3.71, SD=0.818), respectively.

The overall aspects in the desirable state of the evaluating phase to develop vocational college teachers for enhancing entrepreneurial leadership were at a high level (= 4.31, SD=0.702). In the subdimensions of the evaluating phase, evaluating the success of the operation and evaluating the quality of learning resources were at the same average (M=4.31, SD=0.698, 0.707). In the dimensions of entrepreneurial leadership on evaluating the success of the operation, social responsibility and sustainability was the highest average (M=4.35, SD=0.705), followed by self-awareness (M=4.34, SD=0.683), and creation logics in innovation and environmental responsibility and sustainability as the lowest average (M=4.29, SD=0.703, 0.699), respectively. As for the dimensions of entrepreneurial leadership on evaluating the quality of learning resources, self-awareness was the highest average (M=4.37, SD=0.707), followed by social awareness (M=4.33, SD=0.728) and

prediction logics and creation logics in innovation as the lowest average (M=4.28, SD=0.686, 0.694), respectively.

The evaluating quality of learning resources was the first priority needs ($PNI_{modified}$ = 0.131). In the dimensions of entrepreneurial leadership, the first priority needs were creation logics in innovation ($PNI_{modified}$ = 0.154), followed by self-awareness ($PNI_{modified}$ = 0.145), and the last priority needs as environmental responsibility and sustainability ($PNI_{modified}$ = 0.138). The evaluating success of the operation was the last priority needs ($PNI_{modified}$ = 0.140). In the dimensions of entrepreneurial leadership, the first priority needs were economic responsibility and sustainability ($PNI_{modified}$ = 0.151), followed by creation logics in innovation ($PNI_{modified}$ = 0.145), and the last priority needs as environmental responsibility and sustainability ($PNI_{modified}$ = 0.132).

## 6. Discussion of Major Findings

The current state of teacher development to enhance entrepreneurial leadership for vocational colleges indicated prediction logics and creation logics in innovation with the lowest average among teacher development subdimentions. This corresponds with the research conducted by Zijlstra (2014), highlighting that prediction logics and creation logics in innovation signify leaders' ability to generate innovative and valuable ideas, as well as their proficiency in identifying opportunities, optimizing resources, and overcoming challenges. This could stem from vocational colleges not providing sufficient training for teachers to enhance their innovation skills.

The desirable state of teacher development to enhance entrepreneurial leadership for vocational colleges revealed self-awareness with the highest average among teacher development subdimentions. This point has been emphasized by the Ministry of Education (2021) that understanding oneself and respecting others can foster leadership qualities. The result appears to suggest that vocational colleges may not be adequately promoting self-understanding among teachers.

The findings regarding the priority needs of teacher development to enhance entrepreneurial leadership in vocational colleges highlighted the significance of economic responsibility and sustainability. Specifically, analyzing the target audience and analyzing required resources were emphasized within the analyze phase sub-dimension. Particularly, evaluating the success of operations was emphasized within the evaluating phase sub-dimension. This result appears in line with the finding of Greenberg et al. (2011) in that vocational teachers should engage themselves in discussions regarding purpose, prioritization of multiple

stakeholders, performance measurement metrics, and implementing strategies in economic matters. The result as such could involve vocational college administrators not adequately focusing on the college's curriculum and needed teacher training.

## 7. Conclusion and Implications of the Study

In the analyze phase, this study found that analyzing the goals within prediction logics, and analyzing target audience and analyzing required resources for economic responsibility and sustainability were identified as the most crucial requirements for improving entrepreneurial leadership. In this regard, vocational college administrators, department heads, and teachers are advised to collectively analyze the objectives of teacher development.

In the design phase, coaching was identified as the most frequent method for developing teachers to enhance entrepreneurial leadership, particularly in cultivating prediction logics. As a result, vocational college administrators, department heads, and teachers are encouraged to collaborate in designing teacher development methodologies.

In the implementing phase, prioritizing the implementation of teacher methodologies, specifically for developing prediction logics, was of utmost importance. Consequently, vocational college administrators and department heads should urge teachers to participate in teacher development programs on enhancing entrepreneurial leadership.

In the evaluating phase, evaluating the quality of learning resources for economic responsibility and sustainability was the most critical requirement for enhancing entrepreneurial leadership. Therefore, vocational college administrators, department heads, and teachers should prioritize evaluating the quality of learning resources as part of teacher development initiatives.

## 8. Recommendations for Further Research

Based on the major findings, vocational colleges should focus on teacher development guideline to enhance teachers' entrepreneurial leadership. Further investigation into teachers' entrepreneurial leadership should be warranted under diverse conditions, including various agencies or affiliations, different grade levels, and across different learning subjects. Such exploration could help identify how needs and requirements vary under different circumstances, ultimately leading to the development of appropriate and effective guidelines for enhancing vocational college teachers' entrepreneurial leadership as responsive to the specific needs.

## 9. The Authors

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## 10. References

Australian HR Institute. (2022). The Australian HR Capability Framework. (Online). https://www.ahri.com.au/resources/the-australian-hr-capability-framework, November 21, 2023.

Bagheri, A., Lope Pihie, Z.A. & Krauss, S.E. (2013). Entrepreneurial leadership competencies among Malaysian university student entrepreneurial leaders. *Asia Pacific Journal of Education, 2013, 33*(4), 493-508.

Blenker, P., Dreisler, P. & Kjeldsen, J. (2017). *The Entrepreneurial University and the Role of Vocational Education and Training in Entrepreneurship*. London: Palgrave Macmillan.

Board of Investment of Thailand. (2021). Thailand BOI Okays Steps to Accelerate Investment and Promote Digital Adoption. (Online). https://www.boi.go.th/un/boi_event_detail?module=news&topic_id=127308, July 21, 2023.

Boatman, A. (2021). Human Resource Planning Process: A Practitioner's Guide: 5 Steps in the Human Resource Planning Process. (Online). https://www.aihr.com/blog/human-resource-planning-process/, November 24, 2021.

Branch, R. M. (2009). *Instructional Design: The ADDIE Approach*. New York: Springer.

Chaemchoy, S. (2022). *Academic Administration that Responds to Changes in the World in the Era of Disruption*. Bangkok: Chulalongkorn University Press.

Department of International Trade Promotion, Ministry of Commerce. (2022). Tech Startup in Thailand. (Online). https://www.ditp.go.th/wp-content/uploads/2023/11/14_Tech-Startup-in-Thailand.pdf, June 15, 2023.

Department of Skill Development. (2021). Report on the Results of the Project to Increase Labor Productivity towards SME 4.0 for Fiscal Year 2022. (Online). http://eit2.dsd.go.th/~stem/, August 15, 2023.

Geektonight. (2023). What is Human Resource Development (HRD)? Definition, Functions. (Online). https://www.geektonight.com/human-resource-development/#hrd-processes, May 5, 2023.

Greenberg, D., McKone-Sweet, K. & Wilson, H. J. (2011). *The New Entrepreneurial Leader: Developing Leaders Who Shape Social and Economic Opportunity*. Oakland, CA: Berrett-Koehier Publishers.

Gupta, V., MacMillan, I.C. & Surie, G. (2004). Entrepreneurial leadership: Developing and measuring a cross-cultural construct. *Journal of business venturing, 2004, 19*(2), 241-260.

Hermes Digital MarketingThailand. (2023). Techniques for becoming a developer and managing professional training for HRD beginners. (Online). https://shorturl.at/hpJKV, January 26, 2023.

Kanjanawasee, S. (2013). *Traditional Test Theory.* Seventh edition. Bangkok: Chulalongkorn University Printing House.

Krejcie, R.V. & Morgan,, D.W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 1970, 30*, 607-610.

Kuratko, D. F. (2020). *Entrepreneurship: Theory, Process, and Practice.* Boston, Massachusetts: Cengage Learning.

Leonard. J. (2013). *Innovation in the Schoolhouse: Entrepreneurial Leadership in Education.* Lanham, Maryland: Rowman & Littlefield Education.

Lynham, S. A. (2000c). *Organization Development for Performance System.* St. Paul: University of Minnesota Human Resource Development Research Center.

Ministry of Education. (2021). Vocational Teacher Development: Enhancing Skills and Innovation. (Online). http://www.bf.moe.go.th/files/source/MOECV_E_Book_Edition_ 01/10/index.html, January 15, 2023.

Office of the Higher Education Commission. (2019). National Plan for Education and Training 2018-2037. (Online). https://www.mua.go.th/users/bureau/uploadfiles/files/61-07-4.pdf, June 11, 2023.

Office of the Vocational Education Commission. (2019). Vocational Teacher Development Framework 2019-2037. (Online). https://www.vec.go.th/file/edc4e4d7-7b63-4dca-87bf-0ea5ea1b2c5d, June 22, 2023.

Simon, B. (2021). Use Human Resources Planning to Forecast for (Less) Risky Business. Seven Steps to Human Resource Planning. (Online). https://www.smartsheet.com/human-resources-planning-process, July 21, 2021.

Swanson, R. A. (2021). *Human Resource Development Research Handbook.* Oakland, CA: Berrett-Koehler Publishers.

Tidd, J. & Bessant, J. (2018). *Managing Innovation: Integrating Technological, Market and Organizational Change.* Hoboken, New Jersey: John Wiley and Sons.

Tseng. C. J. & Tang, C. J. (2023). Consumers' perception of the cause-related marketing effects of bank's participation. *International Journal of Professional Business Review, 2023, 8*(5), 01-14.

Wongwanit, S. (2016). *Needs Assessment Research.* Bangkok: Chulalongkorn University Printing Press.

World Bank. (2022). *Country Private Sector Diagnostic Creating Markets in Thailand: Rebooting Productivity for Resilient Growth.* Washington, D.C.: International Finance Corporation.

World Bank. (2023). Bridging the Gap: Inequality and Jobs in Thailand. (Online). https://documents1.worldbank.org/curated/en/099112823133018003/pdf/P17759905901d70ed0a968052455d5252f0.pdf, November 29, 2023.

Zijlstra, P.H. (2014). *When Is Entrepreneurial Leadership Most Effective.* Enscchede, Netherlands: University of Twente Press.

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# Improving Chinese Chives Recipe in Accurate Mixture of Riceberry Flour and Lettuce Seaweed

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**Abstract**

This experimental research developed Chinese chives recipe using riceberry flour enriched with lettuce seaweed. The study had three objectives: (1) to study riceberry flour content in Chinese chives production of 10%, 30% and 50% by weight, evaluated by 50 experts; (2) to examine the recipe developed to add lettuce seaweed at the amount of 0.1, 0.5 and 1.0 percent by weight; and (3) to analyze the quality of microorganisms and nutritional value of the product. The results were (i) the recipe mixture of riceberry flour 30% by weight received the highest overall liking score; (ii) the chives recipe mixture supplemented with lettuce seaweed 1.0% by weight received the highest overall liking score on texture and taste; and (iii) the total number of microorganisms was found at 2.8X103 colonies per 1 gram sample--in line with the community product standards. As for nutritional values, the new recipe developed proved to contain carbohydrates, dietary fiber, beta-carotene, magnesium, zinc, and essential fatty acids, including oleic acid and linoleic acid.

***Keywords:*** *Chinese chives, riceberry flour, lettuce seaweed, product development*

## 1. Introduction

Today, changes in social factors apparently affect the global economy. Food manufacturers tend to boost their potential and improve in product research and development to increase production to meet the needs of consumers. Those changes are primarily caused by various factors, such as free trade and investment that can result in high competition. Hence, product development must comply with quality and quantity to attract attention, including production time which is another factor that needs to be given full attention to respond to consumer needs in a fast-paced society. Manufacturers and product developers have to work against time to develop interesting products that meet people's needs (Worasing, Sriveerachai, Srianant & Wongkang, 2009). According to the study by Fuller (1994), product development has many objectives with a wide coverage. However, the development aims to produce new profitable products for the

survival of the organization. As West et al. (1991) noted, product development approaches for small businesses can take many forms, such as developing products that have never been produced or introduced to the market, including the development and release of the first products that the organization produces to stimulate consumer interest as well as developing new products with emphasis on the production process that the organization has selected for the new markets that the organization has never touched. In addition, (Katz, 1998) specified that certain products can be produced and marketed within a short time and quickly; therefore, the organization must be ready in terms of technology and knowledge about the production process, including all other matters related to the developed product.

*Fishery and Agricultural Products:*

Model Sea Farm Project under the Royal Initiative of Her Majesty Queen Sirikit is located at Tambon Bang Kaeo, Ban Laem District Phetchaburi Province arising from the initiative of Her Majesty Queen Sirikit to alleviate the problem of diminishing natural marine life in Thai waters, including fuel and other factors used to set sail to catch wild fish at higher costs--setting sail to catch aquatic animals in more distant seas, and yet aquatic animals caught are not worth the cost. The project mentioned above up serves as a source of education and exchange of knowledge on fisheries for farmers in order to develop suitable fishing careers (Department of Fisheries, 2019). It enables the people in fishing areas to carry out the activities that the project transfers in producing agricultural products from plant cultivation and animal husbandry in sufficient quantities to meet the market demand. More importantly, there is still a lack of fishery products that are sold to consumers and there are some raw materials from the sale of waste fishery products. Such products are in large quantities or cannot be sold are sea grapes as well as lettuce seaweed and riceberry flour, to name but the major ones.

Particularly, Lettuce seaweed is rich in various vitamins and minerals, such as vitamin B, vitamin C, calcium and iodine (Worasing, Sriveerachai, Srianant & Wongkang, 2009). As it is easy to digest and low in fat, it is suitable for those who want to lose weight. It has several properties that help treat osteoporosis, purify blood vessels, make blood vessels flexible, help reduce cholesterol, reduce blood pressure, treat constipation, heals stomach ulcers, stimulate the immune system, relieve rheumatism as a sedative and help eliminate some bacteria that can cause cancer. Moreover, lettuce seaweed has outstanding nutritional properties which are antioxidants, such as beta carotene, vitamin E, tannin, zinc, high folate and low sugar (Noppakonmongcon, Saenkla & Chaleawai, 2014). Considering the nutrients of lettuce seaweed, the researchers initiated a product of Chinese chives by using riceberry flour supplemented with lettuce seaweed to bring fishery products to increase value, reduce waste of agricultural products and create new processed products for farmers or people in Bang Kaeo Subdistrict, Ban Laem District, Phetchaburi Province.

This study aimed at the production of Chinese chives by using riceberry flour in an appropriate amount. The researchers examined the appropriate amount of Chinese chives using riceberry flour on lettuce seaweed, investigated chemical changes, microbes and nutritional value of Chinese chives using riceberry flour supplemented with lettuce seaweed. In line with these objectives, the researchers aimed at producing Chinese chives

using riceberry flour and lettuce seaweed in an appropriate amount, while observing chemical changes, microbes and nutritional value of the newly developed Chinese chives recipe.

## 2. Materials and Methods

This study divided the experimental development of Chinese chives using riceberry flour supplemented with lettuce seaweed into 3 steps as follows:

### 2.1 A study on the production of chives recipe

In this step, the researchers studied the appropriate amount of riceberry flour in the mixture of Chinese chives. The ratio of riceberry flour to rice flour was at 3 levels of 10:90, 30:70 and 50:50 percent by weight. Then, the researchers chose the chives recipe using riceberry flour that has been recognized by the experts for the highest overall taste, texture and taste respectively.

### 2.2 A development of Chives recipe

In this step, the researchers developed chives using riceberry flour supplemented with lettuce seaweed in a proper ratio of mixture. The researchers examined the suitable amount of dried lettuce seaweed in the mixture at the amount of 0.1, 0.5 and 1.0 percent by weight. Sensory tests were conducted to select the chives recipe which receives the highest overall preference among the experts, texture and taste respectively.

### 2.3 An investigation of chemical changes, microbes and nutritional value of the Chives recipe developed

In this step, the researchers studied the microbial and nutritional changes of Chinese chives using riceberry flour supplemented with lettuce seaweed. The product was packed in a glass bottle and stored at room temperature for 4 weeks. The product was randomly sampled for analysis of microorganisms every 1 week to observe the nutritional value of chives products using riceberry flour supplemented with lettuce seaweed.

### 2.4 Chinese chives recipe and making

Riceberry flour 1.48%, Rice flour 3.25%, Chives leaves 59.17%, Tapioca flour 11.83%, Hot water 14.79%, Rice bran oil 6.80%, Salt 1.48%, Baking soda 0.60%, and Dried mustard seaweed 0.60%.

The steps in making Chinese chives recipe were: Combine riceberry flour, rice flour and tapioca flour, knead with hot water until well combined. Then add another part of rice bran oil and knead until the dough is smooth and well combined. Make the chives stuffing by putting the chives leaves, salt, baking soda and rice bran oil into a mixing bowl and knead until the ingredients are combined. Then squeeze out all the water. Add dried mustard seaweed. Set aside in the mixing bowl. Divide the dough into 15 grams per ball and form into balls, and roll to a thickness of 3 mm. Cover with a thin white cloth moistened with water. Then sort the rolled dough and wrap it with Chinese chives, 20 grams each, put it on a tray lined with wax paper and steam it. Set the crate over medium heat until the water boils. Steam the chives. Then turn on the heat and steam for

10 minutes. Put the crate down and set aside to cool the chives and then put into containers or served.

### 2.5 Preparation of lettuce seaweed

Bring lettuce seaweed to clean. Then dry in the sun. Put in the hot air oven for about 30 minutes or until the lettuce seaweed has less moisture. Then blend until fine powder.

### 2.6 Experimental planning and statistical analysis

The researchers studied the changes in Chinese chives using riceberry flour supplemented with lettuce seaweed, in a completely randomized design (CRD); two replicates were performed, and the mean was compared by Duncan's New Multiple Rang Test (DMRT) at 95% confidence level. The samples were collected at room temperature for 4 weeks and analyzed for microbial properties every 1 week.

The researchers used the water activity test analysis using aw meter for chemical properties. pH analysis was carried out using a pH meter and a microbial characterization test for total microorganisms according to the method introduced by BAM (2001, 2006) and ISO (2017), as well as the nutritional analysis according to the method by AOAC (2006, 2012, 2016, 2019)

As for sensory evaluation, the test was performed using a 9-point hedonic scale to evaluate color, smell, texture and overall preference. A randomized complete block design was conducted by 50 expert tasters (Sensory and Consumer Behavior Certificate). The mean differences were compared using Duncan's New Multiple Rang Test (DMRT) (AOAC, 2012) at 95% confidence level.

## 3. Results and Discussion

### 3.1 The production of chives from riceberry flour in an appropriate amount

From the preference test of 50 experts, tested by tasting, they were given a liking score using a 9-point hedonic scale (shown in Table 1). It was found that the chives products produced from rice flour to riceberry flour were 0 (control example) 10:90, 30:70 and 50:50. Percentage by total weight scores for color, odor, taste, texture and total likeness were different from the control formula statistically significant ($p<0.05$). Chives products (control sample) by weight, all received 7.36 points for color, 7.68 for smell, 7.88 for taste, 8.14 for texture and 7.98 for overall preference.

When considering the ratio of chives flour produced from riceberry flour to rice flour, the researchers found that an increase in the ratio of riceberry flour to rice flour resulted in a decrease in color, odor, taste and total preference scores. It was statistically significant ($p<0.05$), which the color score decreased in the range of 6.70 to 7.24 points, and the smell in the range of 6.82 to 7.52 points, while taste ranged from 6.78 to 7.82 points, texture from 6.96 to 7.98 points, and total overall preference from 6.90 to 7.82 points. The liking score evaluated by the experts was an indicator of the quality of the product acceptable to consumers (Abdi & Williams, 2010). The Chinese chives flour product produced from the ratio of riceberry flour to rice flour at the amount of 30 percent by total weight was found to have the same scores for taste, texture and overall preference

as the control sample of Chinese chives flour statistically significant ($p<0.05$). However, when increasing the amount of riceberry flour in large quantities, the product's liking may decrease due to the texture of the product being hard. Consistent with the research of Klamklomjit, Wooti & Leelahapongstom (2022), who studied the product development of riceberry Cookie Stuffed with Pineapple, it was reported that when adding more riceberry flour, the product became more crumbly and less favorable to consumers.

**Table 1:** Results of the Expert's Liking Test Scores on the Characteristics of Chives Using Riceberry Flour over Rice Flour

| Sensory features | Chinese chives ratio of riceberry flour to rice flour (Percentage of total weight) | | | |
|---|---|---|---|---|
| | Control sample | 10 | 30 | 50 |
| Color | 7.36±0.80$^{a}$ | 7.24±0.74$^{ab}$ | 7.04±0.28$^{b}$ | 6.70±0.70$^{c}$ |
| Smell | 7.68±0.84$^{a}$ | 7.52±0.86$^{ab}$ | 7.24±0.66$^{b}$ | 6.82±0.75$^{c}$ |
| Taste | 7.88±0.92$^{a}$ | 7.82±0.94$^{a}$ | 7.60±0.93$^{a}$ | 6.78±0.71$^{b}$ |
| Texture | 8.14±0.81$^{a}$ | 7.98±0.91$^{a}$ | 7.82±0.98$^{a}$ | 6.96±0.86$^{b}$ |
| Overall preference | 7.98±0.77$^{a}$ | 7.82±0.85$^{a}$ | 7.66±0.89$^{a}$ | 6.90±0.81$^{b}$ |

*Different characters of a-d on the same horizontal line indicates significant difference ($p<0.05$).

When considering the ratio of riceberry flour to rice flour suitable for the production of chives from the formula that receives the highest overall liking score, they were particularly texture and taste, respectively. From the evaluation of sensory quality in terms of such preference, the researchers, therefore, decided to choose the ratio of riceberry flour to rice flour equal to 30 percent of the total weight. The experts gave it the highest score for smell, taste, texture and overall liking. Therefore, chives using riceberry flour were selected to be substituted for rice flour equal to 30 percent of the total flour weight to be examined in the next part.

### 3.2 Chives using riceberry flour supplemented with an appropriate amount of lettuce seaweed

When riceberry flour at the ratio of 30: 70 to rice flour was added to lettuce seaweed at the amounts of 0.1, 0.5 and 1.0 percent by weight, it showed the appearance as shown in Figure 1.

**Figure 1:** Chives from Riceberry Flour with Lettuce Seaweed at the Amount of 0.1 (A), 0.2 (B) and 1.0 (C) Percent by Weight

(A) (B) (C)

The experts' preference test scores were obtained by tasting and rated their liking on color, smell, taste, texture and overall liking (shown in Table 2). It was found that when increasing the amount of lettuce seaweed, the panelists scored a statistically significant difference in sensory preference from the control sample ($p<0.05$). However, the control sample received liking scores for color, odor, taste, texture and overall liking of 7.52, 7.00, 7.83, 7.36 and 8.67, 4.52 points, respectively, while the liking score for taste and texture preferences were not significantly different from the control samples ($p<0.05$). The Carissa Carandas products are usually sensory tested for appearance, color, and overall preferences of experts, as reported by Srimongkollak & Lekwat (2023) of no statistical difference in the sensory characteristics.

When considering chives recipe mixture of riceberry flour as a replacement for rice flour supplemented with lettuce seaweed in the amounts of 0.1, 0.5 and 1.0 percent by weight, the panelists rated color sensory preference and the odor aspect with significant difference ($p<0.05$), by which the color scoring in the range of 6.25-7.58 and the odor in the range of 6.57-7.00. However, the scores on taste, texture and total liking were not significantly different when adding lettuce seaweed in riceberry flour as substitute products by which the score was in the range of 7.50-7.52 points, the texture in the range of 7.00-7.52 points, and the overall preference in the range of 7.35-7.92 points. The preference scores of the experts indicated the quality of the product acceptable to consumers (Abdi & Williams, 2010).

**Table 2:** Expert Preference Scores on Product Characteristics

| Sensory features | Chives products using riceberry flour to replace rice flour amount of lettuce seaweed | | | |
|---|---|---|---|---|
| | Control sample | 0.10 | 0.50 | 1.00 |
| Color | 7.52±0.52[a] | 7.00±0.00[a] | 7.58±0.67[a] | 6.25±0.46[b] |
| Smell | 7.00±0.60[a] | 7.00±0.60[a] | 6.42±0.52[b] | 6.57±0.89[b] |
| Taste[ns] | 7.83±0.57 | 7.52±0.62 | 7.67±0.49 | 7.50±0.54 |
| Texture[ns] | 7.36±0.50 | 7.45±0.52 | 7.00±0.89 | 7.00±0.89 |
| Overall preference | 8.67±0.49[a] | 7.92±0.52[b] | 7.57±0.62[b] | 7.35±0.92[b] |

*a-c means different characters on the same horizontal line which were significantly different ($p<0.05$).

[ns]means no statistically significant difference ($p<0.05$)

As reported, the selection of lettuce seaweed quantity added in chives using riceberry flour was based on the formula with the highest overall liking scores, maximum texture and the highest taste, respectively. As for chives using riceberry flour and lettuce seaweed supplement, 0.1 percent per weight, the experts rated overall favorability, texture and high taste. It was not different from Chinese chives using riceberry flour supplemented with lettuce seaweed in the amounts of 0.1 and 0.5 percent per weight. Therefore, the researchers chose the Chinese chives using riceberry flour in which lettuce seaweed was added at 0.1 percent per weight for further studies.

### 3.3 Chemical changes and microbes and the nutritional value of Chinese chives

The researchers examined the shelf life of Chinese chives using riceberry flour supplemented with lettuce seaweed. The total number of microorganisms, yeasts and molds were analyzed, as well as the nutritional value of chives using riceberry flour supplemented with lettuce seaweed. The results were as follows:

*Chemical and microbial quality analysis of Chinese chives from riceberry flour supplemented with lettuce seaweed*

From the analysis of microbial quality of riceberry flour added to the products with lettuce seaweed (shown in Table 3), which is a chemical and microbiological quality check after the production process to indicate hygiene in production, including the quality of raw materials. Such quality can affect contamination of Water Activity equal to 0.87 because the Water Activity value is a factor indicating the lowest level of water in food that microorganisms can be used to grow and use in various chemical reactions. Almost all bacteria are unable to grow at water activity below 0.9 and most fungi do not grow at water activity below 0.7; the pH of the experimented product was 5.51 (Dangjai & Wogndomai, 2019). In addition, the community product standards (CMU 1041/2548) (Anonymous, 2022: Rice Flour Stuffed with Chinese Chive) of Chinese chives indicate that Microbial standards, i.e., the total number of microorganisms must not exceed 1 x 106 colonies per 1 gram of sample. From the analysis under study, it was found that

Chinese chives made from riceberry flour added with lettuce seaweed, the total number of microorganisms was found to be 2.8 x 103 colonies per 1 gram of sample, indicating that the product of Chinese chives developed, comply with the community product standards.

**Table 3:** Analysis of Water Activity, pH of Microorganisms, Yeast and Mold during Product Storage

| Quality value | Number of microorganisms |
|---|---|
| Water Activity ($a_w$) at 25°C | 0.97 |
| pH | 5.51 |
| Aerobic Plate Count, cfu / g | $2.8 \times 10^3$ |
| Yeasts and Molds, cfu / g | < 10 |

*Nutritional value of the Chinese chives developed*

Based on the nutritional value analysis, the Chinese chives developed by a new formula contained the content of protein, fat, ash, total carbohydrates, total dietary fiber and total amount of energy. The amount of energy from fat, vitamin A (beta-carotene), magnesium, zinc, sodium was found with high nutritional value. As for nutritional values per 100 grams, the product contained 2.67 grams of protein, 3.99 grams of total fat, 25.56 grams of total carbohydrates, 147.63 kcal of energy, 35.91 kcal of energy from fat, 4.00 grams of total dietary fiber, beta-carotene 2, 812 micrograms, magnesium, 48.42 micrograms, zinc 0.05 milligrams, and sodium 225.06 milligrams. In addition, the experimental results showed Chives rich in dietary fiber and as source of be-ta-carotene and iron. As for lettuce seaweed, there were nutrients beneficial to the body, as reported earlier by Worasing, Sriveerachai, Srianant & Wongkang (2009) who analyzed the chemical composition of lettuce seaweed and found lettuce seaweed with protein, dietary fiber, calcium, sodium in the amount of 23.0 percent, 9.97 percent, 38.8 percent, and 21.8 percent, respectively. In addition, from the research of Yuenyongputtakal, Worasing & Noyphan (2019), lettuce seaweed when added, would result in the product having a high amount of protein, fat and antioxidant properties.

**Table 4:** Analysis of Nutritional Values of Chinese Chives Using Riceberry Flour with Seaweed Lettuce

| Nutritional value | Quantity |
|---|---|
| *Protein (g/100 g) | 2.67 |
| Total Fat Content(g/100g) | 3.99 |
| Ash (g/100 g) | 1.90 |
| Carbohydrates (grams/100 grams) | 25.56 |
| total energy (kcal/100 g) | 147.63 |
| energy from fat (kcal/100 g) | 35.91 |
| Total dietary fiber (g/100 g | 4.00 |
| Beta Cartine (mcg/100g) | 2,812 |
| Magnesium(mg/100g) | 48.42 |
| Zinc(mg/100g) | 0.05 |
| Sodium (mg/100 g) | 225.06 |

*Protein calculated from a factor equals to 6.25

*Analysis of fatty acid content of Chinese chives using riceberry flour with lettuce seaweed*

The researchers analyzed the saturated fatty acid content and unsaturated fatty acids of Chinese chives products using riceberry flour enriched with seaweed lettuce (shown in Table 5). The fatty acid content of the products was examined by the type and amount of saturated fatty acids and unsaturated fatty acids, with nutrients derived from fat. However, the chemical compounds were different, having different health properties by saturated fat mostly from animal fats and animal products. Grovenor (2002) pointed out that this type of fat would accumulate in fat cells throughout the body and cause obesity). Unsaturated fats, or good fats, are plant-derived fats. This type of fat has less effect on obesity and cardiovascular disease than saturated fat. From the analysis of the amount and type of fatty acids under study, the developed chives recipe contained saturated fatty acids found in the range of 0.01-0.07 g per 100 g of sample weight, namely lauric, myristric, pamitric, stearic and lignoleic. Unsaturated fatty acids were also found, mainly oleic acid and linoleic acid, equal to 1.47 and 1.20 g per 100 g of sample weight. As reported by Insel et al. (2002), this type of fatty acid is necessary for the body (essential fatty acid), which is a fatty acid that the body cannot produce by itself, but must be obtained from the diet.

**Table 5:** Content of Saturated Fatty Acids and Unsaturated Fatty Acids of Chinese Chives Using Riceberry Flour and Seaweed Lettuce

| **Type of fatty acid** | | **Saturated fatty acid (g/100 g of sample weight)** |
|---|---|---|
| Lauric acid | (C12:0) | 0.01 |
| Myristic acid | (C14:0) | 0.02 |
| Palmitic acid | (C16:0) | 0.77 |
| Stearic acid | (C18:0) | 0.09 |
| Arachidic acid | (C20:0) | 0.03 |
| Behenic acid | (C22:0) | 0.01 |
| Lignoceric acid | (C24:0) | 0.02 |
| **Type of fatty acid** | | **Unsaturated fatty acid (g/100 g of sample weight)** |
| Palmitoleic acid | (C16:1) | 0.01 |
| cis-9-Oleic acid | (C18:1n9c) | 1.47 |
| cis-11-Eicosenoic acid | (C20:1n11) | 0.02 |
| Linoleic acid | (C18:2n6c) | 1.20 |
| alpha- Linolenic acid | (C18:3n3) | 0.12 |

## 4. Conclusions

The Chinese chives recipe development was carried out by adjusting the riceberry flour to rice flour formula at 4 levels: 0:100 (control sample), 10:90, 30:70 and 50:50 per-cent by weight. Sensory evaluation of preference by the experts indicated that the ratio of riceberry flour to rice flour supplemented in the amount of 30 percent by total weight received the highest overall likes rating. When combining the newly developed recipe of Chinese chives formula to supplement with lettuce seaweed in the amount of 0.1 percent per weight, the experts rated overall preference on texture and taste. In addition, the new chives recipe containing water activity at 0.97, pH at 5.51, and the number of microorganisms of 2.8 x 103 colonies per 1 gram sample, has met the community product standards. In terms of nutritional value, the recipe contains carbohydrates, dietary fiber, beta-carotene, magnesium and essential fatty acids both oleic acid and linoleic acid. The invention and development of a new chive formula in this study, therefore, has definitely added value for the product, as product enhancement in nutritional values for consumers and for the community's economic growth. Yet, further studies should focus on the enrichment of community products using other useful raw materials locally available, including the storage of developed products in various conditions.

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## 7. References

Abdi, H. & Williams, L. J. (2010). Principal component analysis. *Wiley Interdisciplinary Reviews: Computational Statistics, 2010, 2,* 433-459.

Anonymous. (2022). Rice Flour Stuffed with Chinese Chive. (Online). https://tcps.tisi.go.th/pub/tcps1041_48.pdf, December 15, 2022.

AOAC. (2006). *Official Methods of Analysis.* Eighteenth edition. Gaithersburgs, MD: Association of Official Analytical Chemists.

AOAC. (2012). *Official Method of Analysis*. Nineteenth edition. Washington D.C.: Association of Official Analytical Chemists.

AOAC. (2016). *Official Methods of Analysis.* Washington D.C.: Association of Official Analytical Chemists.

AOAC. (2019). *Official Methods of Analysis of AOAC international.* Twenty-first edition. Gaithersburgs, MD: Association of Official Analytical Chemists.

BAM. (2001). *Bacteriological Analytical Manual Online*. Silver Spring, MD: Food and Drug Administration.

BAM. (2006). *Bacteriological Analytical Manual Online*. Silver Spring, MD: Food and Drug Administration.

Dangjai, S. & Wogndomai, R. (2019). The study of suitable shiitake sausage recipe and shelf life. *Academic Journal of Science and Applied Science, 2019, 1,* 71 - 82.

Department of Fisheries. (2019). *Cultivation and Processing of Sea Grapes.* Phetchaburi: Phetchaburi Coastal Fisheries Research and Development Center, 2-4.

Fuller, G. W. (1994). *New Product Development from Concept to Marketplace.* Boca Raton Florida USA: CRC Press, Inc., 213-214.

Grovenor, M. B. (2002). *Nutrition from Science to Life.* San Diego, CA: Harcourt Inc., 50-54.
Insel, P., Turner, R.E. & Ross, D. (2002). *Nutrition*. Massachusetts: Jones and Bartlett Publishers, 75-77.

ISO. ISO 6579-1. (2017). Microbiology of the Food Chain–Horizontal Method for the Detection, Enumeration and Serotyping of Salmonella-Part 1: Detection of Salmonella spp. Geneva Switzerland: ISO.

Katz, F. (1998). How major core competencies affect development of hot new product. *Food Technology, 1998, 52*(12), 46 - 52.

Klamklomjit, S., Wooti, C. & Leelahapongstom, A. (2022). The Product Development of Riceberry Cookie Stuffed with Pineapple. *Burapha Science Journal, Thailand, 2022, 27*(2), 1357-1374.

Noppakonmongcon, K., Saenkla, P. & Chaleawai, P. (2014). Using Riceberry Flour Replace Wheat Flour in Sweet Bread. Master's thesis, Rajamangala University of Technology Phra Nakhon, 2014.

Srimongkollak, U. & Lekwat, S. (2023). The development of instant juice powder from half-ripe carissa carandas L. by spray dryer and the study on physicochemical and functional properties. *Siam University Food Technology Journal. Thailand, 2023, 18*(2), 112-121.

West, C. K., Farmer, J. A. & Woff, P. M. (1991). *Instructional Design. Implication from Cognitive Science*. Boston: Allyn & Bacon, 315-317.

Worasing, S., Sriveerachai, T., Srianant, A. & Wongkang, P. (2009). Morphology, culture and utilization of sea lettuce algae. Academic document No. 1/2009. Chanthaburi, Thailand: Chanthaburi Coastal Fisheries Research and Development Center, 4.

Yuenyongputtakal, W., Worasing, S. & Noyphan, P. (2019). *Value Added of Sea Lettuce (Ulva rigida) Using as Food Ingredient in Functional Food Product.* Chonburi, Thailand: Burapha University Press.

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# Consumers' Perception of E-Service Quality by Internet Service Providers: A Focus on Satisfaction and Loyalty

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**Abstract**

This empirical study investigated consumers' perception of Internet Service Providers (ISPs) in Bangkok regarding: (i) service quality, (ii) service fairness, (iii) price fairness perception, (iv) promotional offers, (v) technological advancements, and (vi) customer support. The study used a questionnaire to gather quantitative data from a sample of 400 voluntary respondents from three major ISPs (AIS, DTAC, TRUE). The obtained data were analyzed for mean, standard deviations, frequencies, and percentages. The results revealed the respondents' positive perception toward their ISPs, with high ratings for four dimensions: e-service quality, service fairness, price fairness perception, and promotional offers. The other two dimensions--technological advancements and customer support were also rated favorably, though slightly lower. The findings appeared to suggest that maintaining high service quality, transparent pricing, and effective promotional strategies, along with continuous technological advancements and robust customer support, are crucial for enhancing customer satisfaction and loyalty. These findings should definitely have significant implications for ISPs seeking to improve their competitive edge and customer retention strategies.

***Keywords:*** *E-service quality, Internet service providers, technological advancements, customer satisfaction, customer loyalty,*

## 1. Introduction

### 1.1 Background

The rapid growth of the internet in Thailand has transformed the way people communicate, access information, and conduct business. As of 2023, Thailand boasts over 52 million internet users, representing nearly 75% of the population (Donsuchit & Nuangjamnong, 2022). This widespread adoption has spurred the growth of Internet Service Providers (ISPs)--crucial in delivering reliable and high-quality internet services to consumers. In this competitive market, the

quality of e-services provided by ISPs has become a critical determinant of customer satisfaction and loyalty.

Customer satisfaction in the context of ISPs is significantly influenced by various dimensions of e-service quality. These dimensions include reliability, responsiveness, assurance, empathy, and tangibles, as outlined by the SERVQUAL model. Understanding how these dimensions impact customer satisfaction can help ISPs enhance their service delivery, thereby improving customer retention and competitive advantage (Parasuraman, Zeithaml & Berry, 1988).

Thailand's telecommunications sector has seen significant advancements over the past decade, with ISPs playing a pivotal role in the country's digital transformation. The government's efforts, such as the Thailand 4.0 initiative, aim to create a value-based economy driven by innovation and technology, further underscoring the importance of robust internet infrastructure Parasuraman & Colby, 2015).

Despite these advancements, challenges remain. Customers frequently encounter issues, such as inconsistent service quality, poor customer support, and inadequate infrastructure in certain areas. These problems highlight the need for ISPs to focus on improving their e-service quality to meet customer expectations and enhance satisfaction.

Previous research on e-service quality and customer satisfaction has predominantly focused on developed markets, leaving a gap in understanding the unique dynamics within emerging markets like Thailand (Teeter & Schointuch, 2000; Bolton, Warlop & Alba, 2003; Collier & Bienstock, 2006; Xu, Sundar, & Dou, 2013; Huang & Nuangjamnong, 2023). This study aimed to bridge that gap by examining the e-service quality as potentially affecting customer satisfaction toward Thai ISPs. By identifying the key dimensions of e-service quality that influence customer satisfaction, the study will provide actionable insights for ISPs to refine their service offerings and foster greater customer loyalty.

### 1.2 Problem Statement

Despite the critical role of ISPs in Thailand's digital ecosystem, there is a lack of comprehensive research on how e-service quality impacts customer satisfaction within this context. Addressing this gap is essential for ISPs to tailor their services to the specific needs and expectations of Thai consumers.

### 1.3 Research Objectives

(1) To identify the key dimensions of e-service quality for ISPs in Thailand.

(2) To evaluate the extent to which these dimensions affect customer satisfaction and loyalty.

The researchers expected to provide recommendations for Thai ISPs to enhance their service quality and improve customer satisfaction.

### 1.4 Research Questions

(1) What are the primary dimensions of e-service quality in the context of Thai ISPs?

(2) How do these dimensions affect customer satisfaction and loyalty in Thailand?

### 1.5 Significance of the Study

Identifying the important e-service quality aspects that significantly affect customer satisfaction allows ISPs to improve them. This developed approach can improve resource allocation and service delivery. Knowing what makes customers satisfaction might help ISPs stand out. In a competitive information technology industry, high-quality e-services can help ISPs retain clients. ISPs can use the study findings to boost customer satisfaction and loyalty. Satisfied consumers are more likely to stick with their provider and endorse it, minimizing churn and gaining market share.

ISPs' implementation of the study's suggestions is expected to improve customer service. This includes increased reliability, responsiveness, certainty, empathy, and actual service. Understanding which service quality factors matter most might help them choose suppliers.

The study can also give information to policymakers of Thailand's ISP sector's e-service quality to legislate and regulate quality e-service to safeguard consumers. In addition, ISPs may provide high-quality internet access to work efficiently and access online education, healthcare, and other critical services for the betterment of digital entrepreneurship, and help boost economic activity and employment as a whole.

## 2. Literature Review

This section deals with six dimensions under study: (i) service quality, (ii) service fairness, (iii) price fairness perception, (iv) promotional offers, (v) technological advancements, and (vi) customer, followed by related literature on customer satisfaction and loyalty.

### 2.1 E-Service Quality

E-service quality is defined as the extent to which an online service meets customer expectations and delivers a satisfactory experience. As the digital marketplace grows, understanding and improving e-service quality has become essential for businesses. E-service quality encompasses various dimensions, including reliability, responsiveness, assurance, empathy, and tangibles, adapted from traditional service quality models like SERVQUAL (Parasuraman et al., 1988). Dimensions of E-Service Quality: Reliability in e-service quality refers to the service's ability to perform consistently and accurately. This includes the consistency of the service, the uptime of the website, and the accuracy of transaction processing. Zeithaml et al. (1996) emphasize that reliability is a fundamental component, as customers expect e-services to be available and functioning without errors. Responsiveness is the promptness and willingness to assist and address customers' needs. In the context of e-services, this includes quick responses to inquiries, efficient handling of issues, and the availability of support services. Responsiveness is crucial in e-commerce, where delays can lead to customer dissatisfaction and loss of business (Donsuchit & Nuangjamnong, 2022). Assurance involves employees' knowledge and courtesy, as well as their ability to convey trust and confidence. For e-services, this translates to secure transactions, privacy protection, and the overall professionalism of the service. Assurance is particularly important in online environments where trust issues are prevalent (Gefen, 2002).

Empathy is the practice of providing caring and individualized attention to customers. This includes providing personalized services, understanding customer preferences, and providing tailored solutions in e-service contexts. Empathy improves customer satisfaction by making them feel valued and understood. Tangibles in e-service quality refer to the physical evidence of the service, including the appearance of the website, the quality of the user interface, and the overall aesthetic appeal. Well-designed websites with easy navigation and clear information can significantly impact customer perceptions of service quality (Santos, 2003).

Measuring e-service quality requires a comprehensive approach that captures all relevant dimensions. The E-S-QUAL scale developed by Parasuraman et al. (2005) is one of the most widely used frameworks for assessing e-service quality. It includes dimensions such as efficiency, fulfillment, system availability, and privacy. This scale provides a structured way to evaluate how well an e-service meets customer expectations and identifies areas for improvement. E-service quality has a direct impact on customer satisfaction. High e-service quality enhances the customer experience, leading to increased satisfaction, loyalty, and positive word-of-mouth. Studies have shown that customers who perceive high e-service quality are more likely to repurchase and recommend it to others (Collier & Bienstock, 2006). This relationship underscores the importance of continuous improvement in e-service quality to maintain a competitive advantage in the digital marketplace.

### 2.2 Service Fairness

Service fairness refers to the perception of justice or fairness in service delivery. It includes an assessment of the service's process, interaction, and outcome. Service fairness is critical in shaping customer satisfaction and loyalty, particularly in situations where service failures occur. Dimensions of Service Fairness, comprising distributive fairness, concern the perceived fairness of the outcomes received. In a service context, this refers to whether customers feel that they received what they paid for or what was promised. Equity theory, proposed by Intzes & Nuangjamnong (2024), suggests that customers compare their inputs and outcomes to those of others to determine fairness. Procedural fairness is defined as the perceived fairness of the processes used to deliver the service. This includes the transparency, consistency, and impartiality of the procedures. Procedural fairness is important because fair processes can enhance customer perceptions even if the outcomes are not favorable. Interactional fairness is defined as the quality of interpersonal treatment received during service delivery. This includes respect, politeness, and the provision of adequate explanations. Interactional fairness is critical in-service settings, as positive interactions can mitigate the negative effects of unfavorable outcomes (Intzes & Nuangjamnong, 2024).

Scales that assess the different dimensions of fairness perceptions can measure service fairness. For example, the FAIR scale developed by Seiders & Berry (1998) evaluates distributive, procedural, and interactional fairness in service encounters. This scale helps organizations understand customer perceptions of fairness and identifies areas for improvement. Service fairness significantly influences customer satisfaction. When customers perceive fairness in service

delivery, they are more likely to be satisfied, trust the service provider, and exhibit loyalty behaviors. Conversely, perceived unfairness can lead to dissatisfaction, negative word-of-mouth, and a higher likelihood of switching to competitors (Maxham & Netemeyer, 2003). Ensuring fairness in all aspects of service delivery is therefore crucial for maintaining positive customer relationships and long-term success.

For Internet Service Providers (ISPs) in Thailand, focusing on both e-service quality and service fairness is essential to enhancing customer satisfaction and loyalty. High e-service quality can differentiate ISPs in a competitive market, while service fairness can ensure customer retention even in the face of service failures. ISPs can build strong, trust-based relationships with their customers by addressing the key dimensions of e-service quality and ensuring fair processes and interactions. This leads to sustained business growth and success.

### 2.3 Price Fairness Perception

Price fairness perception refers to consumers' judgment of whether the price of a product or service is reasonable, acceptable, and justifiable. This perception is a critical factor influencing customer satisfaction and loyalty, particularly in competitive markets, such as telecommunications. Xia et al. (2004) suggest that factors like price transparency, price consistency, and value for money shape the perception of price fairness. Several studies have highlighted the importance of price fairness perception in determining customer satisfaction. Bolton et al. (2003) found that customers who perceive prices as fair are more likely to be satisfied with their service provider. This satisfaction subsequently enhances customer loyalty, as satisfied customers are more likely to continue using the service and recommend it to others. Martin-Consuegra et al. (2007) also demonstrated that perceived price fairness has a significant positive impact on customer loyalty through the mediating effect of customer satisfaction. This relationship underscores the critical role that price-fairness perception plays in maintaining and enhancing customer loyalty. Pricing strategies for internet service providers can be complex and multifaceted, making maintaining price fairness perception particularly challenging but essential. Kim et al. (2004) found that price fairness perception significantly influences customer satisfaction and loyalty among internet service providers. Customers are sensitive to pricing structures, and any perceived inequities can lead to dissatisfaction and churn. Therefore, internet service providers must ensure transparent and consistent pricing to foster a sense of fairness and enhance customer satisfaction and loyalty.

### 2.4 Promotional Offers

Promotional offers are strategic tools used by companies to attract new customers and retain existing ones. These offers can include discounts, special deals, loyalty programs, and bundled services. The literature has well documented the effectiveness of promotional offers in enhancing customer satisfaction and loyalty. Blattberg et al. (1995) suggest that promotional offers create immediate value for customers, enhancing their satisfaction. When customers feel they are receiving a good deal, their perception of the service provider improves, leading to higher satisfaction levels. Additionally, Neslin (2002) indicates that promotional offers can foster

customer loyalty by encouraging repeat purchases and strengthening the emotional bond between the customer and the brand. In the context of Internet service providers, promotional offers play a significant role in customer retention strategies. Danaher et al. (2008) found that promotional offers, such as discounts and bundled services, significantly impact customer satisfaction and loyalty among Internet service providers. These offers not only provide immediate financial benefits to customers but also signal the company's commitment to providing value, thereby enhancing customer satisfaction and loyalty.

Moreover, Sharp and Sharp (1997) noted that loyalty programs, a common type of promotional offers, are particularly effective for internet service providers. Such programs reward customers for their continued patronage, thereby increasing their satisfaction and likelihood of remaining loyal to the service provider. Kumar & Shah (2004) demonstrated that well-structured loyalty programs positively impact customer satisfaction and long-term loyalty. These findings suggest that promotional offers, when designed and implemented effectively, can be powerful tools for internet service providers to enhance customer satisfaction and loyalty.

To Internet Service Providers (ISPs) in Thailand, understanding and leveraging price fairness perception and promotional offers is crucial for enhancing customer satisfaction and loyalty. Given the competitive nature of the telecommunications market, ISPs must ensure that customers perceive their pricing strategies as fair and transparent. This includes clear pricing communication, avoiding hidden fees, and maintaining consistency in pricing policies. Furthermore, ISPs can utilize promotional offers to attract and retain customers. By offering discounts, bundled services, and well-structured loyalty programs, ISPs can create immediate value for customers, thereby enhancing their satisfaction and loyalty. Promotional offers not only provide financial benefits but also help in building an emotional connection with customers, fostering long-term loyalty.

Price fairness, perception, and promotional offers are critical factors that influence customer satisfaction and loyalty among Internet service providers. For ISPs in Thailand, focusing on these aspects can lead to a competitive advantage, improved customer retention, and sustained business growth. This literature review underscores the importance of these factors and provides a framework for understanding their impact on customer satisfaction and loyalty.

### 2.5 Technological Advancements

Technological advancements are instrumental in shaping customer experiences and satisfaction, particularly for internet service providers. The adoption of cutting-edge technologies significantly enhances service quality, efficiency, and overall customer satisfaction. Dabholkar & Overby (2005) emphasize that advancements, such as high-speed internet, mobile applications, and advanced network infrastructure contribute to superior service delivery, positively affecting customer satisfaction. In the context of internet service providers, technological advancements often manifest as improvements in network speed, coverage, and reliability. Lu et al. (2009) demonstrated that customers highly value these improvements, as they lead to a more seamless and enjoyable user experience. Enhanced network capabilities, including 4G and 5G, provide

faster data transmission and improved connectivity, directly contributing to higher customer satisfaction and loyalty. Customers experiencing consistent and superior technological performance are more likely to remain loyal to their service provider and recommend it to others. Moreover, technological advancements in customer service platforms, such as automated chatbots, self-service portals, and personalized services, also contribute significantly to customer satisfaction. Xu et al. (2013) found that such technologies improve the efficiency and effectiveness of customer service interactions, leading to higher levels of satisfaction and loyalty. By offering innovative solutions that address customer needs promptly and effectively, internet service providers can enhance the overall customer experience and foster loyalty.

### 2.6 Customer Support

Customer support is critical to customer satisfaction and loyalty, especially in industries like internet service providers, where service issues and technical problems frequently arise. High-quality customer support helps resolve issues quickly and effectively, thereby enhancing customer satisfaction. Bitner et al. (1990) emphasize that the quality of customer support has a significant impact on customers' perceptions of the service provider and their overall satisfaction. For Internet service providers, customer support encompasses various services, including technical assistance, billing inquiries, and general customer service. Research by Brown & Maxwell (2002) indicates that responsive and empathetic customer support leads to higher customer satisfaction. Customers' trust in the service provider increases when they perceive prompt and caring handling of their concerns, thereby fostering loyalty. Effective customer support not only resolves immediate issues but also builds long-term customer relationships. Furthermore, studies have shown that personalized customer support, which tailors’ interactions to the individual needs and preferences of customers, enhances customer satisfaction and loyalty. Keiningham et al. (2008) demonstrated that personalized customer support leads to higher customer satisfaction and a stronger emotional connection to the service provider. This emotional connection is a key driver of customer loyalty, as satisfied customers are more likely to continue using the service and recommend it to others.

Understanding the interplay between technological advancements and customer support is essential for comprehending their combined effect on customer satisfaction and loyalty. Both factors contribute uniquely and synergistically to shaping customer perceptions and behaviors. Grewal et al. (2009) and Nuangjamnong (2021) posit that technological advancements enhance the efficiency and effectiveness of customer support, leading to greater customer satisfaction. Similarly, Parasuraman & Colby (2015) contend that advanced technology amplifies the positive effects of customer support on satisfaction. Customer satisfaction serves as a mediator between technological advancements, customer support, and customer loyalty. Anderson & Srinivasan (2003) and Gummerus et al. (2004) demonstrated that customer satisfaction fully mediates the relationship between technological advancements, customer support, and loyalty outcomes. This implies that improvements in technology and customer support directly enhance customer satisfaction, which, in turn, fosters loyalty.

### 2.7 Related Literature

#### 2.7.1 Customer Satisfaction

Customer satisfaction is a critical determinant of market share and company investment, significantly influencing business success. Researchers have proposed various definitions of customer satisfaction, with many focusing on the disconfirmation of expectations. The disconfirmation theory suggests that customer satisfaction arises when the performance of a product or service meets or exceeds pre-purchase expectations. If the product or service fails to meet these expectations, dissatisfaction results. This concept is central to understanding consumer behavior and guiding companies in enhancing their offerings. Gilbert & Veloutsou (2006) define expectations as preconceived perceptions or beliefs regarding service delivery. Customers judge the performance of a product against these expectations. The process of measuring customer satisfaction is inherently complex due to its subjective nature, which varies significantly from one individual to another. This variability makes it challenging to develop a standardized measurement framework. Mitchev & Nuangjamnong (2021) redefined customer satisfaction by emphasizing the response to fulfillment. They described customer satisfaction as the evaluation of a product or service's features to ensure they provide pleasurable consumption levels linked to fulfillment. Thus, measurements of customer satisfaction must consider both the satisfaction of needs and the alignment with expectations. The term "satisfaction" derives from "comfort," indicating a state of contentment without excitement. Customer satisfaction often involves a passive response with minimal emotional involvement. However, the presentation of a pleasant product, such as food, can elicit a higher level of arousal, leading to feelings of happiness and joy. Satisfaction is also associated with the concept of "delight," defined as a positive surprise. When customers are satisfied with a product or service, any disruptions causing discomfort lead to dissatisfaction. Conversely, resolving these issues can result in a sense of relief.

The dissatisfaction model does not fully capture the complexities of customer satisfaction. For instance, various factors like user experience, salesperson treatment, and after-sales service influence a customer purchasing a cell phone. While a customer may be satisfied with one aspect of the product, dissatisfaction with other components can create conflicting feelings about the overall product. Different product elements can influence customer satisfaction in various ways. A customer may be satisfied with one feature in the short term but dissatisfied with another over time. Negative evaluations of a product can also affect overall satisfaction (Lusch et al., 2007). Cadotte & Turgeon (1988) determined that satisfiers, neutrals, and dissatisfiers influence satisfaction. Satisfiers address intrinsic customer needs, while dissatisfiers affect extrinsic needs. Customers have a hierarchy of needs, starting with basic needs. After meeting these basic needs, customers strive to satisfy higher-level needs. Fulfilling intrinsic needs leads to true customer satisfaction. Another model considers customer satisfaction as a comprehensive assessment of the cumulative consumption and purchase experience, reflecting a comparison between perceived rewards and the sacrifices made. Sacrifices include intangible costs such as time and energy spent on arrangements and reservations, as well as the monetary costs involved in purchasing a service (Iglesias & Guillen, 2004). This model highlights the importance of considering the overall

customer experience rather than isolated aspects. Understanding the multifaceted nature of customer satisfaction is particularly relevant for Internet Service Providers (ISPs) in Thailand. As the ISP market becomes increasingly competitive, focusing on the key dimensions of e-service quality—reliability, responsiveness, assurance, empathy, and tangibles—can help providers enhance customer satisfaction. By addressing both intrinsic and extrinsic needs and managing customer expectations effectively, ISPs can improve their service offerings, leading to higher customer retention and loyalty. Customer satisfaction is intricate and plays a crucial role in shaping consumer behavior and business results. The insights gained from this study can help ISPs in Thailand refine their e-service quality, ultimately benefiting all stakeholders involved.

**2.7.2 Customer Loyalty**

In today's highly competitive business environment, customer loyalty is considered one of the most effective strategies for differentiating a business from its competitors. This differentiation drives loyalty by engaging customers intellectually, emotionally, and spiritually. Customer loyalty is not just about repeat purchases; it involves consumers' conscious evaluation of the quality-to-price ratio and price differences. According to Supphellen & Nysveen (2001) and Mitchev & Nuangjamnong (2021), customer loyalty can also be defined as the willingness of customers to pay a premium price for a service, reflecting their perceived value and satisfaction.

Customer loyalty encompasses both behavioral and attitudinal components. Mitchev & Nuangjamnong (2021) describe it as the tendency of customers to avoid choosing competitor brands, instead opting for repeat purchases of a familiar brand. Various factors, such as convenience, performance, satisfaction, and comfort with the brand, may drive this loyalty. Behavioral loyalty refers to the action customers take, such as repeat purchases, while attitudinal loyalty reflects their feelings and attitudes toward the brand. Supporting this view, Supphellen & Nysveen (2001) argue that loyal customers tend to have a positive shopping experience, spend more, shop more consistently, and are attracted to popular and familiar brands. Huang & Nuangjamnong (2023) further emphasize that fostering customer loyalty involves building an emotional bond with customers, which requires integrating customer experience management with the emotional, physical, and value elements of the shopping experience into a cohesive whole.

The literature suggests that retaining existing customers is less expensive and more cost-effective than acquiring new ones. Loyal customers not only ensure steady sales but are also more likely to purchase high-margin supplementary products and services. Additionally, these customers help reduce marketing and consumer education costs, especially when they act as net promoters for the organization (Taylor & Baker, 1994). Loyal customers often share their positive experiences with others, effectively becoming brand ambassadors. Teeter & Schointuch (2000) highlight that customer retention and loyalty are crucial for long-term business success. They note that a strong customer loyalty strategy can significantly drive customer satisfaction and retention, ultimately enhancing the company's profitability and market position. The literature has identified different types and degrees of customer loyalty. Huang & Nuangjamnong (2023) categorize loyalty into attitudinal, behavioral, polygamous, and monogamous loyalty. Customers' emotional and psychological commitment to a brand is known as attitudinal loyalty, while repeat purchases and

consistent customer behavior demonstrate behavioral loyalty. Polygamous loyalty occurs when customers are loyal to multiple brands within a category, whereas monogamous loyalty indicates exclusive loyalty to a single brand.

Understanding the nuances of customer loyalty is particularly relevant for Internet Service Providers (ISPs) in Thailand. The competitive nature of the ISP market necessitates a focus on building strong customer loyalty to ensure long-term success. By delivering high-quality services that meet and exceed customer expectations, ISPs can foster both behavioral and attitudinal loyalty. This involves not only providing reliable internet services but also offering exceptional customer support, addressing customer needs promptly, and creating a positive overall customer experience. Furthermore, ISPs can leverage loyalty programs and personalized services to enhance customer engagement and satisfaction. By understanding the specific needs and preferences of their customers, ISPs can tailor their offerings to provide greater value, thereby strengthening customer loyalty and retention.

Customer loyalty is a multifaceted concept that plays a critical role in business differentiation and success. For ISPs in Thailand, focusing on the key dimensions of customer loyalty and implementing effective strategies to foster it can lead to sustained competitive advantage and improved market performance. This literature review underscores the importance of customer loyalty and provides a framework for understanding its various components and implications.

## 3. Research Methodology

This study utilized a quantitative approach, constructing a questionnaire as the primary tool of data collection. This approach aimed to establish connections between the research objectives and the perspectives of the sample, considering them as part of the environment under examination. The sample of the study comprised 400 voluntary consumers in Bangkok, selected from different stores of internet service providers (AIS, DTAC, TRUE), representing a reasonable number of internet service users under study. The researchers selected Bangkok for its context of major internet service providers for Thai users and possible access to the target sample.

The questionnaire administered to the sample consisted of two main parts. The first part gathered demographic information, including gender, age, education, career, internet service provider (ISP), reason for use, and expenditure amount. The second part focused on questions related to the variables of the study, including service quality, service fairness, price fairness perception, promotional offers, technological advancements, customer support, customer satisfaction, and customer loyalty. The questionnaire was constructed and validated for content relevancy and clarity by ten experts in telecommunications.

The obtained data were analyzed by descriptive statistics for mean, standard deviation, frequencies, and percentages. These statistical processes provided insights into the distribution and variation of responses across different variables of interest. Interpretation of the results contributed to the overall understanding of the impact of ISP e-service quality on customer satisfaction and loyalty.

## 4. Results and Discussion

### 4.1 Demographic Information

The demographic characteristics of the respondents are summarized in Table 1. The majority of respondents were male (58.0%), while female respondents constituted 42.0% of the sample. Regarding age distribution, the largest proportion of respondents fell within the 40-49 years age group (36.8%), followed by the 30-39 years age group (30.0%). Respondents aged 20-29 years and 50-59 years accounted for 14.5% and 13.0% of the sample, respectively. A smaller proportion of respondents belonged to the age groups lower than 20 years old (2.5%) and 60 years and older (3.3%). In terms of education level, the majority of respondents held at least a Bachelor's degree, with 50.5% having a Bachelor Degree and 25.8% holding a Master's Degree. Additionally, 5.8% of respondents reported having an education level lower than a Bachelor's degree, while 18.0% indicated having education levels above a Master's degree. Regarding career, the largest proportion of respondents were company employees (38.3%), followed by business owners (31.5%). Government officers accounted for 16.3% of the sample, while other career categories represented 14.0%. As for usage, the majority of respondents reported using internet services for personal use (68.5%), while 31.5% indicated using them for business purposes. Regarding internet service providers (ISP) usage, TRUE was the most commonly used provider, with 53.5% of respondents utilizing this ISP. AIS and DTAC had lower usage rates, with 31.3% and 15.3% of respondents, respectively. In terms of expenditure amount on internet services, the majority of respondents (49.8%) reported spending between 1001-3000 B. Additionally, 22.8% of respondents reported spending between 500-1000 B, 16.8% spent between 3001-5000 B, and 10.8% spent more than 5000 B.

**Table 1.** Demographic Profile

| Characteristics | | Frequency | Percentage |
|---|---|---|---|
| **Gender** | Male | 232 | 58.0 |
| | Female | 168 | 42.0 |
| **Age** | lower than 20 years old | 10 | 2.5 |
| | 20-29 years | 58 | 14.5 |
| | 30-39 years | 120 | 30.0 |
| | 40-49 years | 147 | 36.8 |
| | 50-59 years | 52 | 13.0 |
| | 60 years and older | 13 | 3.3 |
| **Education level** | Lower than Bachelor Degree | 23 | 5.8 |
| | Bachelor Degree | 202 | 50.5 |
| | Master Degree | 103 | 25.8 |
| | Above Master Degree | 72 | 18.0 |

| Characteristics | | Frequency | Percentage |
|---|---|---|---|
| **Career** | Business owner | 126 | 31.5 |
| | Company employee | 153 | 38.3 |
| | Government officer | 65 | 16.3 |
| | Other | 56 | 14.0 |
| **Reasons for use** | Personal use | 274 | 68.5 |
| | For business use | 126 | 31.5 |
| **Internet service providers** | AIS | 125 | 31.3 |
| | DTAC | 61 | 15.3 |
| | TRUE | 214 | 53.5 |
| **Expenditure amount** | 500-1000 B | 91 | 22.8 |
| | 1001-3000 B | 199 | 49.8 |
| | 3001 - 5000 B | 67 | 16.8 |
| | > 5000 B | 43 | 10.8 |

### 4.2 Experiences of Respondents with Their Internet Service Providers (ISPs)

The results presented in Table 2 provide valuable insights into the perceptions and experiences of the respondents regarding various aspects of their internet service providers (ISPs). In terms of service fairness, a significant majority of respondents (64.3%) expressed confidence in their ISPs' equitable treatment of all customers regardless of their subscription plan. However, a considerable proportion (55.0%) reported experiencing discrepancies in the billing process, indicating potential areas for improvement in ensuring fairness and transparency in billing practices.

Regarding price fairness perception, the majority of the respondents (61.8%) believed that the prices charged by their ISPs were reasonable compared to the quality of service provided. Nonetheless, a notable portion (35.5%) felt they had been overcharged for their internet service, suggesting a perception gap between pricing and perceived value. Promotional offers emerged as a significant factor, with a substantial proportion of respondents (66.8%) taking advantage of such offers provided by their ISPs. However, only a minority (31.5%) considered these promotional offers competitive compared to those offered by other providers, indicating a potential need for ISPs to enhance the competitiveness of their promotional strategies.

Technological advancements were generally perceived positively, with the majority of the respondents (68.5%) acknowledging their ISPs' efforts to keep pace with industry advancements. This suggests a recognition of ISPs' commitment to providing up-to-date and innovative services. Customer support emerged as an area of concern, as the significant majority of the respondents (70.3%) reported experiencing difficulties in reaching customer support when needed. This highlights a critical area for improvement in ensuring timely and accessible customer assistance. Despite these challenges, a substantial proportion of the respondents (68.5%) expressed willingness to recommend their ISPs to others based on their overall experience. Furthermore, an overwhelming majority (93.5%) indicated that they had never considered switching to another ISP, underscoring a high level of customer loyalty within the sample.

Overall, while there are areas of strength, such as customer loyalty, the findings suggest several areas where ISPs could enhance their service delivery to improve customer satisfaction and loyalty, particularly in the realms of billing transparency, promotional competitiveness, and customer support accessibility.

**Table 2.** Respondents' Responses to Yes / No Questions about Their Internet Service Providers (ISPs)

| Yes / No questions about their internet service providers (ISPs) | Frequency | | Percentage | |
|---|---|---|---|---|
| | Yes | No | Yes | No |
| (**Service Fairness**) Do you believe that your internet service provider treats all customers fairly regardless of their subscription plan? Please respond with 'Yes' or 'No'. | 257 | 143 | 64.3 | 35.8 |
| (**Service Fairness**) Have you ever experienced any discrepancies in the billing process with your internet service provider? Please respond with 'Yes' or 'No'. | 220 | 180 | 55.0 | 45.0 |
| (**Price Fairness Perception**) Do you believe that the prices charged by your internet service provider are reasonable compared to the quality of service provided? Please respond with 'Yes' or 'No'. | 247 | 153 | 61.8 | 38.3 |
| (**Price Fairness Perception**) Have you ever felt that you were overcharged for your internet service? Please respond with 'Yes' or 'No'. | 142 | 258 | 35.5 | 64.5 |
| (**Promotional Offers**) Have you ever taken advantage of any promotional offers provided by your internet service provider? Please respond with 'Yes' or 'No'. | 267 | 133 | 66.8 | 33.3 |
| (**Promotional Offers**) Do you believe that the promotional offers provided by your internet service provider are competitive compared to other providers in the market? Please respond with 'Yes' or 'No'. | 126 | 274 | 31.5 | 68.5 |
| (**Technological Advancements**) Do you feel that your internet service provider has kept pace with technological advancements in the industry? Please respond with 'Yes' or 'No'. | 274 | 126 | 68.5 | 31.5 |
| (**Customer Support**) Have you experienced any difficulties in reaching customer support when needed? Please respond with 'Yes' or 'No'. | 281 | 119 | 70.3 | 29.8 |
| (**Customer Satisfaction**) Would you recommend your internet service provider to others based on your experience? Please respond with 'Yes' or 'No'. | 274 | 126 | 68.5 | 31.5 |
| (**Customer Loyalty**) Have you ever considered switching to another internet service provider? Please respond with 'Yes' or 'No'. | 374 | 26 | 93.5 | 6.5 |

### 4.3 Perceptions of Respondents Regarding Their Internet Service Providers (ISPs) Concerning a Variety of Dimensions

Table 3 provides a comprehensive overview of the respondents' perceptions across various dimensions related to their Internet Service Providers (ISPs). Regarding reliability, the majority of the respondents rated their internet connection's reliability favorably, with 234 respondents (58.5%) giving a rating of 4, and 87 respondents (21.8%) giving a rating of 3. However, there were some concerns, as 14 respondents (3.5%) rated the reliability as 2 or below.

In terms of service fairness and transparency of pricing policies, a significant proportion of the respondents (214, 53.5%) rated their ISP's pricing policies as transparent (rating of 4), while 93 respondents (23.3%) gave a rating of 5, indicating a high level of transparency. For price fairness perception with value for money, the majority of the respondents (265, 66.3%) rated the value for money of their internet service subscription positively for price fairness perception, with 56 respondents (14%) giving a rating of 3, and 55 respondents (13.8%) giving a rating of 1 or 2.

There were mixed perceptions regarding promotional offers based on satisfaction with promotional deals, with 184 respondents (46%) expressing satisfaction (rating of 4), while 145 respondents (36.3%) gave a rating of 1 or 2, indicating dissatisfaction.

The majority of the respondents (229, 57.3%) expressed satisfaction with the technological features offered by their ISP, with 78 respondents (19.5%) giving a rating of 1 or 2. We also observed a similar pattern in the reliability of technology, where 177 respondents (44.3%) expressed satisfaction (a rating of 4), while 145 respondents (36.3%) gave a rating of 1 or 2.

With regard to the responsiveness of customer support, a considerable portion of the respondents (242, 60.5%) rated it positively, with 68 respondents (17%) expressing dissatisfaction (a rating of 1). Moreover, the respondents had mixed perceptions regarding the knowledgeability of customer support representatives, with 180 respondents (45%) expressing satisfaction (a rating of 4), while 131 respondents (32.8%) gave a rating of 1 or 2.

Customer satisfaction: Overall satisfaction was expressed by the majority of the respondents (232, 58%) with the services provided by their ISP, with 78 respondents (19.5%) expressing dissatisfaction (rating of 1 or 2). Similarly, there were mixed perceptions regarding the likelihood of continuing to use the services, with 177 respondents (44.3%) expressing a high likelihood (a rating of 4 or 5), and 140 respondents (35%) giving a low likelihood (a rating of 1 or 2).

As for customer loyalty or tenure as a customer, the respondents varied in their tenure as customers, with 235 respondents (58.8%) being customers for 1-3 years and 78 respondents (19.5%) being customers for less than 1 year. Furthermore, the majority of the respondents (187, 46.8%) expressed satisfaction with the overall experience of being a customer, with 129 respondents (32.3%) giving a rating of 4 or 5.

Overall, the findings highlight areas of strength and areas for improvement across different dimensions of ISP performance, with satisfaction levels varying among the respondents.

**Table 3.** Dimension of Internet Service Providers (ISPs)

| E-Service Quality | Frequency | | | | |
|---|---|---|---|---|---|
| | **5** | **4** | **3** | **2** | **1** |
| Please rate the reliability of your internet connection on a scale from 1 to 5, where 1 is very unreliable and 5 is very reliable. | 65 | 234 | 87 | 12 | 2 |
| How satisfied are you with the speed of your internet service? Please rate on a scale from 1 to 5, where 1 is very dissatisfied and 5 is very satisfied. | 53 | 267 | 56 | 14 | 10 |
| How would you rate the overall performance of your internet service provider in terms of customer service? Please rate on a scale from 1 to 5, where 1 is poor and 5 is excellent. | 45 | 224 | 98 | 25 | 8 |
| **Service Fairness** | | | | | |
| How transparent do you find the pricing policies of your internet service provider? Please rate on a scale from 1 to 5, where 1 is not transparent at all and 5 is very transparent. | 93 | 214 | 74 | 16 | 3 |
| **Price Fairness Perception** | | | | | |
| How would you rate the value for money of your internet service subscription? Please rate on a scale from 1 to 5, where 1 is very poor value and 5 is excellent value. | 55 | 265 | 56 | 14 | 10 |
| **Promotional Offers** | | | | | |
| How satisfied are you with the promotional deals offered by your internet service provider? Please rate on a scale from 1 to 5, where 1 is very dissatisfied and 5 is very satisfied. | 145 | 184 | 51 | 11 | 9 |
| **Technological Advancements** | | | | | |
| How satisfied are you with the technological features offered by your internet service provider, such as mobile apps and advanced network infrastructure? Please rate on a scale from 1 to 5, where 1 is very dissatisfied and 5 is very satisfied. | 78 | 229 | 66 | 18 | 9 |
| How would you rate the reliability of the technology used by your internet service provider? Please rate on a scale from 1 to 5, where 1 is very unreliable and 5 is very reliable. | 145 | 177 | 46 | 26 | 6 |
| **Customer Support** | | | | | |
| How satisfied are you with the responsiveness of customer support provided by your internet service provider? Please rate on a scale from 1 to 5, where 1 is very dissatisfied and 5 is very satisfied. | 68 | 242 | 61 | 29 | |
| How knowledgeable do you find the customer support representatives of your internet service provider? Please rate on a scale from 1 to 5, where 1 is not knowledgeable at all and 5 is very knowledgeable. | 131 | 180 | 67 | 19 | 3 |

| E-Service Quality | Frequency | | | | |
|---|---|---|---|---|---|
| | 5 | 4 | 3 | 2 | 1 |
| **Customer Satisfaction** | | | | | |
| Overall, how satisfied are you with the services provided by your internet service provider? Please rate on a scale from 1 to 5, where 1 is very dissatisfied and 5 is very satisfied. | 78 | 232 | 63 | 27 | |
| How likely are you to continue using the services of your internet service provider in the future? Please rate on a scale from 1 to 5, where 1 is very unlikely and 5 is very likely. | 140 | 177 | 57 | 20 | 6 |
| **Customer Loyalty** | | | | | |
| How long have you been a customer of your current internet service provider? Please select one: Less than 1 year / 1-3 years / 3-5 years / More than 5 years. | 78 | 235 | 60 | 27 | |
| How satisfied are you with the overall experience of being a customer of your internet service provider? Please rate on a scale from 1 to 5, where 1 is very dissatisfied and 5 is very satisfied. | 129 | 187 | 67 | 10 | 7 |

Table 4 presents the mean scores and standard deviations for several dimensions related to Internet Service Providers (ISPs) as perceived by the respondents, along with their corresponding interpretations.

Firstly, the respondents indicated strong agreement across various aspects of ISP performance. The mean scores for service quality, service fairness, price fairness perception, promotional offers, and technological advancements ranged from 4.21 to 4.61, suggesting a high level of satisfaction with these facets. The high rating for promotional offers is particularly noteworthy, indicating that the respondents strongly agree with the attractiveness and value of promotional deals provided by their ISPs.

Similarly, the respondents expressed positive sentiments toward the fairness and reliability of services offered by their ISPs. The mean scores for service quality, service fairness, and price fairness perception all fell within the range of 4.21 to 4.36, indicating a strong agreement with the respondents' equitable treatment and value proposition.

In terms of customer support, while the mean score of 4.19 reflects an overall agreement with the effectiveness of customer support services, there were slight variations in satisfaction levels, as evidenced by the standard deviation of 0.774. This suggests that while the respondents generally agreed with the quality of customer support, there may be room for improvement in certain areas to ensure consistent satisfaction.

Furthermore, the respondents indicated a moderate level of agreement regarding customer satisfaction and customer loyalty, with mean scores of 4.02 and 4.07, respectively. Although the respondents generally expressed satisfaction with the services provided by their ISPs and demonstrated a willingness to remain loyal, the standard deviations of 1.1 and 0.985 suggest some variability in individual experiences and loyalty intentions.

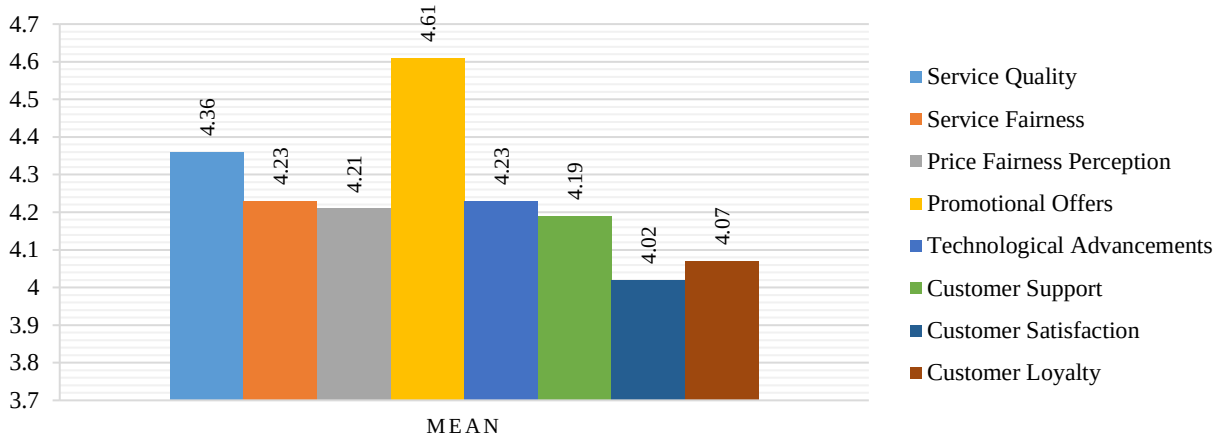
Overall in Figure 1, the findings underscore the positive perception of ISPs among the respondents, with strong agreement across various dimensions of service quality, fairness, and

satisfaction. These insights provide valuable implications for ISPs seeking to maintain high levels of customer satisfaction and loyalty in a competitive market environment

**Table 4.** Mean and Standard Deviation of Dimensions Related to Internet Service Providers (ISPs)

| Dimensions related to internet service providers (ISPs) | Mean | SD | Interpretation |
|---|---|---|---|
| Service Quality | 4.36 | 0.691 | Strongly agree |
| Service Fairness | 4.23 | 0.787 | Strongly agree |
| Price Fairness Perception | 4.21 | 0.789 | Strongly agree |
| Promotional Offers | 4.61 | 0.650 | Strongly agree |
| Technological Advancements | 4.23 | 0.805 | Strongly agree |
| Customer Support | 4.19 | 0.774 | Agree |
| Customer Satisfaction | 4.02 | 1.100 | Agree |
| Customer Loyalty | 4.07 | 0.985 | Agree |

**Figure 1.** Internet Service Provider (ISP) Dimension Mean Score Bar Graph




## 5. Conclusion and Discussion

### 5.1 Conclusion

The study investigated various dimensions of Internet Service Providers (ISPs): e-service quality, fairness, promotional offers, technological advancements, customer support, satisfaction, and loyalty, among consumers in Bangkok. The study revealed several key findings via quantitative analysis using descriptive statistics.

Overall, the respondents expressed high levels of satisfaction and agreement across most dimensions related to their ISPs. The respondents highly rated service quality, fairness, price fairness perception, promotional offers, and technological advancements, indicating a positive perception of the services provided by ISPs in Bangkok. However, there were slight variations in satisfaction levels with customer support, suggesting areas for improvement in service delivery.

Customer satisfaction and loyalty were moderately high, with the respondents generally indicating positive intentions to continue using their current ISPs. Despite this, there were some

variations in individual experiences and loyalty intentions, highlighting the importance of continued efforts to enhance customer satisfaction and loyalty in the competitive ISP market.

### 5.2 Discussion

The study's findings highlight the significance of various factors in shaping consumer perceptions and behaviors toward ISPs (Anderson & Srinivasan, 2003; Danaher, Wilson & Davis, 2008; Keiningham et al., 2008; Xu, Sundar & Dou, 2013; Intzes & Nuangjamnong. 2024). High ratings for service quality, fairness, and promotional offers suggest that consumers in Bangkok value reliability, transparency, and value-added services when choosing an ISP. Furthermore, positive perceptions of technological advancements highlight the importance of staying updated with the latest technology to meet consumer expectations (Brown & Maxwell, 2002; Santos, 2003; Grewal, Levy & Kumar, 2009; Lu et al., 2009; Mitchev & Nuangjamnong, 2021).

However, the study also identified areas for improvement, particularly in customer support. While the respondents generally agreed with the effectiveness of customer support services, there were slight variations in satisfaction levels, indicating the need for ISPs to enhance responsiveness and knowledgeability (Cadotte & Turgeon, 1988; Gefen, 2002; Kumar & Shah, 2004; Dabholkar & Overby, 2005; Martin-Consuegra, Molina & Esteban, 2007; Nuangjamnong, 2021) to ensure consistent customer satisfaction.

## 6. Recommendations

Based on the obtained findings, the researchers would like to recommend the following:

(1) To improve customer support, ISPs should invest in training and development programs for customer support representatives to enhance responsiveness and knowledgeability. Implementing self-service options and improving communication channels can also help streamline support processes.

(2) To enhance transparency, ISPs should ensure transparency in pricing policies and billing processes to build trust and credibility among consumers. Providing clear and accurate information about subscription plans and charges can help minimize discrepancies and enhance perceived fairness.

(3) For innovative promotional offers, ISPs should continue to innovate and offer competitive promotional deals to attract and retain customers. Tailoring offers to meet the diverse needs and preferences of consumers can help differentiate ISPs in the market and increase customer satisfaction.

(4) By investing in technological advancements, ISPs should prioritize investments in technological advancements to improve service quality and reliability. Embracing emerging technologies, such as 5G and IoT can help enhance the overall customer experience and strengthen loyalty.

## 7. Further Study

Further research can explore additional factors influencing customer satisfaction and loyalty, as this study offers valuable insights into consumer perceptions of ISPs in Bangkok. Future studies could investigate the provincial context and the impact of demographic variables, such as

age, gender, and income level on consumer preferences and behaviors. Additionally, longitudinal studies tracking changes in consumer perceptions over time can provide valuable insights into evolving trends and preferences in the ISP industry. Furthermore, qualitative research methods, such as interviews and focus groups can offer deeper insights into the underlying reasons behind consumer perceptions and behaviors, allowing ISPs to adjust their strategies more effectively.

## 8. The Authors

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## 9. References

Anderson, R. E. & Srinivasan, S. S. (2003). E-satisfaction and e-loyalty: A contingency framework. *Psychology & Marketing, 2003, 20(2),* 123-138. https://doi.org/10.1002/mar.10063

Bitner, M. J., Booms, B. H. & Tetreault, M. S. (1990). The service encounter: Diagnosing favorable and unfavorable incidents. *Journal of Marketing, 1990, 54(1),* 71-84. https://doi.org/10.1177/002224299005400105

Blattberg, R. C., Briesch, R. & Fox, E. J. (1995). *How promotions work. Marketing Science, 1995, 14*(3_supplement), G122-G132. https://doi.org/10.1287/mksc.14.3.G122

Bolton, L. E., Warlop, L. & Alba, J. W. (2003). Consumer perceptions of price (un)fairness. *Journal of Consumer Research, 2003, 29(4),* 474-491. https://doi.org/10.1086/346244

Brown, S. W. & Maxwell, J. D. (2002). Customer support services: Managing the quality trade-off. *Journal of Service Research, 2002, 4(4),* 259-270. https://doi.org/10.1177/1094670502004004003

Cadotte, E. R. & Turgeon, N. (1988). Dissatisfiers and satisfiers: Suggestions from consumer complaints and compliments. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior, 1988, 1,* 74-79.

Collier, J. E. & Bienstock, C. C. (2006). Measuring service quality in e-retailing. *Journal of Service Research, 2006, 8(3),* 260-275.

Dabholkar, P. A. & Overby, J. W. (2005). Linking process and outcome to service quality and customer satisfaction evaluations: An investigation of real estate agent service. *International Journal of Service Industry Management, 2005, 16(1),* 10-27. https://doi.org/10.1108/09564230510587179

Danaher, P. J., Wilson, I. W. & Davis, R. A. (2008). A comparison of online and offline consumer brand loyalty. *Marketing Science, 2008, 22(4),* 461-476. https://doi.org/10.1287/mksc.22.4.461.24907

Donsuchit, T. & Nuangjamnong, C. (2022). Determinant of influencing customer loyalty and repurchase intention toward mobile application food delivery service in Bangkok. *International Research E-Journal on Business and Economics, 2022, 7(1),* 1–14. http://www.assumptionjournal.au.edu/index.php/aumitjournal/article/view/6283

Gefen, D. (2002). Customer loyalty in e-commerce. *Journal of the Association for Information Systems, 2002, 3(1),* 2.

Gilbert, G. R. & Veloutsou, C. (2006). A cross-industry comparison of customer satisfaction. *Journal of Services Marketing, 2006, 20(5),* 298-308.

Grewal, D., Levy, M. & Kumar, V. (2009). Customer experience management in retailing: An organizing framework. *Journal of Retailing, 2009, 85(1),* 1-14. https://doi.org/10.1016/j.jretai.2009.01.001

Gummerus, J., Liljander, V., Pura, M. & Riel, A. (2004). Customer loyalty to content-based web sites: The case of an online health-care service. *Journal of Services Marketing, 2004, 18(3),* 175-186. https://doi.org/10.1108/08876040410536486

Huang, J. X. & Nuangjamnong, C. (2023). The impact of customer satisfaction on customer loyalty in Chinese e-commerce platforms in China. *The AU E-Journal of Interdisciplinary Research, 2023, 8(2),* 63–79. http://www.assumptionjournal.au.edu/index.php/eJIR/article/view/7807

Iglesias, M. P. & Guillén, M. J. Y. (2004). Perceived quality and price: Their impact on the satisfaction of restaurant customers. *International Journal of Contemporary hospitality management, 2004, 16(6),* 373-379.

Intzes, W. & Nuangjamnong, C. (2024). Factors influencing patient loyalty towards dental care providers—residents in Bangkok, Thailand. *AU-GSB e-Journal, 2024, 17(1),* 225–236. https://doi.org/https://doi.org/10.14456/augsbejr.2024.22

Keiningham, T. L., Aksoy, L., Andreassen, T. W., Cooil, B. & Wahren, B. J. (2008). The aggregate impact of customer satisfaction on consumer behavior. *Journal of Service Research, 2008, 11(1),* 20-34. https://doi.org/10.1177/1094670508319097

Kim, M. K., Park, M. C. & Jeong, D. H. (2004). The effects of customer satisfaction and switching barrier on customer loyalty in Korean mobile telecommunication services. *Telecommunications Policy, 2004, 28(2),* 145-159. https://doi.org/10.1016/j.telpol.2003.12.003

Kumar, V. & Shah, D. (2004). Building and sustaining profitable customer loyalty for the 21st century. *Journal of Retailing, 2004, 80(4),* 317-330. https://doi.org/10.1016/j.jretai.2004.10.007

Lu, J., Yu, C. S., Liu, C. & Yao, J. E. (2009). Technology acceptance model for wireless Internet. *Internet Research, 2009, 13(3)*, 206-222. https://doi.org/10.1108/10662240310478222

Lusch, R. F., Vargo, S. L. & O'brien, M. (2007). Competing through service: Insights from service-dominant logic. *Journal of Retailing, 2007, 83(1)*, 5-18.

Martin-Consuegra, D., Molina, A. & Esteban, A. (2007). An integrated model of price, satisfaction and loyalty: An empirical analysis in the service sector. *Journal of Product & Brand Management, 2007, 16(7)*, 459-468. https://doi.org/10.1108/10610420710834913

Maxham III, J. G. & Netemeyer, R. G. (2003). Firms reap what they sow: The effects of shared values and perceived organizational justice on customers' evaluations of complaint handling. *Journal of Marketing, 2003, 67(1)*, 46-62.

Mitchev, T. & Nuangjamnong, C. (2021). The impact of e-commerce on customer satisfaction and customer loyalty during the COVID-19 pandemic: A quantitative analysis in Thailand. *AU-GSB e-Journal, 2021, 14(2)*, 59–70. https://doi.org/10.14456/augsbejr.2021.15

Neslin, S. A. (2002). Sales promotion. In B. A. Weitz & R. Wensley. (Eds.). *Handbook of Marketing*. Los Angeles, CA: Sage Publications, 310-338.

Nuangjamnong, C. (2021). Investigation of factors influencing students' intention to use banking services through smartphone devices during COVID-19 pandemic. *International Journal of Economics and Business Administration, 2021, 9(1)*, 331-346.

Parasuraman, A. & Colby, C. L. (2015). An updated and streamlined technology readiness index: TRI 2.0. *Journal of Service Research, 2015, 18(1)*, 59-74. https://doi.org/10.1177/1094670514539730

Parasuraman, A., Zeithaml, V. A. & Berry, L. L. (1988). Servqual: A multiple-item scale for measuring consumer perc. *Journal of retailing, 1988, 64(1)*, 12.

Parasuraman, A., Zeithaml, V. A. & Malhotra, A. (2005). ES-QUAL: A multiple-item scale for assessing electronic service quality. *Journal of service research, 2005, 7(3)*, 213-233.

Santos, J. (2003). E-service quality: A model of virtual service quality dimensions. *Managing Service Quality: An International Journal, 2003, 13*(3), 233-246.

Seiders, K. & Berry, L. L. (1998). Service fairness: What it is and why it matters. *Academy of Management Perspectives, 1998, 12(2)*, 8-20.

Sharp, B. & Sharp, A. (1997). Loyalty programs and their impact on repeat-purchase loyalty patterns. *International Journal of Research in Marketing, 1997, 14(5)*, 473-486. https://doi.org/10.1016/S0167-8116(97)00022-0

Supphellen, M. & Nysveen, H. (2001). Drivers of intention to revisit the websites of well-known companies: The role of corporate brand loyalty. *International Journal of Market Research, 2001, 43(3),* 341-352. https://doi.org/10.1177/147078530104300306

Taylor, S. A. & Baker, T. L. (1994). An assessment of the relationship between service quality and customer satisfaction in the formation of consumers' purchase intentions. *Journal of Retailing, 1994, 70(2),* 163-178. https://doi.org/10.1016/0022-4359(94)90013-2

Teeter, T. & Schointuch, D. (2000). Customer retention: The ultimate test. *Journal of Business Strategy, 2000, 21(4),* 25-30. https://doi.org/10.1108/eb040093

Xia, L., Monroe, K. B. & Cox, J. L. (2004). The price is unfair! A conceptual framework of price fairness perceptions. *Journal of Marketing, 2004, 68(4),* 1-15. https://doi.org/10.1509/jmkg.68.4.1.42733

Xu, M. A., Sundar, S. S. & Dou, W. (2013). What goes around comes around: The reciprocal link between fair customer service treatment and customer satisfaction. *Journal of Business Research, 2013, 66(6),* 790-796. https://doi.org/10.1016/j.jbusres.2011.05.025

Zeithaml, V. A., Berry, L. L. & Parasuraman, A. (1996). The behavioral consequences of service quality. *Journal of Marketing, 1996, 60(2),* 31-46. https://doi.org/10.1177/002224299606000203

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# Packaging Design of Tea and Snack Product Sets Based on the Identity of Kudeejeen Community in Bangkok

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**Abstract**

The research has three objectives: (1) to collect information on the existing tea and snacks that are the identity of the Kudeejeen Community, (2) to design packaging based on the Kudieejeen Community identity for the selected tea and snack product sets, and (3) to assess the satisfaction of the target group with the designed packaging based on the Kudieejeen Community identity for the selected tea and snack product sets, and its marketing aspects. The participants were from Kueejeen Community, located in Kanlaya sub-district, Thonburi, Bangkok. The sample was selected using simple random sampling, for a total of 160 participants, both male and female, aged 20-60 years. The research tools for data collection were a questionnaire with open-ended and closed-ended questions, and a product prototype satisfaction evaluation form. They were tested by three experts in product design for content validity. The obtained data were from field visits, in-depth interviews, focus group discussions, and non-participant and participant observation in the community. The results were: (1) the participants were interested in tea and snacks products with the identity of Kudeejeen Community and their overall satisfaction was high at 4.45 with the design of tea and snacks packaging with the identity of Kudeejeen Community. (2) When considering each response item, the researchers found that the usability and beauty aspects were equal, with an average of 4.48, followed by the marketing aspect, with an average of 4.38. The implications are for job creation and increased income for the community, which in turn can improve the quality of life in the community. The findings are expected to help producers predict production and marketing trends as well as provide consumers with more choices when purchasing local snack products.

***Keywords:*** *Tea and snacks products, packaging design, identity, consumer satisfaction, Kudeejeen Community*

## 1. Introduction

Local identity plays a crucial role in shaping the cultural characteristics of a community. It encompasses unique traits that distinguish individuals, societies, communities, or nations, such as ethnicity, language, religion, and local culture (Phongnak, 2014). Identity design for local products serves as a powerful tool to enhance product visibility, establish credibility among consumers, and expand market opportunities (Wanitchakorn, 2016; Teerawornkul, 2017). This, in turn, drives economic growth and empowers local communities. However, many local products lack a well-defined identity, particularly in terms of packaging and visual appeal. This often leads to challenges in attracting consumers and establishing a strong market presence (Auppathak, Daocharoenporn, Soteyome, Yutthavisut, Tubbiyam, Thedkwanchai & Ooaymaweerahirun, 2024; Singkhajorn, Jarujutarat, Phuhirun & Chuensupantharat, 2024).

Kudeejeen Community is located in Kalaya Subdistrict, Thon Buri District, Bangkok. It is a small community next to Chao Phraya River, and there are a large number of Thais of Chinese and Portuguese descent living there. It is an old community, over 200 years old dated back to the reign of King Taksin the Great. There is an interesting and unique tourist attraction of this community, namely Santa Cruz Church. There is outstanding wisdom of this community from the Portuguese in the past, as shown by an ethnic dessert called Khanom Farang Kudeejeen. It is considered a product with the identity of the Kudijeen community, which is inherited from the ancestors--local people of Portuguese descent. It uses only three ingredients: flour, eggs, and sugar, and sprinkled with dried fruit in two sizes, large and small. The large size is sprinkled with raisins, candied squash, and dried tomatoes, and sugar. The small size is a traditional Chinese kudee without topping. The dessert is soft, fragrant, and not too sweet in taste; other desserts include Kuay Tas, Kusarang, and Sap Yaek (Chanbut et al., 2016a, 2016b; Singkhajorn, Jarujutarat, Phuhirun & Chuensupantharat, 2024).

The researchers visited the Kudeejeen community, well-known for its cultural food and dessert. From an interview with the President of the Kudeejeen Community, about developing and expanding cultural food--a set of tea and snack products typical of the Kudeejeen community with added value. There was a planned marketing strategy guideline to increase business opportunities and raise income levels for the community.

## 2. Research Objectives

There were three research objectives:

(1) To collect information on the existing tea and snacks that are the identity of the Kudeejeen Community.

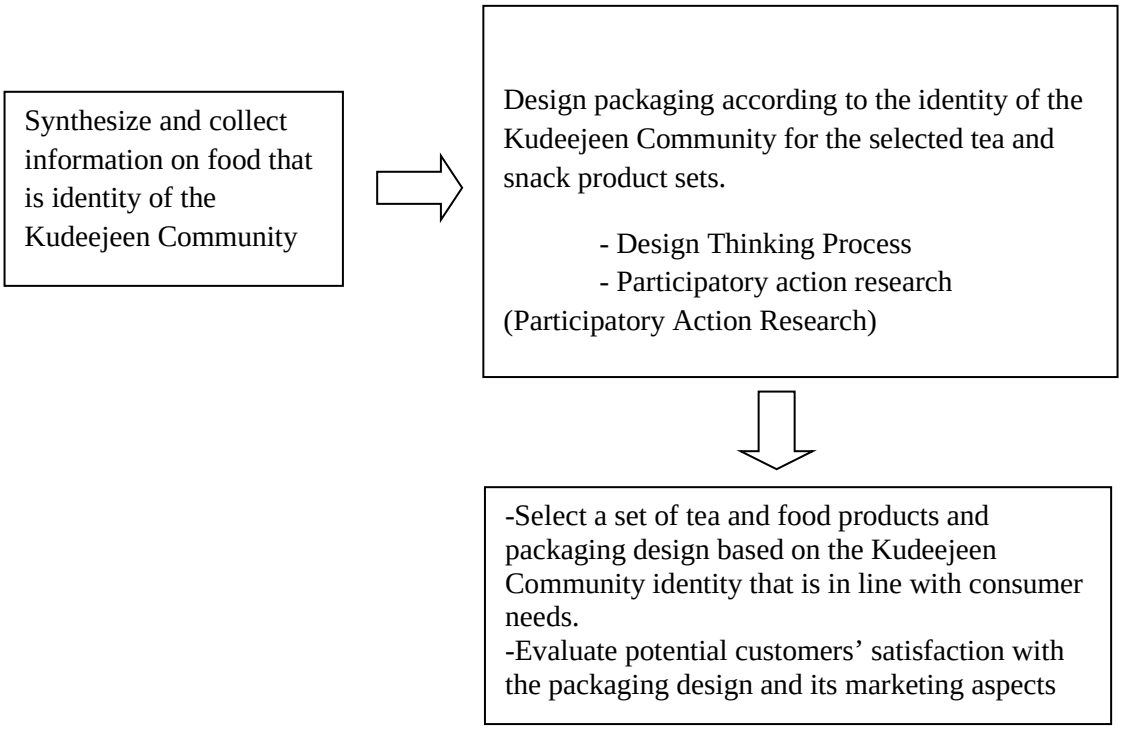
(2) To design packaging based on the Kudieejeen Community identity for the selected tea and snack product sets.

(3) To assess the satisfaction of the target group with the designed packaging based on the Kudieejeen Community identity for the selected tea and snack product sets, and its marketing aspects.

Based on the research objectives, the researchers developed a conceptual framework as shown in Figure 1.

## 3. Research Conceptual Framework

**Figure 1:** Research Conceptual Framework




## 4. Research Methodology

The researchers aimed to study the design characteristics of souvenir sets. The research scope was set in Kudeejeen Community, Kanlaya Sub-district, Thonburi District, Bangkok.

The sample group of 160 in total, was from the Kudeejeen Community by simple random sampling: male and female, 80 per group, aged 20-60 years.

**Table 1:** The Participants

| Age (year) | 20-30 | 31-40 | 41-50 | 51-60 |
|---|---|---|---|---|
| Number (people) | 40 | 40 | 40 | 40 |

The research tools for data collection were a questionnaire, a set of interview questions, participatory and non-participatory observation scheme, and satisfaction assessment form. The constructed questionnaire consisted of open-ended and closed-ended questions in three parts:

Part 1: General information on the participants by gender and age.

Part 2: Questions on the selected product sets and packaging design, including utility, reasonable price, and convenience in use, beauty in style pattern of the material (modern/ exotic/ cultural), and durability in use.

Part 3: Opinions on the packaging design of the selected product sets, and its marketing aspects.

The questions were on a 5-level rating scale with evaluation criteria and meanings (Phuengthian, 2000).

4.50 - 5.00: Very appropriate
3.50 – 4.49: Well-suited
2.50 – 3.49: Moderately appropriate
1.50 - 2.49: Less appropriate
1.00 - 1.49: Least appropriate

The researchers tested and revised the constructed questionnaire, together with the set interview questions and the observation scheme, on the basis of feedback from three experts in design and product development. Question item consistency (Index Item of Congruence: IOC) was checked to obtain the value greater than 0.5 for each item.

## 5. Data Analysis

In data analysis, descriptive statistics was used to describe the general information of the sample, information about product design, consumer product selection, in terms of frequency, mean and standard deviation.

## 6. Results

This section reports (1) Analysis of marketing and design of tea and snack product sets, (2) SWOT Analysis of the market situation, (3) Target group analysis, (4) Packaging design of a set of tea and snack products according to the identity of the Kudeejeen Community, (5) Marketing aspects of the packaging design, and (6) Participants' satisfaction with the packaging design of the selected product sets, and its marketing aspects.

### 6.1 Analysis of marketing and design of tea and snack product sets according to the identity of the Kudeejeen Community

Kudeejeen Community has various unique snacks and desserts, such as Khanom Farang Kudeejeen, Khanom Kuay Tas, and Khanom Kusarang. These desserts are not yet widely known to the public. The production of various desserts including the tea product sets still uses packaging that doesn't look attractive. There is no clear symbol indicating the identity of the product. As a result, consumers are not interested in them as should be.

### 6.2 Analysis of strengths, weaknesses, opportunities, and threats (SWOT Analysis)

*Strengths*

- A set of tea and snack products has a unique flavor and pleasing to the consumer
- Emphasis on being an old community with a long history, including the inheritance of ancient desserts from generation to generation, making memorable stories with sentimental value. The ancient desserts are suitable as souvenirs with a long history.

*Weaknesses*

A set of tea and snack products from the Kudeejeen Community, has been on very few and limited public relations media. There is no online sales channel. There is no highlight of the logo, lack of personnel to take care of designing the brand and packaging.

Therefore, it requires packaging design, and public relation media for the selected product sets to catch customers' attention.

*Opportunities*

Kudeejeen Community's long history and its Thai-Sino-Portuguese traditions offer an opportunity to generate income within the community by selling tea and snack product sets that are unique snacks of the community. Various products carry stories as added value to stimulate sales. This is a good opportunity to compete in marketing with other snack products.

*Threats*

The Community's various tea and snack products still use the same old packaging that doesn't look eye-catching as souvenirs. Plain packaging is considered an obstacle in selling tea and snack product sets. The Community needs to develop and design packaging and branding to attract customers.

### 6.3 Target group analysis

The target group or expected customers are working people who like stories about culture or history as well as uniqueness of products as souvenirs. The target group could be attracted to added value of local products, desserts or snacks, so that they might buy as souvenirs for friends and special people.

### 6.4 Packaging design of a set of tea and snack products based on the identity of Kudeejeen Community

A selected set of tea and snack products based on the identity of Kudeejeen Community requires two designs: logo and packaging.

### 6.5 Marketing aspects of the packaging design

Considering the target group, the researchers analyzed the distinctive characteristics of the Community's tea and snack products snacks, and conceptualized them into the designed logo and new packaging as marketing aspects to attract potential customers.

*Logo*

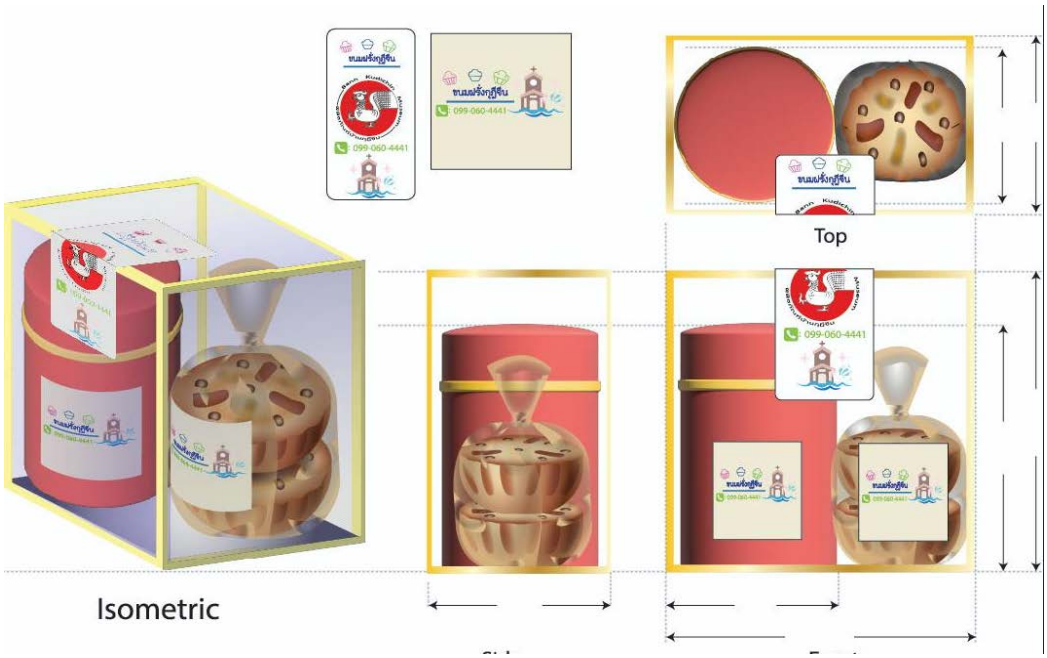
The researchers designed a logo consistent with the identity of Kudeejeen Community in terms of the color pleasing to viewers with the letters naming the tea and snack product set. The original packaging for snacks carried only the name of the product without a logo. To the researchers, the logo of the tea and snack product sets must have a unique identity so that consumers can remember the products and buy as souvenirs. Overall, the design carries: letters indicating the name of the dessert, a candy pattern with a phone number, the color in a cream tone matched with the brown tone of the dessert, and the dessert picture—all making the design pleasing to the eye and easy to remember.

**Image 2:** Logo or Brand Image


*Packaging*

The packaging design emphasizes the uniqueness of the dessert name and the dessert logo, the design composition, the color red for tea products, to be packed in stainless steel cans and snacks in clear plastic bags, and attached with a label. The cream color scheme is used for visual appeal and clearer text. Browallia New Thai font is used for both texts and logos to create consistency in the letters in red—looking modern and easy to read. It is meant to catch the eye with the Thai text that looks neat and easy to read. In addition, the text is highlighted in keywords that people can remember easily.

**Image 3:** Packaging



### 6.6 Satisfaction with the packaging design of tea and snacks based on the Kudeejeen Community, and its marketing aspects

The participants evaluated the *overall image of the packaging design* at a high level 4.48. When considering each item, the researchers found its *suitable use* at 4.54, followed by *being safe to users* at 4.24. *Convenience and ease of use* were at 3.99 and *suitable size* at 3.98, respectively.

The participants were satisfied with the packaging design of the selected tea and snack sets in terms of *overall beauty* at a high level 4.41. When considering each item, it was found that it was functional and suitable for use at 4.54, followed by *suitability for souvenirs* at 4.14. The *distinctiveness* is appropriate to the current trend and the souvenir products can clearly convey the identity of the community at 4.01 and *the style* is beautiful and appropriate at 3.36, respectively.

The participants' satisfaction with the packaging design of tea and snacks based on Kudeejeen Community in *overall marketing aspects* at a high level 4.41. When considering each marketing aspect item, it was found that it was able to *explain to consumers the types of products* at 4.50, followed by *materials* that are easily found locally for production at 4.25. The *size* is appropriate for the distribution area in terms of *selling price* at 4.00. The *production process* is not complicated, and can be commercially produced at the community at 3.91, respectively.

## 7. Conclusion

As seen in the findings of the study, the selected set of tea and snack products and the packaging design reflecting the identity of Kudeejeen Community finally appeared attractive to the participants under study. The participants as potential customers provided local data from field visits, in-depth interviews, focus group discussions, and non-participant and observation in the community. They were positive to the cultural souvenirs in the study, as shown in their high overall satisfaction at 4.45 with the new packaging design of the selected tea and snack sets reflecting the identity of Kudeejeen Community. To the researchers, the implications of the obtained findings are potentially for job creation and increased income for the community. The researchers definitely expected that commercial production of tea sets, cultural snacks and desserts can benefit community members in the long run as part of the trend of community-based tourism.

## 8. The Authors

The first author Kanjataporn Tongpila (Faculty of Engineering and Industrial Technology), the second author Julalak Jarujutarat (Department of Product Design and Development, Faculty of Engineering and Industrial Technology), and the third author Sakornrat Torrod (Office of the President) are academic staff members of Bansomdejchaopraya Rajabhat University, Bangkok, Thailand. They share research interest in the areas of entrepreneurial management, product design and development, and current issues in industrial innovation and technology.

**9. References**

Auppathak, C., Daocharoenporn, N., Soteyome, T., Yutthavisut, K., Tubbiyam, P., Thedkwanchai, S. & Ooaymaweerahirun, P. (2024). Managing extended shelf life of Thong Yod snacks in the modified condition. *RICE Journal of Creative Entrepreneurship and Management, 2024, 5*(2), 67-80. doi 10.14456/rjcm.2024.11

Chanbut, T. et al. (2016a). Carrying on the wisdom of ancient desserts of the Kudichin community. Report on the subject of humans and the environment. Suan Dusit University. Pages 1-12.

Chanbut, T. et al. (2016b). Study of Kudichin Community, Thonburi District, Bangkok Province. A Report on Contemporary Thai Society. Bangkok: Suan Dusit University, 1-7.

Phongnak, I. (2014). Community Identity of the Ancient City of U Thong for the Development of Cultural Tourism in Suphan Buri Province. A Master of Arts Thesis. Cultural Management Program (Interdisciplinary Studies), Chulalongkorn University, Bangkok, Thailand.

Phungthian, T. (2000). *Basic Statistics and Research.* Bangkok: Paisan Sutta.

Singkhajorn, S., Jarujutarat, J., Phuhirun, E. & Chuensupantharat, N. (2024). Creative community tourism development based on Kudeejeen Community identity, Thailand. *RICE Journal of Creative Entrepreneurship and Management, 2024, 5*(1), 37-46. doi 10.14456/rjcm.2024. 3

Teerawornkul, N. (2017). Creating Identity through Designing and Developing Product Packaging from Scratch of the Phra Samut Chedi District Community Ocean Province. A Research Report. Bangkok: Dhonburi Rajabhat University.

Wanitchakorn, A. (2016). *Local Product Design.* Bangkok: Chulalongkorn University Press.

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**Academic Paper**

# Internet of Things (IoT) Technology for a Creative Intelligent Interactive Classroom

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**Abstract**

The new era of digital technology has revealed its important role in every aspect of life. The application of technology in the education sector is essential to modernize the efficiency and quality of learning. One technology that is gaining a lot of attention for use in the classroom is the Internet of Things (IoT), a system that connects electronic devices and tools to be able to exchange information and executeD tasks between them. This paper reports the IoT implementation in the classroom how it helps create intelligent and interactive learning environments that can respond to the needs of each student. The key elements are discussed: (1) installing sensors and behavioral tracking devices to collect data, (2) processing data with cloud and artificial intelligence, (3) providing advice on how to optimize the environment, teaching process, and activities. and (4) creating interactions between teachers, students, and various devices through control and display devices. Smart classrooms and IoT interactions monitor and optimize the environment by tracking and analyzing learner behavior in order to provide individual study advice and motivate learners through interesting interactions The expected learning experience as such, however, still carries some limitations and challenges in many areas that must be taken into account, such as investment budget, technical complexity and security, and privacy issues. But overall, IoT is considered one of the most interesting innovations for educational reformation in the digital age.

***Keywords:*** *Internet of Things, smart classroom, interactive learning environment, quality of learning*

## 1. Introduction: Background

The world has fully entered the digital age in which digital technology has played an important role in every aspect of life. Technology is used to support the learning process for efficiency, motivate and enhance the learning experience even further (Ejaz & Anpalagan, 2019; Phakamach & Senarith, 2022). One of the technologies with high potential to be used in the classroom is the Internet of Things (IoT) technology.

IoT is the concept of connecting various electronic devices into the internet system This allows those devices to send and receive data, command work, and control each other's work. This technology has great potential to be applied to create smart and

interactive learning environments that can respond and adapt to the needs of individual learners (Qiao, 2020; Ghashim & Arshad, 2023).

Using IoT in the classroom will allow tracking and analyzing the learning behavior of students. Teachers can monitor and adjust the environment to suit learning, such as temperature, lighting, noise levels, and air quality in the classroom. IoT systems can also make recommendations and adjust content, activities, and teaching methods to suit abilities and learning styles of each student with a smart system that can interact with students closely. It will help create an interesting learning atmosphere, increase motivation and significantly raise the level of learning efficiency (Digital Government Development Agency, 2022)

In addition, IoT allows students to more conveniently access information and interact with lessons through various mobile devices, such as tablets and smartphones-- promoting blended learning between classroom and outside classroom. With these benefits, IoT helps raise the quality of education to modernity and effectively meet the needs of today's learners (Ejaz & Anpalagan, 2019). Although the application of IoT in the education sector is relatively new and presents challenges in many areas, including budget, technical, and security aspects, but such technology can offer options for educational reform in the digital age for a new and modern learning experience (Phakamach & Senarith, 2022). IoT responds to the needs of learners in the digital age and increases the educational competitiveness of the country by leaps and bounds.

In this paper, the author reports the IoT implementation in the classroom how it helps create intelligent and interactive learning environments that can respond to the needs of each student. The author will also discuss the key elements: (1) installing sensors and behavioral tracking devices to collect data, (2) processing data with cloud and artificial intelligence, (3) providing advice on how to optimize the environment, teaching process, and activities. and (4) creating interactions between teachers, students, and various devices through control and display devices. Emphasis will be on smart classrooms and IoT interactions monitored and optimized for the learning environment, but still with some limitations and challenges that deserve attention from teachers and school administrators concerned.

## 2. Definition of IoT and Its Application in the Education Sector

IoT is a system that consists of various devices and tools that can connect to the internet and exchange information with each other in the education sector Applications of IoT can take many forms, such as:

(1) Sensor equipment:

Sensors can be installed to measure classroom environments, such as temperature, humidity, air quality, noise levels, and adjust the environment to suit learning.

(2) Devices for tracking student behavior:

Video cameras and motion sensors are used to collect behavioral data level of intention and student interaction during teaching and learning.

(3) Interactive devices:

Smart screens tablets or smartphones can be connected to the IoT system to receive data from various sensors and send data back to control other devices.

## 3. Creating a Smart and Interactive Classroom with IoT

Creating an intelligent interactive classroom using Internet of Things (IoT) technology consists of the following key elements:

(1) Connecting IoT devices

- Install various sensor devices, such as sensors to measure temperature, humidity, air quality, and sound level in the classroom area.

- Install equipment for tracking student behavior, such as video cameras and motion sensors.

- Install interactive devices, such as smart displays, tablets, smartphones for displaying and receiving commands.

- Connect these IoT devices to the cloud and shared internet networks.

(2) Data collection and processing

- Data from sensors and behavioral tracking devices is continuously sent to the cloud

- Statistical and artificial intelligence techniques, such as machine learning are used to process and analyze the data.

- Analyze data to understand each student's environment, behavior, and problems.

(3) Giving advice and improvements

- The system will process information and provide recommendations for improvement and control as follows:

(i) Adjust the physical environment to be suitable for learning, such as controlling temperature, lighting, and air quality.

(ii) Adjust the teaching process, content, activities, and teaching methods to suit the abilities and learning styles of each student.

(iii) Provide advice to teachers and students to improve their weaknesses and develop their learning potential.

(4) Interaction

- Teachers and students can interact with the system through various devices, such as:

(i) View environmental information, instructions and other information on display.

(ii) Send commands to control other devices, such as adjusting the temperature and lighting levels.

(iii) Interact with the system through voice or other means.

(iv) Create a more lively and interesting learning atmosphere.

These processes will help create smart classrooms that can adapt to the situation. Teachers can track and analyze each student in detail as well as create interaction and learning motivation for students.

## 4. The Key Elements of Implementing IoT in the Classroom to Create an Intelligent Interactive Learning Environment

The key elements are as follows:

(1) Connecting IoT devices: Installing sensors and control devices in the classroom, and connecting them to the cloud and the internet.

(2) Data collection and analysis: Data from IoT devices is sent to the cloud and processed, using statistical algorithms and artificial intelligence.

(3) Providing suggestions and improvements: The system analyzes the data and sends suggestions to adjust the environment, teaching process and various activities as appropriate for each student.

(4) Interaction: Teachers and learners can interact with IoT devices through various displays or controls—in receiving information and sending orders.

**5. Benefits of Smart Interactive Classroom and IoT**

Applying Internet of Things (IoT) technology to create an intelligent interactive classroom has important benefits:

(1) Create an environment suitable for learning

- IoT systems can monitor and adjust the physical environment in the classroom, such as temperature, lighting, air quality, and noise levels, to a level appropriate for continuous learning.

- IoT systems help create a learning environment that is comfortable and conducive to student perception and memory.

(2) Track and analyze student behavior in detail

- Behavior tracking devices, such as video cameras, motion sensors can collect data on each student's behavior and level of learning intention.

- These data will be analyzed to understand the problems, strengths and weaknesses in students' learning style and the specific needs of individual learners.

(3) Adjust the teaching and learning process to suit individual differences

- From data analysis, the system provides recommendations for adjusting the teaching process, activities, and content to suit each student's abilities and learning style.

- The system helps learners receive learning according to their individual potential and needs, resulting in higher learning efficiency.

(4) Increase interaction and motivation for learning

- Teachers and students can interact with the IoT system through various devices, such as displays and tablets.

- Teachers and students can control and operate the equipment by themselves--making the learning environment livelier and more interesting for better learning motivation.

(5) Raise the quality and achievement of education

- Creating the right environment for individual teaching, and increasing students' motivation. This will result in learners progressing and achieving their learning goals as expected.

- Overall, smart interactive classrooms can effectively improve students' learning quality and achievement in education.

Therefore, applying IoT in the classroom is very useful in creating a new learning environment that meets the needs of today's learners. Promoting individual learning leads to good learning motivation and significantly raise educational achievement levels.

**Table 1:** Examples of Applications of Internet of Things (IoT) Technology for Intelligent Interactive Learning

| Devices/ IoT Technology | Description | Benefits for Learning |
|---|---|---|
| 1. Smart Monitor | Large display that can receive commands via touch or voice. | Display lesson content and multimedia in an interesting way. Increase interaction between students and lessons. |
| 2. Motion Sensor | Installed in various areas of the classroom. | Detect student movement, assess student interest and participation levels to adjust teaching methods appropriately. |
| 3. Closed-circuit Camera | A camera that can track movement and record video. | Analyze the learning behavior of students, such as their level of intention, problems encountered, etc. |
| 4. Tablet or Portable Computer. | Devices that students can connect to the IoT system. | In the classroom, students can access lesson content, do exercises, and interact with the lesson. |
| 5. Temperature and Lighting Control System | Control the temperature and lighting levels in the classroom through the IoT system. | Create an appropriate learning atmosphere. Help students concentrate and increases learning efficiency. |
| 6. Mobile Learning Application | Applications that connect to IoT systems in the classroom. | Allow students to access lesson content, do exercises, and receive additional guidance. through their mobile phones. |

Table 1 shows IoT Technology applied in the classroom can help create a learning environment that is modern, interesting, and more interactive among students. This will result in students being motivated to learn and feel positive toward the lesson content.

## 6. How to Apply IoT in the Classroom to Create an Intelligent Interactive Learning Environment

(1) Class attendance monitoring system: Install classroom entrance and exit sensors. Connect to the database system to record the entry and exit times of each student. Help track attendance statistics accurately.

(2) System for adjusting the environment within the classroom: Using sensors to measure temperature, humidity, air quality, controlling the air conditioning system and lighting to be appropriate for teaching and learning.

(3) Teaching assistance system: Use robots, display screens to facilitate teaching, such as displaying information, accompanying videos, or voice control.

(4) Apps for students: Develop apps for mobile phones and tablets so that students can interact, do exercises, and access information on the cloud to learn at any time.

(5) Learning behavior analysis system: Take data from various sensors, such as physical activity and concentration to analyze behavior in order to adjust teaching methods to suit individual learners.

## 7. Limitations and Challenges in Using IoT in the Classroom

Although IoT has many benefits, there are still some limitations and challenges that need to be considered, including:

(1) Initial investment cost: Installing IoT devices and data processing systems is rather expensive, especially in the beginning.

(2) Technical challenges: Collecting, integrating, and analyzing data from multiple devices can be complex and require skilled personnel.

(3) Security and Privacy Issues: Data leakage or use by unauthorized persons may bring about privacy issues.

(4) Technology Growth Rate: The continued development of IoT technology can quickly cause installed devices and systems to become outdated.

It is vitally important to recognize that technology when applied to education requires good planning, clear-cut performance objectives, corresponding lesson plans and learning activities, learners' feedback and relevant methods of assessment and evaluation for target performances (Santhuenkaew, 2023). Students' satisfaction and follow-ups on different learning stages must be realistically managed by teachers or assigned authorities (Chanprasert, 2021). Technology when applied in the classroom needs to fit in the types of subject matters, like sciences, mathematics, languages, arts, and social sciences (Visaltanachoti, 2022; Santhuenkaew, Jaikaew & Athikiat, 2024). As known among teachers, technology could help students in terms of their adjustment in learning paces and time for sharing and interaction with their peers. These could help justify the implementing methods for education-based technology in support of students' learning as an ultimate goal.

## 8. Conclusion

To the author of this paper, Internet of Things (IoT) technology has great potential to create intelligent and interactive learning environments. Implementing IoT devices in the classroom can help track and analyze student behavior as instant feedback to teachers. It is essential to adjust the physical environment and learning activities to suit individual learners as well as increase their motivation and interaction in the classroom. However, teachers should note some limitations and challenges when implementing IoT at the classroom level. Above all, IoT has arrived as an option worth adapting in support of our students' learning in the digital age.

## 9. The Author

Thanarak Santhuenkaew is a lecturer in the Faculty of Education Ramkhamhaeng University, Bangkok, Thailand. The author has his research interest in the areas of educational technology for guidance, counseling, and instruction, as well as current issues in technology-based learning management.

## 10. References

Chanprasert, K. (2021). Learners' satisfaction with online teaching and learning management in a physics course. *RICE Journal of Creative Entrepreneurship and Management, 2*(2), 56-68. doi 10.14456/rjcm.2021.29.

Digital Government Development Agency. (2022). Thai language manual for digital technology. (Online). https://www.dga.or.th/th/profile/7551, March 19, 2024.

Ejaz, W. & Anpalagan, A. (2019). Internet of things for smart cities. *Internet of Things for Next-Generation Smart Systems.* New York: Springer, 17-30. doi:10.1007/978-3-319-95037-2_2

Ghashim, I.A. & Arshad, M. (2023). Internet of Things (IoT)-based teaching and learning: Modern trends and open challenges. *Sustainability, 2023,* 15, 15656. (Online). https://doi.org/10.3390/su152115656, February 23, 2024.

Phakamach, P. & Senarith, P. (2022). The metaverse in education: The future of immersive teaching & learning. *RICE Journal of Creative Entrepreneurship and Management, 2022, 3*(2), 75-88. doi 10.14456/rjcm.2022.12

Qiao X. (2020). Integration model for multimedia education resource based on internet of things. *International Journal of Continuing Engineering Education and Life Long Learning, 2020, 31*(1) 17-35. (Online). https://doi.org/10.1504/IJCEELL.2021.111849, March 23, 2024.

Santhuenkaew, T. (2023). Guidelines for organizing computer science courses at the elementary level. *RICE Journal of Creative Entrepreneurship and Management, 2023, 4*(2), 78-88. doi 10.14456rjcm.2023.12

Santhuenkaew, T., Jaikaew, S. & Athikiat, K. (2024). Information technology for school guidance. *RICE Journal of Creative Entrepreneurship and Management, 2024, 5*(1), 78-88. doi:10.14456/rjcm.2024.6

Visaltanachoti, C. (2022). The use of algorithm system model in teaching English to Thai students. *RICE Journal of Creative Entrepreneurship and Management, 2022, 3*(1), 45-54. doi 10.14456rjcm.2022.5

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# The Market Value of Upcycled Home Decorative Furniture Products from Denim: A Case Study of Hiran Ruchi Subdistrict Community in Bangkok**

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**Abstract**

The problem of managing large waste, such as mattresses and sofas, is one of the major challenges in metropolitan areas, especially in Bangkok, where this type of waste is often disposed improperly and negatively impacts the environment. This research focuses on presenting a large-scale waste management approach through the upcycling process. One of the key materials explored in this research is denim, which is difficult to decompose but can be creatively reused. This research had three objectives: (1) To identify the initial problems regarding surplus materials in the community in Hiran Ruchi Subdistrict, Thon Buri District, Bangkok. (2) To develop a prototype of home decorative furniture products from denim through the upcycling process to create market value for the community. (3) To analyze the relationship between home decorative furniture products made from denim, and the upcycling process that creates market value for the community. The researchers collected data from 500 voluntary participants in the Hiran Ruchi community, using a survey questionnaire and a set of interview questions with IOC values greater than 0.6. The interviews with the participants focused on waste material problems in the community and selection of furniture for product development, and with professional experts on product design, production processes, and marketing. The results indicated the positive relationship between home decorative furniture products made from denim and the upcycling process that creates market value for the community. To the participants under study, the upcycling approach to product development not only addresses the identified waste problem but also taps on new markets for upcycled products with environmental sustainability value. It was also expected that upcycled products could help generate income for the community, aligning with the needs and value of modern consumers for environmental conservation and sustainability in product development.

***Keywords:*** *Market value, upcycling process, home decorative furniture products, denim, Hiran Ruchi Subdistrict Community in Bangkok*

[**] The full title of the research project: "The Development of Home Decorative Furniture Products from Denim Through an Upcycling Process to Create the Market Value of the Community in Hiran Ruchi Subdistrict, Thon Buri District, Bangkok"

## 1. Rationale of the Study

The problem of waste management and unsustainable use of resources is one of the major issues affecting the environment and human health. Handling large pieces of waste, such as mattresses and sofas, is often found to be disposed improperly in water bodies or sewers. In Bangkok, an average of 20 tons of this type of waste is collected every day, which is the main cause of flooding (Krungsri Research Center, 2022c).

One interesting example is denim, a material that is difficult to decompose and is one of the causes of pollution problems. Reusing denim or developing new products from these materials is an important approach to solving environmental problems. This concern was raised in the research of Suansri (2022) on the strategy of adding value of waste fabric products in rural communities. The study reported the use of waste fabrics to create higher-value products in rural communities. Somsri (2019) researched into product design from natural materials and upcycling in community handicrafts, and highlighted the use of natural materials and local waste products to develop handicraft products. Modernform (2023) has shifted to produce eco-friendly furniture in the 'BCG' style.

Quite a few previous studies have shown that most consumers value eco-friendly products and are willing to pay more for products that are designed and manufactured to be environmentally friendly (Pongsiri & Thongmak, 2020; Krungsri Research Center. (2022a, 2022b, 2022c, 2022d; Pattamasiri & Piyawong, 2023). Therefore, the researchers of the present study considered upcycling an approach that can add market value to community products, and therefore pursued a study on upcycled product development in Hiran Ruchi District, Thonburi District, Bangkok, aiming at increasing market value of a specific product selected by the community members.

## 2. Background of the Study

This section gives background in support of this research: (1) the product development theory, (2) home furnishings made from denim, (3) upcycling concept, (4) market value concept, and (5) circular economy concept.

### 2.1 The Product Development Theory

Ulrich & Eppinger (2012) pioneered the concept of product design and development. The product development process consists of six main steps—systematically linked procedures that create products effectively meeting market demands. The first step is *identifying opportunities*, which involves exploring the market by researching consumer needs and gaps. Once a business opportunity is found, the next step is *ideation*, where new product ideas are invented and designed to respond to the identified opportunities. The third step is *idea selection*, where the concepts created are evaluated based on factors, such as technical and marketing feasibility, as well as production costs. Once the best idea is selected, the process

moves to *the prototype development stage*, where a prototype is created to test practical applications and gather consumer feedback. Data from these tests are used to improve the product. If the prototype passes testing, it moves to *the product planning stage*, which focuses on production planning, marketing, and managing the necessary resources to meet production targets. Finally, *the product launch stage* introduces the product to the market through promotion and distribution, aiming to reach consumers and generate the desired sales.

The Product Development Theory (Ulrich & Eppinger, 2012) emphasizes that the product development process must go through stages of market research, design, prototype development, and improvements based on feedback from consumers and experts. Applying this concept to home furnishings made from upcycled waste denim helps align the furniture development process with market needs.

### 2.2 Home Furnishings Made from Denim

The concept of denim furniture is not identified as the work of a particular individual, but rather a concept developed from a combination of Sustainable Design and the process of upcycling, which has become widespread in recent decades. This concept focuses on using materials that are used or wasted in the clothing industry, such as denim, to design furniture that is unique and environmentally friendly. The idea of using denim in furniture design is part of using waste materials to create new value. It was developed from the upcycling process, which focuses on adding value to materials that have been discarded or used. This concept is promoted by the approach of sustainable product design. Many companies and designers have started using denim in their designs, particularly using denim from old clothes to make furniture. This is a concept that is constantly growing in the design industry and many famous designers and brands, such as Droog Design from the Netherlands Furniture made from waste materials, including denim, has been developed, while many brands in Europe and the United States have adopted denim in furniture with high aesthetics and functionality (PEFC Sustainable Furniture Research, 2022). The use of denim in the manufacture of furniture is considered to add value to the rest of the material.

### 2.3 Upcycling Concept

The process of upcycling is about adding value to waste materials, as opposed to recycling, which often reduces the value of materials. Upcycling theory which emphasizes the use of waste materials to improve it, can be applied to the development of furniture products. The upcycling concept focuses on replacing valueless materials with more valuable goods. This means taking waste materials or discarded materials to improve or develop them into products with higher value or benefits. It is officially stated that the inventor of this concept: the term "upcycling" was about waste management, indicating difference between recycling and upcycling. The concept of upcycling was promoted and expanded more broadly in a book called *Cradle to Cradle Remaking the Way We Make Things* by German designer Michael Braungart and American architect William McDonough in 2002. Upcycling in

designing products aimed to be environmentally friendly. It focuses on designing products that can be continuously reused in the circular economy.

Krungsri Research Center (2022d) emphasized that upcycling can create new sustainable products that can meet the needs of markets interested in environmental conservation. The sustainability design theory suggests that the use of eco-friendly or waste materials, such as denim, can make a difference and add value to a product (Crilly, Moultrie & Clarkson, 2004). In addition to that, furniture products made from sustainable materials are attractive to environmentally conscious consumers.

### 2.4 Market Value Concept

The concept of market value has been studied and developed by many economists and marketers (Qiao, Shi & Chen, 2022). The origin of this concept comes from the extensive theory of value in economics. Adam Smith's theory (1776), in particular, explained that the economic value of goods depends on the labor used in production. Additionally, Karl Marx (1876) also used the concept of labor value to explain it in terms of political economy. From the perspective of modern marketing and business, the concept of market value has been expanded by many scholars, including Philip Kotler (Kotler, 2016), one of the pioneers in marketing. Kotler described market value as the value that consumers perceive from products and services, based on factors, such as quality, value, satisfaction, and comparison with other products in the market. According to Kotler, market value is not determined solely by the cost of production but by consumers' perception of a product or service's value, which can be enhanced through marketing, communication, and branding. The market value of a product can be increased through emotional enrichment and brand differentiation. In economics, market value has also been discussed in David Ricardo's theory (Ricardo, 1817) of market and value, which focuses on supply and demand in determining the price of goods or services in the market. In conclusion, market value is related to the evaluation of goods' value from the consumer's perspective and its impact on market demand.

### 2.5 Circular Economy Concept

The Circular Economy is not invented by a single person, but is born from the development of ideas and theories from various fields. The concept was continuously developed during the 20th century with many contributors. But the person who played a key role in making this concept clear and gaining widespread attention was Walter R. Stahel (Stahel, 1976), one of the pioneers of the circular economy concept. Stahel proposed the idea in 1976 through a report to the European Commission that emphasizes the approach of extending the life of products through repairs, reuse and recycling to create a "loop economy" or circular economy. Stahel's concept aims to reduce waste and increase efficiency in resource use. Kenneth Boulding American economist who proposed the concept of "cyclical economy" in the writing of the story *The Economics of the Coming Spaceship Earth* (1966). It proposes that the world has limited resources, so it must be used and circulated sustainably to reduce

loss and impact on the environment. Boulding's concept is considered the cornerstone of the circular economy in the modern era. In the 21st century, the Ellen MacArthur Foundation (2013) as has brought the concept of the circular economy to international attention by presenting a clear circular economy conceptual framework and disseminating the approach to sustainable economic development through design, production and waste management This is in line with the concept of Bocken et al. (2016) that emphasizes the sustainable use of resources in the production cycle. To the researchers of the present study, developing furniture with a circular economy approach will help strengthen the economic value of the community and reduce the impact of waste on the environment.

### 3.4 Research Objectives

There were three research objectives:

(1) To identify the initial problems regarding surplus materials in the community in Hiran Ruchi Subdistrict, Thon Buri District, Bangkok.

(2) To develop a prototype of home decorative furniture products from denim through upcycling processes to create market value for the community.

(3) To analyze the relationship between home decorative furniture products made from denim and the upcycling processes that create market value for the community.

### 4.4 Research Scope

The research scope in terms of population and location, covers the development of home decorative furniture from denim using upcycling processes to enhance the market value for the community in Hiran Ruchi Subdistrict, Thon Buri District, Bangkok.

#### 4.4.1 Population

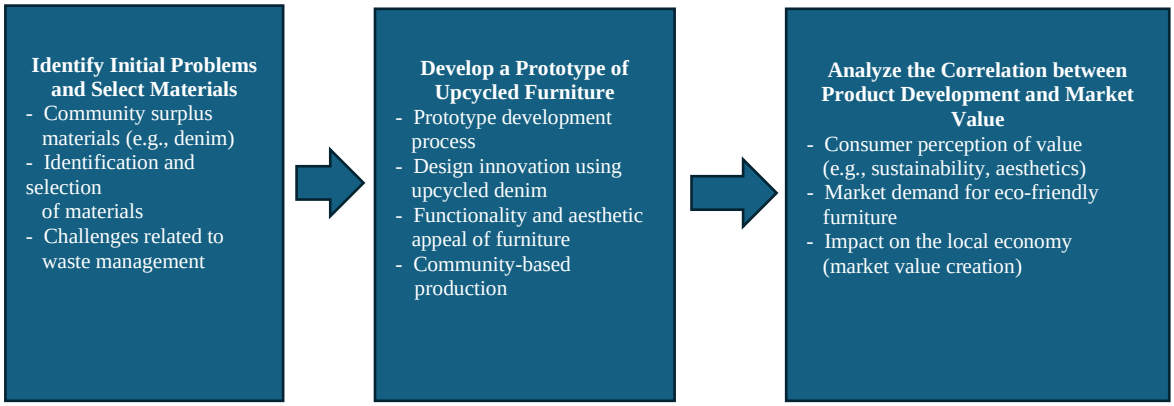
The Bangkok Metropolitan Administration's survey reports the population statistics by subdistrict in the 2022-2023 BMA's annual operational plan. Hiran Ruchi Subdistrict has approximately 10,788 residents with a population density of about 15,612.16 people per square kilometer. It is a densely populated and well-developed area; community entrepreneurs produce home decorative furniture from waste materials particularly denim. This group possesses knowledge about local product production and resources, including the use of discarded materials for product development. In this research, consumers in Bangkok are key target groups that show demand and product value perception toward the upcycling process—leading to market analysis and product value enhancement strategies.

#### 4.2 Location

The research aimed to explore and study local resources, the use of denim and community waste materials, and resource management for developing new products through the upcycling process. Given the issues related to waste and sustainable resource in use, Hiran Ruchi Subdistrict was chosen for its accumulation of waste and discarded furniture materials, which can potentially harm the community’s environment.

## 5.4 Research Conceptual Framework

**Figure 1:** Research Conceptual Framework




## 6.4 Research Methods

The research methods were in three stages:

### 6.1 Preliminary Survey according to Objective 1

The researchers investigated the initial problem of waste materials in the community, selected furniture to develop home decoration furniture products from denim by the upcycling process to create market value for the community under study. *Field observation* was done along with *interviews* with community residents, followed by a *focus group discussion* with stakeholders and furniture producers. The researchers looked for data on material types, volume, features, suitability for upcycling, and selection criteria (see Results in Table 1). The interviews on needed data were recorded and transcribed for three product-design experts to examine and consider the suitability analysis of interview items (Index Item of Congruent IOC with a value of 0.76). The researchers surveyed the problem of waste materials at various places in the community, such as houses, shops, or garment shops to collect information on the quantity and types of related waste materials, particularly old denim from the clothing industry, as well as furniture that can be developed into new products by upcycling**.**

### 6.2 Design and Development according to Objective 2

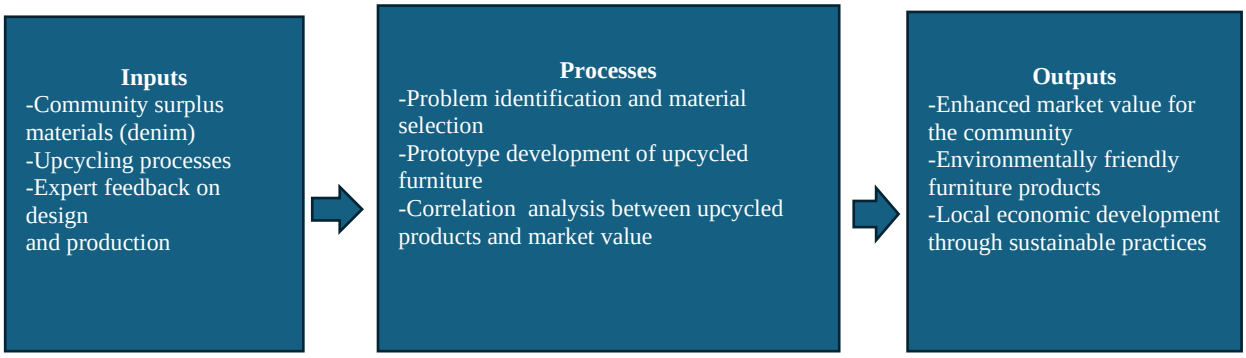
This stage was to develop a prototype product of denim home furnishings with the upcycling process to create market value for the community. The researchers provided three experts with the data obtained in the first stage to consider and recommend the design and development method of upcycled denim furniture products to create market value (see Advice and Method of Operation in Table 2). *The product design expert* advised on furniture design guidelines that meet the needs of the market, such as choosing the right denim fabric, shape design and functionality, as well as the aesthetic value of the product. *The manufacturing*

*expert* evaluated the production process, taking into account the cost-effectiveness of resource use, waste reduction and overall efficiency in the production of upcycled denim furniture for quality and reasonable production costs. *The marketing expert* analyzed target buyers and market trends to create a product release strategy and plan for promotion of denim furniture products in the right channels to achieve the highest market value.

### 6.3 Market Experiment and Satisfaction Assessment according to Objective 3

The researchers aimed at bringing the upcycled products developed into the target market both in the community and consumers in Bangkok by using various channels, such as product launch activities to offer the opportunity for interested buyers to try out the product while assessing consumers' acceptance and satisfaction. *The three product-design experts* gave feedback to the final version of the questionnaire on consumers' acceptance and satisfaction before it was distributed to the participants (Index Item of Congruent IOC with a value of 0.76). The participants were asked to respond to the items on product design, product quality, usability value for money, environmental impact, market value creation, and future expectations (see Results in Tables 3 and 4).

**Figure 2:** Three Stages of Research




## 7. Results of Data Analysis

This section reports the results of data analysis regarding (i) the preliminary survey on the community's waste materials, (ii) the experts' opinions, (iii) the prototypes of upcycled denim furniture development, (iv) the images of the participants' interview sessions, (v) the activities in upcycled product development, (vi) satisfaction assessment, (vii) the respondents' demographic variables, and (viii) the relationships of other variables via correlation analysis, all as shown in Tables 1-4 and Images 1-4.

**Table 1:** Results of Waste Material Survey

| Material Type | Volume (Unit) | Features | Suitability for Upcycling | Selection Criteria |
|---|---|---|---|---|
| Old Denim | 200 kilograms | Durable, suitable for sewing | Old denim from sewing shops and the local clothing industry. This material can be used to design home décor products, such as sofas or cushions. | The old jeans selected should remain in good condition. There are no too many tears or damages, as this will affect the strength of the new product to be developed. |
| Rag | 100 kilograms | It can be used as a decorative part. | Other waste materials, scraps from sewing clothes and old fabrics that are not in use. It can be used in the production process of home furnishings. | It should be a material that allows product design to be more diverse and creative. |
| Old Blankets | 30 pieces | Used as a furniture lining | | |
| Old Furniture | 50-60 pieces | Can be repaired or refined. | Waste old furniture that is discarded or not in use, such as sofas and chairs, per month, which can be improved through new designs with denim to add value to the product. | Old furniture should have a still strong structure. Although some may need repairs, such as replacing the upholstery or replacing the upholstery. It can be used for a long time. |

**Table 2:** Development of Prototype Denim Home Furnishing Products Using the Upcycling Process to Create Market Value for the Hiran Ruchi Community, Thonburi District

| Expert Type | Advice | Method of Operation |
|---|---|---|
| Product Design Expert | The product design expert recommended using denim in a way that emphasizes durability, combined with a design that meets the user's needs, particularly enhancing aesthetics and comfort to make the product more attractive and aligned with current market demands. | **Examples of products designed using denim and waste materials through the upcycling process are as follows**:<br>**Denim chairs** These chairs are upholstered with old denim fabric for the seat and chair covers. Durability and aesthetics are enhanced by embroidering patterns or adding details from multi-colored denim scraps. They are suitable for decorating homes in either vintage or modern styles.<br>**Denim coffee table** A table with a textured surface made from denim, cut into small pieces and arranged to create a specific pattern.<br>**Denim sofas** Small sofas upholstered with multi-colored denim or old jeans used as covers. They are ideal for those who love eco-friendly and creative home decor.<br>**Denim cushions** These cushions are made from denim scraps and decorated with embroidered or buttoned patterns. They add softness and beauty to sofas or beds. |

| Expert Type | Advice | Method of Operation |
|---|---|---|
| Manufacturing Expert | The manufacturing expert recommended to increase production efficiency by taking into account the reduction of waste from the use of waste materials, and to choose economically cost-effective production methods along with maintaining the quality of furniture, as well as the use of technology to increase the cost-effectiveness of the production process. | Production efficiency should be measured in a way that takes into account the reduction of waste from the use of waste materials and the selection of cost-effective production methods along with maintaining the quality of furniture. Reduced waste volume monitoring the amount of waste materials, such as denim scraps that are recycled or reduced compared to previous production. If the amount of waste decreases, this indicates an increase in resource efficiency and cost-effectiveness in the use of materials. The amount of used material can be reproduced into new products with minimal loss. Production efficiency is in terms of time spent in the production process. If the time required at each step can be reduced, it will help to speed up production. Reduce costs and increase productivity in terms of comparing production costs before and after renovation. If the cost is reduced while maintaining the quality of the furniture, it is possible to maintain the quality of the furniture. It shows that there is an increase in production efficiency. |
| Marketing Expert | The marketing expert recommended strategizing how to promote products effectively. The focus is on clearly defining the target audience while building a brand that promotes sustainability and environmental conservation to differentiate itself in the market and attract customers. | In terms of marketing, the target audience should be clearly defined: consumers who care about the environment and those who prefer unique or eco-friendly products that meet the needs of furniture from waste materials. Branding needs to emphasize sustainability values. Product promotion should focus on environmental protection. Reduce waste and use recycled materials to demonstrate social responsibility and make a difference in the market, in terms of using marketing strategies that create a sense of participation, such as organizing activities for customers to experience products or displaying artworks using waste materials. Running campaigns through social media and events will help customers feel more engaged with the brand. |

**Image 1:** Community Interview Process

**Image 2:** Prototype Production Process

**Image 3**: Home Decorative Furniture Products from Denim through the Upcycling Process

**Image 4**: Prototype Product Exhibition and Satisfaction Survey

As for the statistical analysis of the data obtained from 500 voluntary participants from the community under study, regarding (i) gender, (ii) age, (iii) occupation, and (iv) monthly income, the researchers found that for all variables, including gender, age, occupation, and monthly income, were complete responses from all participants, as follows:

- Gender: The majority of respondents were female, with 238 individuals, accounting for 47.6%, which makes this the largest group in the sample. The next largest group was male, with 207 individuals, representing 41.4%. The other category comprised 55 individuals, making up 11.0%.
- Age: The largest group was between 21-30 years old, accounting for 34.2% of the sample. The second-largest group was between 31-40 years old, representing 26.0%. The smallest group was those under 20 years old, with only 8.6%. Additionally, 68.8% of respondents were 40 years old or younger, while 32.0% were 41 years or older, with 14.0% of respondents at 51 years old or above.
- Occupation: The largest group of respondents were employees, accounting for 35.2%. The second-largest group was university students, representing 19.6%. The other category was 18.0%. The smallest group consisted of retired individuals, accounting for only 4.4%.
- Monthly Income in Baht: The largest group of respondents reported their monthly income within the range of 10,001-30,000, making up 38.2%. The second-largest group earned between 30,001-50,000, representing 22.4%. The smallest group consisted of those earning more than 70,000, accounting for 8.8% of the total respondents.

The average of *the gender variable* is ($\bar{X}$) = 1.70. This value indicates the distribution of respondents between males and females, with the average leaning slightly towards females. The standard deviation (S.D.) = 0.658 shows that the data is not widely spread from the mean. The average of *the age variable* is ($\bar{X}$) = 2.94, which shows that the majority of the sample falls in the mid-range age group. The standard deviation (S.D.) = 1.190 indicates a relatively large variation in age within the sample. The average of *the occupation variable* is ($\bar{X}$) = 2.98, which reflects a fairly even distribution of occupations among the sample. The standard deviation (S.D.) = 1.742 suggests a considerable spread in the types of occupations represented. The average of *the monthly income variable* is ($\bar{X}$) = 2.47, indicating that most respondents fall into a middle-income range. The standard deviation (S.D.) = 1.180 shows a moderate level of variation in income among the sample.

From the respondents' responses, it is clear that the variables are well-distributed, with no missing data. The analysis of means and standard deviations highlights that the sample group is diverse in terms of gender, age, occupation, and income. This data can be further utilized to study relationships between variables or to develop strategies in line with the research objectives.

**Table 3**: The Relationship between Home Decorative Furniture Products from Denim through the Upcycling Process to Create Market Value for the Hiran Ruchi Community

| | | **Product Design** | **Product Quality** | **Usability** | **Value for Money** | **Environmental Impact** | **Market Value Creation** | **Future Expectations** |
|---|---|---|---|---|---|---|---|---|
| **Product Design** | Pearson Correlation | 1 | **.118**** | -0.012 | .094* | 0.083 | -0.012 | -0.022 |
| | Sig. (2-tailed) | | 0.008 | 0.782 | 0.035 | 0.062 | 0.785 | 0.63 |
| **Product Quality** | Pearson Correlation | **.118**** | 1 | -0.008 | **.862**** | -0.009 | 0.067 | 0.016 |
| | Sig. (2-tailed) | 0.008 | | 0.852 | 0.001 | 0.85 | 0.134 | 0.728 |
| **Usability** | Pearson Correlation | -0.012 | -0.008 | 1 | 0.002 | -0.015 | **.544**** | -0.014 |
| | Sig. (2-tailed) | 0.782 | 0.852 | | 0.972 | 0.743 | 0.001 | 0.763 |
| **Value for Money** | Pearson Correlation | **.094*** | **.862**** | 0.002 | 1 | -0.052 | **.093*** | 0.044 |
| | Sig. (2-tailed) | 0.035 | 0.001 | 0.972 | | 0.247 | 0.037 | 0.324 |
| **Environmental Impact** | Pearson Correlation | 0.083 | -0.009 | -0.015 | -0.052 | 1 | 0.031 | 0.021 |
| | Sig. (2-tailed) | 0.062 | 0.85 | 0.743 | 0.247 | | 0.495 | 0.634 |
| **Market Value Creation** | Pearson Correlation | -0.012 | 0.067 | **.544**** | **.093*** | 0.031 | 1 | 0.08 |
| | Sig. (2-tailed) | 0.785 | 0.134 | 0.001 | 0.037 | 0.495 | | 0.073 |
| **Future Expectations** | Pearson Correlation | -0.022 | 0.016 | -0.014 | 0.044 | 0.021 | 0.08 | 1 |
| | Sig. (2-tailed) | 0.63 | 0.728 | 0.763 | 0.324 | 0.634 | 0.073 | |

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

**Table 4:** Pairwise Analysis of Variable Relationships for Home Decorative Furniture Products from Denim through Upcycling to Create Market Value for the Hiran Ruchi Community

| Pair of Variables | Correlation | Level of Correlation | p-value | Interpretation |
|---|---|---|---|---|
| Pair 1<br>Product Design and Product Quality | **.118**** | Low | 0.008 | The relationship between product design and product quality was low with a statistical significance level of 0.01. This indicated that a well-designed product tended to have a significant impact on product quality. |
| Pair 2<br>Product Design and Value for Money | .094* | High | 0.035 | The relationship between product design and value for money was high with a statistical significance level of 0.05. This suggested that a well-designed product had a strong association with customers' perception of value. |
| Pair 3<br>Product Quality and Value for Money | **.862**** | Very High | 0.001 | Product quality showed a very high correlation with value for money, with statistical significance at the 0.01 level. This indicated that product quality greatly influenced customers' perception of value. |
| Pair 4<br>Usability and Market Value Creation | **.544**** | Moderate | 0.001 | The usability had a moderate correlation with market value creation, with statistical significance at the 0.01 level. This meant that the ease of use of a product moderately influenced its market value. |
| Pair 5<br>Value for Money and Market Value Creation | **.093*** | High | 0.037 | Value for money was highly correlated with market value creation with a statistical significance level of 0.05. This indicated that customers' perception of value for money directly impacted the product's market value |

## 8. Discussion of Results

### 8.1 Correlation Result 1: Product Design and Product Quality

The correlation between Product Design and Product Quality was 0.118, indicating a very low correlation and statistically significant at the level of p-value = 0.008. Positive correlation indicates that the quality of the design and product improve together. It is a real relationship between the design and the quality of the product in meeting the needs of the market. When applied to denim products, a design that focuses on functionality (e.g., flexibility, durability) and aesthetics will result in a more attractive product. Decorations that create beauty will affect customers' satisfaction. It can set a higher selling price and subsequently build brand loyalty. It also makes the product more competitive in the market. These points correspond with the theory by Ulrich & Eppinger (2012) on the role of design in the product development process and the perception of quality from consumers. Good design can increase the value of the product and make the product stand out in the market, as emphasized by Kotler & Keller, 2016). Good design helps create awareness of product quality and a competitive advantage. Crilly et al. (2004) pointed out that design directly affects the quality assessment of consumers, especially in terms of aesthetics and suitability for use, which affects the perception of product quality. Noble & Kumar (2010) also discussed the

importance of product design in relation to consumer perception of quality in that products with consumer-conscious designs are more likely to be perceived as of higher quality.

### 8.2 Correlation Result 2: Product Design and Value for Money

The correlation between Product Design and Value for Money at 0.094 (p-value 0.035) indicates that good design plays an important role in making customers feel the worth price and the benefits the product offers. Customer Perceived Value refers to how customers feel that the products they purchase offer a return that is worth the price and the benefits they receive. Well-designed products often help create a positive image for the product, such as beauty, convenience, and functionality that meets customers' needs. These factors all contribute to the perception that the product is "valuable" to the customer. Thoughtful and detailed product design enhances the sense of value, especially when the design makes consumers feel that the product meets their everyday needs. The more a product's design aligns with customer demands, the higher the perceived value will be. This perceived value can influence purchasing decisions and long-term customer satisfaction. When customers perceive a product as valuable, they are more likely to repurchase it or recommend it to others, which helps grow the business. Multiple studies conducted between 2021 and 2024 highlight the importance of product design in influencing customer perceptions of value, particularly in terms of aesthetics and functionality that meet customer needs. For example, Xu et al. (2022) focused on cultural and creative product design, and asserted that designs emphasizing aesthetics and cultural relevance can significantly boost the perceived value of products. Similarly, Qiao et al. (2022) studied the relationship between perceived product value and brand value, highlighting that the perceived value from product design influences brand value through emotional connections and consumer commitment to the brand. This underscores the importance of design that caters to customer needs.

### 8.3 Correlation Result 3: Product Quality and Value for Money

The correlation between Product Quality and Value for Money has a very strong correlation at 0.862 and a statistical significance level of 0.01. This high correlation indicates that product quality directly and significantly impacts customer perceptions of value. In other words, when the quality of a product increases, the customer's perception of the product's value also increases accordingly. The meaning of this correlation is that when a product has good quality, whether in terms of design, production, or service, customers tend to feel that the product is valuable and appropriate for its price with a good return on investment. The quality of the product in terms of durability, reliability, and functionality that meets consumer needs directly influences the perceived value. Several studies confirm the correlation between product quality and perceived value. For example, Xu et al. (2022) highlighted that the aesthetics and quality of product design have a direct impact on customer perceptions of value, confirming that good design and high quality significantly enhance customers' sense of value. Foroudi (2023) identified product quality and design as key factors in creating competitive

advantages and increasing the market value of products, which clearly impacts customer perceptions of value. Tsiotsou (2016) studied perceived quality and value in the context of services, and confirmed that product and service quality strongly influence consumer perceptions of value and satisfaction.

### 8.4 Correlation Result 4: Product Usage and Market Value Creation

The correlation between Product Usage and Market Value Creation was 0.544 and the statistical significance at 0.01. This correlation was moderate, indicating that product usability impacts market value creation. In other words, when a product is convenient to use or has good functionality, its ability to increase market value improves significantly. This means that designing products to be user-friendly and suitable for consumers helps create greater market value. This point is consistent with research by the Krungsri Research Center (2022a, 2022b, 2022c, 2022d), which analyzed industry trends in Thailand, emphasizing product design that meets usability needs along with sustainability. For example, products made from recycled materials help increase market value and consumer demand. Pattamasiri & Piyawong (2023) researched into product development from local materials in Thai communities and found that user-friendly design and consumer experience significantly influence market value creation. Pongsiri & Thongmak (2020) also studied the relationship between product design and perceived value in the OTOP market [OTOP One Tambon/district, One Product], indicating that usability-focused design enhances market value and promotes the sustainability of OTOP businesses in Thailand.

### 8.5 Correlation Result 5: Value for Money and Market Value Creation

The correlation between Value for Money and Market Value Creation was 0.093 with the statistical significance at 0.05, indicating a slightly positive relationship. In other words, when consumers perceive a product as valuable, it leads to a certain increase in the market value of that product. Perceived value refers to the consumers' assessment of a product by comparing the price paid with the quality received. If consumers perceive a product as valuable, that product will be seen as a good choice in the market, potentially increasing its market value, as customer satisfaction may lead to recommendations.

It should be noted that the market value of a product does not depend solely on its quality, but also on how consumers perceive its value in relation to the price and benefits received. According to previous findings from related research over the past five years in Thailand, the perception of a product's value has a clear impact on market value creation. The research on Eco-friendly Furniture Growth in Thailand by Krungsri Research Center (2022a) reported that Thai consumers perceive the value of eco-friendly furniture, with consumers willing to pay 5-10% more if the furniture can reduce pollution and be environmentally friendly. This directly impacts the market value creation of these products. Similarly, PEFC Sustainable Furniture Research (2022) pointed out that sustainability certification in furniture plays a crucial role in building market value. Consumers' perception of certified sustainable

wood furniture holding more value allows manufacturers to set higher prices. Krungsri Research Center (2022b) highlighted that Thai consumers perceive the value of furniture made from eco-friendly materials. It also indicated that the expansion of green buildings in Thailand has significantly stimulated the growth of the eco-friendly furniture market. This point aligns with the DITP research on consumer preferences (Department of International Trade Promotion, 2022) in that the perception of value in eco-friendly furniture influences market growth. Consumers are seeking higher-quality, environmentally friendly products, leading to higher market value for furniture designed with environmental considerations.

As pointed out in earlier discussion on the findings corresponding with theorical concepts and practices in product design and development, consumers' behavior, and marketing management, the researchers of the present study felt confident of its contribution to the area of upcycled product development as pertinent to communities in Thailand and similar contexts in the ASEAN countries. The research stages of product design and development of upcycled denim furniture can serve as guidelines for furniture entrepreneurs to apply to their actual operations. The exemplified process shows how upcycled furniture investors can add market value to products that move along with the trend of environmental preservation and sustainability.

## 9. Conclusion

The study was on home furniture made from denim through the upcycling process to create market value for the community in Hiran Ruchi Subdistrict, Thonburi District, Bangkok. It began with a field survey to investigate initial problems related to waste materials in the community, selecting materials to develop home furniture products made from denim through the upcycling process. After the preliminary survey, the research team used the collected data to develop prototype home furniture products. Experts' advice and feedback were sought during the design process to ensure that the products met both aesthetic and functional requirements. Once the prototypes were developed, the research proceeded with an analysis of the relationship between upcycled denim furniture products and market value creation. This analysis helped the research team to understand the impact of product development on consumer perceptions of value and the potential for market expansion.

The results indicate the positive relationship between home decorative furniture products made from denim and the upcycling processes that create market value for the community. The participants under study voiced their opinion that the upcycling approach to furniture product development not only addresses the identified waste problem but also creates potential markets for upcycled products with environmental sustainability value. They felt optimistic about the community's capacity in meeting with the needs of modern consumers that value environmental conservation and sustainability in product development.

The researchers also found that the factors of *environmental impact* and *future expectations* do not have a statistically significant correlation. This could be explained by some possible factors, such as (i) The perceived value of the upcycling process in terms of

environmental impact may not influence future expectations; (ii) Consumers or the community may not view environmental preservation as the main factor influencing their future expectations for these furniture products; (iii) Future expectations regarding a product may focus on other factors, such as dur ability, value for money, or future market trends, rather than environmental impact. Consumers may not directly associate reducing environmental impact with the future potential of the product; (iv) Some consumers in the community may lack awareness of the environmental benefits of upcycling, resulting in a failure to see the connection between using eco-friendly furniture and creating future value; and (v) Future expectations may rely on other social factors not directly related to the environment. All these points are for entrepreneurs' consideration in planning and crafting marketing strategies that effectively enhance the value of the community's upcycled products.

## 10. Suggestions

Based on the research findings, the Hiran Ruchi community can use the obtained information to improve prototype products to align with the needs of consumers in the local market as well as using it as a model in developing new products that address sustainability and efficient resource use. The analyzed data on the correlation between *products* and *market value creation* can be used to plan marketing strategies focused on meeting the needs of target consumers, especially those who prioritize value and sustainability. Marketing communication strategies should highlight the unique features of denim furniture that is eco-friendly and the added value generated through sustainable production processes. The research findings can also be used to foster collaboration between the community and various organizations in developing new products that support the local economy. Efficient use of waste resources not only helps reduce waste but also creates jobs and sustainable income for community members.

## 11. Future Research

In-depth research should be conducted on the behaviors and motivations of environmentally conscious target groups to understand what drives their decisions to purchase eco-friendly furniture. This can help tailor marketing strategies to better meet the needs and expectations of different consumer groups.

As for the efficiency of the upcycling process, further research should examine its long-term environmental impact, not only in terms of waste reduction but also in the efficient use of resources and energy. Future research could focus on developing and integrating new technologies into the upcycling process to maximize production efficiency, or explore the use of other eco-friendly materials and production technologies that reduce energy consumption and minimize environmental impact.

Further research can be conducted on the economic and social impacts of using the upcycling process in furniture development. This could help determine how much job creation, income generation, and long-term support for the community's economy can be achieved.

Potential researchers could explore the opportunities to expand the market for upcycled furniture to international markets. They could focus on understanding the demand in countries

that prioritize sustainable products, as well as how to establish upcycled quality standards and marketing communication in an international context.

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## 13. References

Bocken, N. M. P., de Pauw, I., Bakker, C. & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering, 2016*,*33*(5), 308-320.

Crilly, N., Moultrie, J. & Clarkson, P. J. (2004). Seeing things consumer response to the visual domain in product design. *Design Studies, 2004, 25*(6), 547-577.

Department of International Trade Promotion (DITP). (2022). *DITP Research on Consumer Preferences: Sustainable Furniture Trends in Thai Consumer Markets.* Bangkok: Ministry of Commerce, Thailand.

Ellen MacArthur Foundation. (2013). *Towards the Circular Economy.* The Isle of Wight, UK: Ellen MacArthur Foundation.

Foroudi, P. (2023). Design and consumer behavior: How aesthetics influence product evaluation. *Journal of Consumer Behavior, 2023, 22*(2), 167-184.

Kotler, P. (2016). *Marketing Management*. Fifteenth edition. London: Pearson Education.

Kotler, P. & Keller, K. L. (2016). *Marketing Management*. Fifteenth edition. London: Pearson Education.

Krungsri Research Center. (2022a). Eco-friendly furniture growth in Thailand. *Market Trends and Consumer Behavior.* Bangkok: Krungsri Bank.

Krungsri Research Center. (2022b). *Market Insights into Green Furniture in Thailand.* Bangkok: Krungsri Bank.

Krungsri Research Center. (2022c). *Trends in Eco-Friendly Furniture in Thailand.* Bangkok: Krungsri Bank.

Krungsri Research Center. (2022d). *Upcycling and the Future of Sustainable Products in Thailand.* Bangkok: Krungsri Bank.

Marx, K. (1867). *Das Kapital Critique of Political Economy.* Hamburg: Verlag von Otto Meissner.

Modernform. (2023). *Eco-friendly furniture in the 'BCG' style.* (Online). Digital information. https://modernform.co.th, July 11, 2023.

Noble, C. H. & Kumar, M. (2010). Exploring the relationships among product design, consumer involvement, and product quality. *Journal of Product Innovation Management, 2010, 27*(6), 967-982.

Pattamasiri, K. & Piyawong, P. (2023). Local product development and market expansion in Thai communities. *Community Development Journal, 2023, 38*(2), 123-140.

Pongsiri, N. & Thongmak, M. (2020). Design and consumer perception in OTOP products. *Journal of Marketing Research, 2020, 57*(4), 355-370.

Programme for the Endorsement of Forest Certification (PEFC). (2022). *Sustainable Furniture Research: Sustainable Furniture and Consumer Preferences.* Geneva, Switzerland: PEFC International.

Qiao, Y., Shi, X. & Chen, J. (2022). Branding and product value creation through design. *Journal of Product and Brand Management, 2022, 31*(3), 252-267.

Ricardo, D. (1817). *On the Principles of Political Economy and Taxation.* Hachette, UK: John Murray Publishers.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations.* London: W. Strahan and T. Cadell Publisher.

Somsri, R. (2019). *Product Design from Natural Materials and Upcycling in Community Crafts.* Bangkok: Kasetsart University Press.

Stahel, W. R. (1976). *The Potential for Substituting Manpower for Energy Report to the European Commission.* Luxembourg: European Commission.

Suansri, N. (2022). *Strategies for Increasing the Value of Products from Textile Waste in Rural Communities.* Bangkok: Thammasat University Press.

Tsiotsou, R. H. (2016). The role of perceived product quality and overall satisfaction on purchase intentions. *Journal of Retailing and Consumer Services, 2016, 29,* 74-82.

Ulrich, K. T. & Eppinger, S. D. (2012). *Product Design and Development.* Fifth edition. New York: McGraw-Hill.

Xu, Y., Hong, P., & Zhang, J. (2022). Cultural creative product design and consumer perception A study of value creation. *International Journal of Market Research, 2022, 64*(1), 3-21.

*Sharing Professional Viewpoint*

# Rural Carbon Management: A Keystone for Climate Resilience and Economic Revitalization

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## 1. Opening

Rural carbon management is a keystone for climate resilience and economic revitalization. As the shadow of climate change looms ever larger, casting a stark light on our collective future, the quest for innovative and lasting solutions has never been more urgent. Within this critical search, rural carbon management stands out as a beacon of hope—a largely untapped reservoir of potential that not only offers a formidable shield against the advancing threats of climate change but also a pathway to economic rejuvenation and enduring resilience for rural communities. This strategy, ripe with promise, invites us to rethink our approach to environmental stewardship and rural development, presenting a unique opportunity to harmonize the health of our planet with the prosperity of its inhabitants.

## 2. Rural Carbon Management

Rural carbon management refers to practices aimed at reducing carbon emissions and enhancing carbon sequestration in rural settings (Tang & Luo, 2014). It encapsulates a blend of agricultural innovations, forestry management, and land use changes designed to capture atmospheric carbon. This strategy is pivotal, given that rural areas are both vulnerable to climate change and crucial for food security. Through practices, such as agroforestry, conservation agriculture, and peatland restoration, rural carbon management offers a pathway to sustain livelihoods while contributing to global climate goals.

The historical narrative of rural carbon management is punctuated with initiatives that demonstrate its potential to transform both landscapes and livelihoods. A more contemporary example, yet deeply impactful, is the case of Costa Rica's Payment for Ecosystem Services (PES) program initiated in the late 1990s (Farley & Costanza, 2010). This innovative approach aimed to address rampant deforestation and biodiversity loss by financially compensating landowners for maintaining their forests, which play a crucial role in carbon sequestration. The PES program facilitated a paradigm shift in how natural resources were valued and managed, leading to significant increases in forest cover, enhanced biodiversity, and the stabilization of ecosystems capable of sequestering large amounts of carbon dioxide from the atmosphere. This initiative not only underscored the

economic viability of conserving natural landscapes but also set a precedent for how rural carbon management can be integrated into national development strategies, contributing to Costa Rica's reputation as a leader in environmental sustainability (Allen et al., 2017). The recent commitment by the European Union to achieve carbon neutrality by 2050 underscores the role of rural carbon management. The EU's strategy includes significant investments in rural areas, focusing on sustainable agriculture, forest management, and bioenergy (Smith et al., 2001; Scarlat et al., 2015; Pe’er et al., 2020), which are integral to the bloc's broader climate ambitions.

## 3. The Analysis of Rural Carbon Management

The analysis of rural carbon management reveals significant challenges that obstruct its adoption and effectiveness, rooted in technological, financial, sociopolitical, and ecological factors. Technological barriers include the high costs and complexity of advanced equipment, exacerbated by inadequate infrastructure like limited internet access (Sharma et al., 2021). Financially, the substantial initial investments for sustainable practices and the slow realization of benefits hinder participation among smallholder farmers, with existing mechanisms like carbon credits often out of reach (Zeweld et al., 2017). Furthermore, a lack of knowledge and awareness about carbon management practices amongst rural communities, coupled with fragmented and misaligned policies, further complicates implementation. Ecological diversity demands tailored strategies, adding another layer of complexity (Saikanth et al., 2023). Overcoming these obstacles to tap into the strategy's full potential for climate resilience and economic revitalization requires integrated efforts from all sectors of society. Challenges in the commercialization of biomass in Malaysia, categorized into technical, financial, social awareness barriers, and misunderstanding and gaps between stakeholders, provide insight into similar challenges faced in rural carbon management globally (Mansor et al., 2018). The recognition of these barriers and recommendations for overcoming them, including technology innovation, logistics management, and policy and enforcement, can be applied to enhance the adoption of rural carbon management practices. Efforts should be made to address these barriers comprehensively, incorporating technological innovation, financial support mechanisms, enhanced knowledge dissemination, and policy alignment to facilitate the broader implementation of rural carbon management strategies for sustainable development and climate resilience.

## 4. Potential Solutions

As we pivot from understanding the intricate barriers to exploring potential solutions, it becomes evident that bridging the gap between current challenges and effective strategies in rural carbon management necessitates not just innovative thinking but also a collaborative effort that spans global, national, and local levels. This transition highlights

the critical role of policy frameworks, financial mechanisms, and community engagement in converting the theoretical potential of rural carbon management into tangible environmental and economic benefits. Existing solutions, including the United Nations' REDD+ initiative and various national agricultural subsidy programs, have been pivotal in aiming to incentivize carbon-positive practices in rural landscapes. These programs are designed to support reforestation, sustainable agriculture, and conservation efforts that contribute directly to carbon sequestration and the reduction of greenhouse gas emissions. The REDD+ initiative, in particular, has played a significant role in providing financial compensations to countries and communities that are able to reduce emissions from deforestation and forest degradation, fostering a direct link between carbon management and economic incentives (Schweikart et al., 2022).

To effectively harness the benefits of rural carbon management, a multifaceted approach is required that addresses the unique challenges faced by rural communities. This approach involves crafting strategies that are finely attuned to the specific ecological and socio-economic contexts of these communities, ensuring that interventions are not only relevant but also substantially beneficial. Key to this is enhancing access to financial resources, such as microcredits and carbon credit markets, which are vital for motivating the widespread adoption of sustainable carbon management practices (Bai et al., 2022). Additionally, there's a pressing need to invest in capacity building and education tailored for rural communities. This investment should focus on imparting knowledge about sustainable practices, technology use, and how to effectively engage with markets, thereby empowering these communities to actively participate in and benefit from carbon management efforts (Li et al., 2021). Furthermore, advocating for the integration of coherent policies that recognize and support rural carbon management within national and international climate strategies is crucial. Such policies should aim to bridge the gap between large-scale environmental goals and the ground-level contributions of rural areas, ensuring that the latter are adequately supported and acknowledged in the broader fight against climate change.

The creation and dissemination of financial innovations and services, including carbon finance, offer promising pathways to leverage investments in sustainable and low-carbon projects in rural areas, thus aligning financial sector initiatives with climate resilience and sustainable development goals (Brahmi et al., 2023). Collectively, these solutions represent a comprehensive pathway toward leveraging rural carbon management for environmental sustainability and the socio-economic upliftment of rural communities. Enhanced participation in carbon markets, coupled with targeted financial and educational support, can unlock the potential of rural communities to contribute significantly to climate change mitigation and adaptation efforts, thereby achieving sustainable development and improved livelihoods.

## 5. Closing

As the global community grapples with the imperatives of climate action and sustainable development, the role of rural carbon management becomes increasingly indispensable. This strategy not only offers a means to combat climate change but also a vehicle for rural revitalization, blending ecological sustainability with economic resilience. The question moving forward is how we can collectively harness and amplify the potential of rural areas in the climate narrative, transforming challenges into opportunities for growth and resilience. The future of rural carbon management is not just about carbon—it's about reimagining rural landscapes as thriving, resilient communities at the forefront of the global climate solution.

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## 7. References

Allen, K. & Vásquez, S. (2017). Forest cover, development, and sustainability in Costa Rica: Can one policy fit all? *Land Use Policy, 2017, 67,* 212-221.

Bai, R. & Lin, B. (2022). Access to credit and green innovation. *Journal of Global Information Management (JGIM), 2022, 30*(1), 1-21.

Brahmi, M., Esposito, L., Parziale, A., Dhayal, K., Agrawal, S., Giri, A. & Loan, N. (2023). The role of greener innovations in promoting financial inclusion to achieve carbon neutrality: An integrative review. *Economies, 2023, 11*(7), 194.

Farley, J. & Costanza, R. (2010). Payments for ecosystem services: From local to global. *Ecological Economics, 2010, 69,* 2060-2068.

Li, F., Xu, X., Li, Z., Du, P. & Ye, J. (2021). Can low-carbon technological innovation truly improve enterprise performance? The case of Chinese manufacturing companies. *Journal of Cleaner Production, 2021, 293,* 125949.

Mansor, A., Theo, W., Lim, J., Ani, F., Hashim, H. & Ho, W. (2018). Potential commercialisation of biocoke production in Malaysia—A best evidence review. *Renewable and Sustainable Energy Reviews, 2018, 90,* 636-649.

Pe'er, G., Bonn, A., Bruelheide, H., Dieker, P., Eisenhauer, N., Feindt, P., Hagedorn, G., Hansjürgens, B., Herzon, I., Lomba, Â., Marquard, E., Moreira, F., Nitsch, H., Oppermann, R., Perino, A., Röder, N., Schleyer, C., Schindler, S., Wolf, C., Zinngrebe, Y. & Lakner, S. (2020). Action needed for the EU Common Agricultural Policy to address sustainability challenges. *People and Nature (Hoboken, N.J.), 2020, 2*, 305-316.

Saikanth, D. R. K., Kishore, A. J., Sadineni, T., Singh, V., Upadhyay, L., Kumar, S. & Panigrahi, C. K. (2023). A review on exploring carbon farming as a strategy to mitigate greenhouse gas emissions. *International Journal of Plant & Soil Science,2023, 35*(23), 380-388.

Scarlat, N., Dallemand, J., Monforti-Ferrario, F. & Nita, V. (2015). The role of biomass and bioenergy in a future bioeconomy: Policies and facts. *Environmental Development, 2015, 15,* 3-34.

Schweikart, M., Mertz, O. & Müller, D. (2022). Adaptive approaches to REDD+ are needed for countries with high forest cover and low deforestation rates. *Environmental Research Letters, 2022, 17*(11), 114011.

Sharma, M., Kaushal, R., Kaushik, P. & Ramakrishna, S. (2021). Carbon farming: Prospects and challenges. *Sustainability, 2021, 13*(19), 11122.

Smith, P., Goulding, K., Smith, K., Powlson, D., Smith, J., Falloon, P. & Coleman, K. (2001). Enhancing the carbon sink in European agricultural soils: Including trace gas fluxes in estimates of carbon mitigation potential. *Nutrient Cycling in Agroecosystems, 2001, 60*, 237-252.

Tang, Q. & Luo, L. (2014). Carbon management systems and carbon mitigation. *Australian Accounting Review, 2014, 24,* 84-98.

Zeweld, W., Huylenbroeck, G., Tesfay, G. & Speelman, S. (2017). Smallholder farmers' behavioural intentions towards sustainable agricultural practices. *Journal of Environmental Management, 2017, 187*, 71-81.

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# *RJCM* Publication Policy

## 1. Policy

*RICE Journal of Creative Entrepreneurship and Management (RJCM)* has its focus on original contributions on research work or academic issues in the areas of creative entrepreneurship and management as practiced by academics or scholars in their fields of specializations in social sciences. It is a double-blind peer-reviewed journal and each volume is published online-plus-print thrice a year: No.1 in April, No.2 in August and No 3 in December. Original research articles, academic papers and brief professional viewpoints for sharing will be included in this journal. The details and views expressed in the published papers are entirely the responsibility of those authors.

## 2. Submission of Manuscripts

Authors should submit a non-formatted WORD file of their manuscript in single spacing (see Section 3: For Authors below) to Editor-in-Chief 2 Ruja Pholsward <rujajinda@gmail.com>.

- The Office of the Editors-in-Chief is at Science and Technology Building, Floor 4, Rattanakosin International College of Creative Entrepreneurship, Rajamangala University of Technology Rattanakosin, Thanon Putthamonthon Sai 5, Salaya, Nakhon Pathom 73170, Thailand.

- Telephone number (office): +66 2441 6000 ext 2790
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  Website: https://ricejournal.rmutr.ac.th

- There will be no publication fee for both the online-plus-print versions for papers printed in *RICE Journal of Creative Entrepreneurship and Management (RJCM)* Volumes 1-4.

- Publication Fee and Payments are effective from Volume 5 onward.
  RICE, RMUTR Announcement on Publication Fees (Document dated 5.04.23)
  * General authors: 6,000 baht
  * RICE/RMUTR staff members: As specified in the Document dated 5.04.23.
  * Bank transfer to Krungthai Bank, Account number 459-0-58498-0 after the editor-in-chief's initial feedback to the author.
  *The author please send a copy of the transfer slip to the editor-in-chief so that the review stage can proceed.
  * Please address your inquiries to the editor-in-chief (rujajinda@gmail.com, Tel +66 81 436 1303).

- The latest date for submission of the first draft of the manuscript to be published in *RJCM* each year: (1) Number 1 in February, (2) Number 2 in June, and (3) Number 3 in October.

## 3. For Authors

### Arrangement and Style of Manuscript

#### 3.1 Paper and Page Setup:

Paper size: Standard A4

| | |
|---|---|
| Top margin: 1 inch | Bottom margin: 1 inch |
| Left margin: 1.25 inches | Right margin: 1 inch |
| Header: 0.5 inch | Footer: 0.5 inch |

**3.2 Manuscripts of Original Articles**, for both print and online versions, should be submitted in a WORD file of the A4-sized paper, using the Times New Roman (12-point font). Symbols used should be of a similar size and typed on the corresponding lines of text used in each section. Manuscripts of the original article should contain the following sections: title, author's name, author's workplace, abstract and keywords, the main text/ body text, acknowledgements, references, tables, figures, captions/legends and illustrations. Each page should be clearly numbered in the bottom center of each sheet. Authors should carefully edit and proofread their manuscripts before submission.

**3.2.1 The Title:** The **title of the article** must not exceed 2 lines. A title itself has to be informative and indicates the main topic in the article. The title should be set in the center of the page, using upper and lower case letters of Times New Roman 12 points and printed bold. If there is any symbol, its size must be the same as the text in that line.

**3.2.2 Author's Name:** The author's name and last name are in Times New Roman 11 points in upper and lower case letters in the center of the page below the title of the article. In the case of multi-authorship, identify each author by superscript numbers at the end of the author's last name.

**3.2.3 Author's Workplace:** The workplace (address of the institution) of the author and/or the group of the authors, are in regular Times New Roman 10 points in upper and lower case letters in the center of the page. In case of multi-authorship, please superscript numbers in front of the entire author's name. The e-mail address and telephone number of the corresponding author should also be included here.

**3.2.4 Abstract and Keywords:** The abstract and key words are in Times New Roman 11 points. They must be single-spaced under the author's workplace and separated from the bottom line of the author's workplace.

**3.2.4.1 Abstract** should be informative and state what was done, obtained and concluded. It should be accurate, self-contained, concise and specific, coherent and readable, and reflect only what appears in the original paper. An abstract should contain the following basic components: (1) purpose/motivation/problem statement, (2) methods/design/procedure/approach, (3) results/findings/products, (4) conclusion/applications/research limitations/implications (if applicable), practical implications (if applicable), pedagogic or social implications (if applicable), and (5) originality/value. The length of the abstract should be about 150 words and not exceed 200 words. Type the word "**Abstract**," using Times New Roman 11 points and print bold, left-hand justified. The abstract should be written in one single-spaced paragraph under the heading.

**3.2.4.2 Keywords:** Type the word "Keywords," using Times New Roman 11 points and in italics, left-hand justified, separated by a colon (:) followed by keywords written in English not over five words, and separate words by a comma (,).

**3.2.5 The Main Text:** The main text of the manuscript must be typed in WORD using Times New Roman 12 points, under an abstract and keywords with single-spaced line and separated from the above section. The main text of your paper should be divided into eight sections (see below), each with a separate heading. Headings are in bold letters, left-hand justified in the column. The first line of each paragraph should indent 0.5 inch from the left margin (of the page/of the right-hand column). Scientific names are normally shown in italics, and symbols must be the same size as the text in that line. The body of the text includes: (1) Introduction, (2) Research Objectives, (3) Research Methodology, (4) Results and Discussion, (5) Conclusion, (6) Acknowledgement, (7) The Author, and (8) References.

**3.2.6 In-text Citations:** Authors are to give references to all the information obtained from books, papers in journals, websites, or other sources. The Author-Date System should be used to cite references within the paper by using the author's last name and date (year), separated by a comma in parentheses; for example, name(s), year.

**3.2.7 Tables and Figures:**

**3.2.7.1 Tables:** The large-sized table format should not be split into two columns but small-sized table can be fit into the column. Each table must be titled, numbered consecutively and complete with heading (title with a description that goes above the table). The word "**Tables**," including number should be typed using Times New Roman 11 points and bold, left-hand justified, and follow by regular 11 points Times New Roman for the heading.

**3.2.7.2 Figures**: Line-drawn graph or Figure (in black) is accepted. Also, in the case of photographs, glossy photographic prints, 3.5 x 5.0-inchs, should be submitted concurrently. Similar to tables, large-sized figure format should not be split into two columns but small-sized figure can be fit into the column. Each figure must be numbered consecutively and complete with caption under the figure. The word "**Figure**," including number should be typed using Times New Roman 11 points and bold, left-hand justified, and followed by regular 11 points Times New Roman for the caption.

**3.2.8 Symbols and Units:** Every used symbol must be defined in the text and written in the simplest possible way.

**3.2.9 Numbering Pages:** Manuscript pages must be consecutively numbered throughout the paper except the first page in the bottom center of the page, using bold Times New Roman 12 points.

**3.2.10 Reference Lists:** The final page contains a list of resources cited in the paper. The style of citations used in RJCM should conform to the American Psychological Association (APA). It is the author's responsibility to ensure the accuracy of all references cited in the paper. References should be listed in alphabetical order using regular Times New Roman 11 points.

**3.3 Guideline to References**

**Abstract**

**Format:**

Author.//(Year of publication).//Title of Abstract (abstract).//*Journal Title,/Year,/ Volume(*Number),/Page numbers.

**Example:**

Osti, L. & Cicero, L. (2018). Tourists' perception of landscape attributes in rural tourism (abstract). *Worldwide Hospitality and Tourism Themes, 2018, 10*(2), 211.

**Books**
**Format:**
Author.//(Year of publication).//*Title*.//Edition (if any).//Place of publication://Publisher.
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Wallace, M. & Wray, A. (2016). *Critical Reading and Writing for Postgraduates.* Third edition. Thousand Oaks, California: Sage Publications Inc.

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Hickman, G. R. (2010). Concepts of leadership in organizational change. In Preedy, M., Bennett, N. & Wise, C. (Eds). (2012). *Educational Leadership: Context, Strategy and Collaboration.* Thousand Oaks, CA: SAGE Publications Inc., 67-82.

**Conference and Seminar Proceedings**
**Format:**
Author.//(Year of publication).//Article title.//*Name of Conference,/Conference date.*//Place of publication (if any)://Publisher (if any).

**Example:**
Jareonsubphayanont, N. (2014). The international student policy in Thailand and its implication on the 2015 ASEAN Economic Community. *Southeast Asian Studies in Asia from Multidisciplinary Perspective International Conference, March 2014*, Kunming, China.

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**Format:**
Author.//(Year of publication).//Title of Dissertation or Thesis.//Type of Thesis.//Awarding Institution.
**Example:**
Ua-umakul, A. (2017). The Effects of the Counseling-Based Method on Physics Learning Achievements of Upper Secondary School Students: An Area Focus on Momentum. A Dissertation for the Degree of Doctor of Education in Educational Studies. The Graduate School, Rangsit University.

**Editorial**
**Format:**
Author.//(Year of publication).//Title of Editorial (editorial).//*Journal Title,/Year,/Volume (if any*)(Number),/Page numbers.
**Example:**
Fisher, R. I. (2003). Immunotherapy in Non-Hodgkin's lymphoma: Treatment advances (editorial). *Semin Oncol 30, 2003,* (2Suppl 4), 1-2.

**Journal Articles**
**Format:**
Author.//(Year of publication).//Article title.//*Journal Title,/Year,/Volume*(Number),/Page numbers.//Doi number (if any).

**Example:**
Srichandum, S. & Rujirayanyong, T. (2010). Production scheduling for dispatching ready mixed concrete trucks using bee colony optimization. *American Journal of Engineering and Applied Sciences, 2010, 3*(1), 823-830.

Trongratsameethong, A. & Woodtikarn, P. (2019). Thai QBE for ad hoc query. *Journal of Technology and Innovation in Tertiary Education, 2019, 2*(2), 1-24. doi 10.14456/jti.2019.7

**Letter**
**Format:**
Author.//(Year of publication).//Title of Letter (letter).//*Journal Title,/Year,/Volume (if any),*/Page numbers.
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**Unpublished/In Press Article**
**Format:**
Author.//(In press year).//Article title.//*Journal Title.//*(in press).
**Example:**
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**Websites**
**Format:**
Author.//(Year of publication).//Title.//(Online).//the full address of the web page,/ accessed date.
**Example:**
Charlotte, B. (2016). Quotes about Action Learning. (Online). http://www.goodreads.com/quotes/tag/action-learning, January 18, 2017.

### 3.4 Manuscripts of Brief Professional Viewpoints for Sharing

The length of Brief Professional Viewpoints for Sharing is about 8-10 typed A4 pages. Its content should be arranged as follows: **title**, **name of the author, name and address of the institution**, **3-5 keywords**, **body text**, **the author's biography** of 50-80 words, and **references**. The format, font, and font size used in each section correspond to those in the section of **3.2. Manuscripts of Original Article**.

### 3.5 Reprints

During the years of publication (2020-present), authors will receive one free print copy of the journal.

## *RJCM* Publication Ethics

*RICE Journal of Creative Entrepreneurship and Management (RJCM)* has policies on publication ethics after the guidelines given by Committee on Publication Ethics (COPE) <https://publication ethics.org>. Publication ethics policies mainly involve duties of (1) Authors, (2) Editors, and (3) Reviewers.

**Authors:**

Authors or paper contributors shall not submit simultaneous or duplicate manuscripts. It is imperative that authors submit work of original investigation and acknowledge concepts, research methodology and findings of preceding authors or researchers by giving proper references. If required, authors need to seek permission for the use of specific data or adaptation of research methodology as well as provide evidence on approval of professional ethics in the selected field of study. Plagiarism of all kinds is unacceptable and will result in paper rejection and permanent dismissal by *RJCM*. Authors shall be solely and fully liable for all viewpoints and research components used in published papers.

*If required,* under the guidelines given by the institutional/ national board of research ethics on the use of human subjects in social science research, authors are responsible for complying with the established criteria as well as securing a certified approval from the board for the purpose of protecting the human subjects in the study regarding their rights, security, health, privacy and confidentiality.

**Editors:**

The editors are to ensure transparency in the publication policies, communication with corresponding authors regarding submission, response on paper acceptance/ rejection, and notification of double-blinded review results for paper revision. In particular, the editors shall not consider multiple submission or redundant publication. The editors shall provide information on the *RJCM* website on ownership, editorial board, publication policies, publication schedule, data access and sharing, pre- and post-publication contacts—ranging from inquiries from paper contributors, correspondence, requests for clarification, comments for paper revision, to complaints or appeals, if any. The editors reserve the right not to deal with allegations of research misconduct from any party concerned under the condition that concrete evidence is found for the act of malpractice.

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Reviewers are in the double-blinded peer review process in evaluating submitted papers on the basis of criteria established by the editorial team. Reviewers shall remain anonymous to the authors whose papers are under review. It is imperative that reviewers' decision on paper revision or rejection be justified by constructive comments or suggestions, as guided by professional ethics in selecting scholarly work for publication. Given comments must be written in an objective and professional manner without sarcasm or severe criticism. Reviewers shall keep their reviews strictly confidential in all circumstances.

It is required that reviewers have no known competing financial interests or personal relationships that could have appeared to influence the work reported in the reviewed paper.

# *RJCM* Research Ethics

## Research Ethics on the Use of Human Subjects in Social Sciences

Thailand's Institutional/ National Board of Research Ethics on the Use of Human Subjects in Social Sciences requires as compulsory that researchers comply with the established criteria as well as secure a certified approval from the Board for the purpose of protecting the human subjects in the study from risks affecting their rights, security, health, privacy and confidentiality.

The Board specifies research that imposes *three levels of risks* on the human subjects under study: (1) nil or very low, (2) low, and (2) higher than low, and instructs researchers to obtain a certified approval from the Board's classified reviews:

(1) Exemption Review is for the research project that uses unidentifiable data that impose *nil or very low risks* to the human subjects under study. Researchers can request an exemption review approval from the Board.

(2) Expedited Review is for the research project that uses data that impose *low risks* to the human subjects under study. Researchers can obtain an expedited review approval from the Board via the consideration and recommendation of two Board members and an endorsement from the Board Chairperson.

(3) Full Board Review is for the research project that uses data that impose *higher than low risks* to the human subjects under study. Researchers can obtain a full review approval from the Board via the consideration and recommendation of two Board members (specialists in the area under study) and a representative from the public or community concerned, followed by an endorsement from the full Board.

## *RJCM* Call for Papers

*RICE Journal of Creative Entrepreneurship and Management (RJCM)* is an international journal for academics and scholars at the higher education level to communicate and share their viewpoints and academic work with fellow professionals in the areas of creative entrepreneurship and management as practiced in their fields of specializations in social sciences. Currently, it is classified as Tier 2 in Thai-Journal Citation Index (TCI).

*RJCM* publishes three numbers per volume annually and welcomes contributors to submit their manuscript in January, May, and September of each year. We accept both academic and research papers in social sciences from contributors. The papers are double-blind three-peer-reviewed in each volume and published online-plus-print thrice a year.

The length of the unformatted manuscript in WORD can be 15-25 pages in length including references. The contents of the manuscript should include (1) a title with the author's name, affiliate, email address and telephone contact, (2) an abstract of 150 words with 3-5 keywords, (3) an introduction, (4) a rationale and background of the study, (5) research objectives, (6) research methodology, (7) data collection procedure, (8) data analysis, (9) results and discussion, (10) research limitation (if any), (11) conclusion, (12) acknowledgement(s) (if any), (13) the author's biography of about 50-80 words, (14) references, and (15) an appendix or appendices (if any).

All interested readers and paper contributors please contact Editor-in-Chief: Ruja Pholsward, Ph.D., Associate Professor, Rattanakosin International College of Creative Entrepreneurship (RICE), Rajamangala University of Technology Rattanakosin (RMUTR) <rujajinda@gmail.com>, <ruja.pho@rmutr.ac.th>. Please check *RJCM* Publication Policy as guidelines to paper submission.

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