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Editorial Note

RMUTT Global Business Accounting and Finance Review (GBAFR) is an academic journal prepared by Graduate Studies (Ph.D. Program), Faculty of Business Administration, Rajamangala University of Technology Thanyaburi (RMUTT). The GBAFR journal aims to disseminate good academic outputs related to business administration, accounting, and finance aspects of individuals from both within and outside the university. It is an intermediate for exchanging academic views as well as a source for promoting and developing research competency of faculty staffs, academicians, researchers, students, and any persons in terms of business administration, accounting, and finance fields.

This journal published five research and academic papers, and one book review. In addition, each of the research and academic articles presented such interesting concepts, for employees' motivation, customer's satisfaction, financial planning for retirement, sustainability reporting and competitive advantage strategy, leading to creating new knowledge to the reader. Therefore, this journal is a channel disseminating the knowledge of business administration, accounting, and finance which related persons could apply it for further benefits.

Lastly, the editorial department and editorial board would like to considerably thank you for supporting and pushing forward this journal to occur and well accomplish. We are hopeful of your good cooperation and continuing support in the future.

Sukontip Wongpun, Ph.D.
Editor-in-Chief

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LEVERAGING SMART FARMERS' INCOME THROUGH MARKETING MANAGEMENT OF SAFE VEGETABLES IN NAKHON PATHOM PROVINCE

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Abstract

The objective of this research was to study smart farmers' income through marketing management of safe vegetables in Nakhon Pathom Province. The data was collected from 3 operators and 750 customers who bought safe vegetables via an electronic commerce system. The research results revealed that: 1) The decision made to buy the safe vegetable through multi-channel marketing stems from the combined influence between the e-marketing mix and technology adoption with statistical significance. 2) In order to deliver to consumers in a timely manner, a safe vegetable delivery system and standardized packaging for safe vegetable delivery should focus on maintaining freshness, cleanliness, and product quality. 3) The development of a safe vegetable traceability system among smart farmers in Nakhon Pathom Province must focus on making QR code to provide complete information at every step from upstream to downstream of the cultivation process, maintenance, and harvesting, ready to deliver to consumers. 4) Online marketing channels will reduce the number of middlemen while increasing the value of safe products. For offline marketing, farmers sell products in the market by themselves. The emphasis should be placed in the form of contract farming. Furthermore, 5) the proactive marketing media public relations strategy for safe vegetables in Nakhon Pathom Province should focus on the creation of brand communication on the safe vegetables to be recognized, remembered, and trusted.

Keywords: Smart Farmers, Multi-Channel Marketing, Marketing Management

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Introduction

Leveraging smart farmers' income through marketing management of safe vegetables in Nakhon Pathom Province is essential. Agreeing with the National Organic Agriculture Development Strategy 2017 - 2021, the vision was set for "Thailand as a regional leader in production, consumption, trade in organic agriculture products and services that is sustainable and is recognized internationally". The emphasis is put on promoting the use of information system, public relations and development of organic farming networks as well as marketing promotion distribution channel and logistics system. This is in accordance with the vision of Nakhon Pathom Province that focuses on positioning an agricultural city and industrial safety. Safe vegetables are an important agricultural product of Nakhon Pathom Province as the center of production and delivery of safe vegetables to the main market in Bangkok (Upstream activities). There is the lack of systematic production management. The high levels of chemicals used in cultivation are caused by misunderstandings that negatively affect farmers and consumers. There is the raw material collector problem (Midstream activities) in terms of inefficiency in checking standards or quality of important agricultural products such as safe vegetables, etc. There is also the lack of technology to help increasing the distribution channels. The products are unable to reach target customers effectively. The innovation and technology is also lacked in helping the marketing promotion and there if the problem of consumers who lack knowledge and awareness of safe food consumption (downstream activities). The inspection of standards or quality is not in line with international market acceptance. As a result, consumers lack confidence.

Agriculture in Thailand still encounters many problems. Especially, the productivity is still at a low level and the average income of farmers is low because farmers do not have enough knowledge. They lack marketing insights for production planning as well as the knowledge to produce high quality agricultural products that are safe for consumers and environmentally friendly (Ruthaichanok, 2013). The aforementioned issues reflect that farmer's occupation still lack sustainable development especially in strengthening to be self-reliant in the long term. Therefore, the smart farmer concept in the view of the Ministry of Agriculture means a farmer who has a thorough knowledge of the agricultural occupation being able to plan by knowing the market demand and preparing the production accordingly. This includes the ability to increase production efficiency and to solve problems quickly by analyzing the data as a component of decision-making based on principles and reasons. They know how to apply technology in agriculture emphasizing on the production of high quality agricultural products which are safe for consumers and environmentally friendly to modernize farmers to be self-reliant in a sustainable way.

The smart farmers in Nakhon Pathom Province produce the safe vegetables with the fund contributed for supporting the greenhouses for growing safe vegetables from the Agricultural Nakhon Pathom Provincial Agriculture Office. According to the results from the preliminary survey by meeting with Nakhon Pathom Provincial Agriculture and Head of Strategy and Information Group, Nakhon Pathom Provincial Agriculture Office, it can be concluded that most smart farmers in Nakhon Pathom

Province do not have sufficient knowledge and management skills for safe vegetable marketing in a new marketing situation that combines both offline and online media to provide the multi-channel marketing. They lack the insights into the purchasing behavior of consumers or customers. This leads to a lack of connection among producers, traders and consumers. There is no safe delivery system for vegetables directly to consumers. The standardized safe vegetable packaging design technology is not used to help establishing a system of traceability that creates confidence and credibility to customers or consumers in the new era. The public relations strategies are lacked for brand communication to help promoting the sale of safe vegetables to the target group. This agrees with the research of Kanchanik (2012) who suggested the development of farmers that the supporting information should be provided to farmers in terms of technology, production, production management, marketing and business operations to enable farmers to increase their production capacity, exporting quality, and safe products from toxic substances as well as adopting technology to help facilitating the work along with the paradigm adjustment and adaptation of farmers.

From the aforementioned statements, the research team realized the need to create a series of research project on "Leveraging smart farmers' income through marketing management of safe vegetables in Nakhon Pathom Province". This consisted of 5 sub-projects covering from the study of consumer behavior and decision to buy safe vegetables, the study of delivery system development, the study of traceability system, the marketing channel development, and the media strategy for proactive marketing with participation from farmers of safe vegetable products. Research results useful to those who were interested were presented.

Research objectives

1. To study the consumer behavior and factors affecting the decision to buy safe vegetable products via electronic commerce and multi-channel marketing systems.

2. To study the development of safe vegetable delivery system among smart farmers in Nakhon Pathom Province

3. To study the development of safe vegetable traceability system among smart farmers in Nakhon Pathom Province

4. To study the development of offline and online marketing channels for safe vegetables among the smart farmers in Nakhon Pathom Province

5. To study the promotion of marketing of safe vegetables for the smart farmers in Nakhon Pathom Province through the media strategy of participatory proactive marketing.

Literature Review

Multi-channel marketing

The new market concept entering the business which is highly competitive by using the concept in approaching the customers first will have the competitive advantage. Kerin Hartley and Rudelius

(2007) defined it as the mean to integrate multiple marketing channels, communicate and send information to reach customers and attract them to buy any time, any place and any way. Thus, there are many marketing channels such as retail stores, websites, mail order with catalogs, or direct communication through letters, e-mails or text messages via mobile phones. Anuchit (2002) suggested that multi-channel marketing is a combination between communication and delivery of goods or services to customers including linkage and reinforcement among channels. It is a synergy with the goal to attract customers and maintain a good relationship with customers.

Multi-channel marketing focuses on developing mainly the e-commerce marketing channels as an alternative to the new generation of consumers with behavioral changes to use digital media. These media are starting to play an increasingly important role in daily life (Prachachat Business, 2010). In the modern media improvement era, the role of media will be a channel for consumers to have access to change the channel to buy products that focus on convenience and ease of use. There are recommendations for methods and easier access to the required information. The consumers are more inclined to buy products when there are more marketing channels to buy (Baran, Galka, & Struk 2008).

In the past 5 years, the development of information systems has evolved greatly. There is continuous development until there is research in the marketing field mentioning multi-channel marketing. The development begins from Single Channel marketing to Multi-Channel marketing through multiple channels at present. However, the current trend of e-commerce has started to have entrepreneurs stepping over to the market through Cross-Channel method including Omni-Channel marketing more. With the development of more complete information technology, it is possible to bring data from all channels and scattered parties and process them altogether. It allows us to enable each party to work altogether under the same data set. Thus, all channels can work altogether and can respond well to the needs of customers. This is therefore the era of Omni-Channel marketing in using every channel to help meeting the needs of customers in All Moment of Customer Journey (Netway, 2021).

Safe vegetable delivery system

It is the system for transferring goods from one point to another such as transferring products from warehouses to customers (Ecommerce Platforms, 2014). There are many ways and different vehicles for safe vegetable transportation to the markets. The distance to be transported also causes the operators to consider durability and strength of the packages to protect the products to be safe during transportation. Transferring the safe vegetables with different equipment will cause different damage to products. The entity must consider the method of transportation used to determine the comparative disadvantage to a minimum. The economy of transportation due to weather factors must also be considered. When the products are delivered through a place or to a place with different weather conditions, the temperature and humidity can damage the safe vegetables when the packaging is not protected. The transaction of safe vegetable transportation can be divided into two types; 1) Business to Business (B2B) and 2) Business to Consumer (B2C) (Department of International Trade Promotion,

2018). Currently, as the consumers are more likely to buy products online and some working age groups are busy of work until they have no time to buy products. Therefore, the business of delivering products between the operators to consumers as Door to Door Service is more popular whether for small or large operators because it can facilitate both buyers and sellers.

Traceability system

It is a way for consumers to check the products they want to consume in order to ensure the produce that farmers send to consumers. This can guarantee confidence in the products to see how they are planted, cared, and produced. The consumers can know the growers. It can also encourage repeat purchases in the future (Chalermchon Waisayadamrong, 2006; Schwagele, 2005). In making regular buyers become loyal customers, the production traceability can be used to verify confidence using QR Code. It also plays an important role in the traceability system to growers or production sites (Soratham Kettaphan, 2017). In the era of rapidly developed technology, farmers can use technology to participate in the distribution of products more than in the past year. It can be said that the producers can have loyal customers and the consumers are confident in the sources of vegetables and fruits.

The developed prototype of safe vegetable traceability among modern farmers in Nakhon Pathom Province is compliant with Good Agricultural Practices (GAP) and can be used to meet the needs of users and consumers who wish to trace the safety of vegetables produced in the community of farmers effectively. QR Coding and labeling of agricultural products is very important because it will be one of the channels for contacting farmers back to consumers. Each type of vegetable can be planted with good care. QR Code system will be able to tell the “substance” to consumers to understand the agricultural process from the cultivation process, maintenance, harvesting from upstream to downstream.

Online marketing channels

These includes e-commerce systems and social media of facebook, Instragram, shopee, Line and online ordering The development process of marketing channels both online and offline will help leveraging farmers by increasing the competitiveness to be able to expand the market to customers more (Angeline, 2012).

The development of online marketing happens when companies do most of their marketing activities through digital communication channels. As digital media is the coded medium to identify the users, the marketers are enabled for Two-way Communication with customers. Digital channels are channels that help creating the opportunities for farmers as well as reducing the disparity in terms of costs that affect small businesses. It also creates opportunities for small businesses to be known and expand the customer base widely.

In choosing a digital channel that is suitable for the business, the digital channel that is generally known is through websites, e-mail, blogs, social networks, internet browsing program, online video,

digital games and mobile commerce. The current marketing channels mean the channels that businesses can use to contact their customers including online channels such as Facebook or Line and offline channels such as printing media and TV (Kwon & Lenno, 2009; Close, 2012).

Public Relations strategy

It means public relations marketing to implement the successful and engaging proactive branding which comes from the formulation of a comprehensive and well-defined strategy with systematic planning and rigorous management. The researches are defined for the clear objectives and the audience. The design of the message and the selection of various types of media and communication channels are carefully made with appropriate monitoring and response (FAO, 2014c). The synthetic outcomes for development communication campaign strategies presented by international development organizations and academics with contributions to the ongoing developments include FAO (2015), FAO (2014b), FAO (2014c), IFAD (2010), Tufte and Mefalopulos (2009). It outlines the elements of the communication strategy that researchers can implement and apply as a conceptual framework for developing a participatory proactive public relations strategy with 11 elements; 1) Main problem or starting point of marketing public relations, 2) Target group, 3) Marketing public relations goals, 4) Marketing public relations objectives, 5) Marketing public relations concept, 6) Marketing public relations strategy, 7) Marketing public relations media strategy, 8) Indicators for monitoring and evaluation, 9) Budget, 10) Responsible person, and 11) Marketing public relations action plan.

Developing a media strategy for participatory marketing is a continuation step from the development of marketing public relations strategy. It is to develop the participatory public relations media strategy to promote safe vegetable marketing among modern farmers in Nakhon Pathom Province to consumers considering about message and story, methods/media used to increase consumer's knowledge, change attitude, and create new behaviors to understand abstract things into concrete, reduce misunderstandings, and increase memorization. The group process is applied by allowing farmers to develop messages, contents, tones and design media according to their experiences. There are media experts to give advice to consider the suitability, divided into 5 main steps; preparation, production planning or decision making, test before use, final media production, and the field use. In this section, the participatory tool has been developed only in the preparation and production planning processes by applying a conceptual framework proposed by the Food and Agriculture Organization of the United Nations (FAO, 2015; FAO, 2014b; IFAD, 2010).

There are important issues in the formulation of media marketing public relations strategy which are divided into 2 parts; 1) Determination of communication methods by choosing strategic communication methods or activities that enable interaction, sharing and exchanging information. This may be interpersonal communication, medium communication, or mass communication in only one way or in combination (FAO, 2014b). 2) Strategic choice of communication channels mean any medium, tool or activity used to deliver messages to a defined target audience, e.g. personal media, folk

media, community media, mass media, internet, new media and social media, etc. There are 3 criteria for selecting media; 1) Appropriateness and correspondence with the target group considering the need, characteristics, or exposure style, communication skills, communication channels, communication potential of each target group or the results of analysis on the knowledge gap, skills, attitudes and behaviors, 2) Communication objectives and content of the strategy, and 3) Cost effectiveness (IFAD, 2010; FAO, 2015; FAO, 2014b).

In this research, the researchers studied the leveraging of smart farmers' income through marketing management of safe vegetables in Nakhon Pathom Province through the research process according to the following research framework:

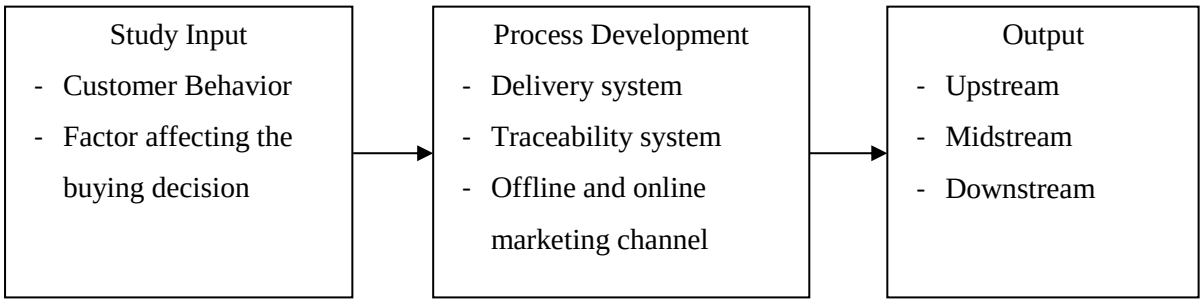

Figure 1 Research framework

Input

Studying the behaviors of consumers and factors affecting the decision making to buy the safe vegetables via e-commerce and multi-channel marketing systems using the combined research methods. The data was collected from 750 customers who bought the safe vegetables via e-commerce system and the interview was conducted with 3 operators who sold the safe vegetables.

Process

1. The development on the safe vegetable delivery of the smart farmers in Nakhon Pathom Province consisted of the development on the quick parcel delivery form of safe vegetables of the quick parcel service provider as well as the service quality of the quick parcel delivery service provider (SERVQUAL).

2. The development on the safe vegetable traceability system in the smart farmers in Nakhon Pathom Province showed the data from the upstream to the downstream including the data of the manufacturer, vegetable species, growing process, maintenance, manufacturing area, and data of the distributor. All were as determined by the National Agricultural Commodity and Food Standards.

3. The development on the offline and online marketing channel for the safe vegetables in the smart farmers in Nakhon Pathom Province consisted of:

1) Offline marketing channel including the community market, point-of-sale market, and network market, 2) Online marketing channel including the e-commerce system and social media

4. The promotion on the safe vegetables of the smart farmers in Nakhon Pathom Province through the PR strategies of participatory proactive marketing by developing the PR strategies of participatory proactive marketing and determining as the PR strategies for safe vegetables with the participation of smart farmers in Nakhon Pathom Province, government agencies, private agencies, customers, and consumers divided into 11 elements.

Output

The gained produce can be leveraged from; 1) Upstream: The farmers have knowledge in the consumer's behaviors in order to plan the production, 2) Midstream: The farmers can be leveraged in generating more income from multi-channels of marketing, and 3) Downstream: The customers can be leveraged in traceability towards the production source in order to reinforce the confidence in all sectors as well as leveraging the income generation to the smart farmers for the safe vegetables in Nakhon Pathom Province concretely.

Research Methodology

The goal for the study of "Leveraging of smart farmers' income through marketing management of safe vegetables in Nakhon Pathom Province" focuses on the profound understanding of consumer purchasing behavior leading to strategy formulation, proper marketing management, standards for safe delivery and packaging of vegetables, traceability system that builds confidence for customers and consumers, increasing number of offline and online multi-channel marketing. The offline and online proactive engaging marketing media can reach and drive purchasing decisions between farmers and customers and directly between farmers and the final consumers. Thus the smart farmers in Nakhon Pathom Province can have the ability to use marketing to lead production. They can sell products in higher volumes and prices leading to an important result in the economic dimension to leverage the smart farmers' income in Nakhon Pathom Province. In this research, the data were collected from a group of operators, and customers who purchase safe vegetables via e-commerce. The emphasis is put on participatory action research among smart farmers in Nakhon Pathom Province, consumers/customers, government agencies, private sector and related parties. The tools used in the data collection include the questionnaires, interview forms, and group discussions. Such results are synthesized altogether.

Research Findings

From the result of knowledge synthesis using the system theory consisting of input, processes and output, the research and development process is applied by dividing the research process into 3 parts as follows:

1. Input: It is the study of consumers' behaviors and purchasing decisions towards safe agricultural products through multi-channel marketing. It was found that most of the purchasing

behaviors via online channels were female, single, aged between 21-30 years old with bachelor's degree. Most of them earn more than 20,000 baht. The average daily time spent buying vegetables through e-commerce systems takes about 1-2 hours between 8AM – 8PM. It is commonly used to buy vegetables through the e-commerce system. The frequency of buying safe vegetables through the e-commerce system is 1-2 times per month for most consumers. Each time is approximately 100-300 baht. The most popular e-commerce marketing channels to buy are Facebook, Line and Shopee. Electronic commerce payment methods include paying cash to employees upon receipt of products, cash on delivery and via mobile payment. The consumer behaviors in purchasing safe vegetables are through marketing channels using multi-channel marketing both online and offline.

The decision making through e-commerce system regarding the safe vegetable marketing mix consists of good quality products and clear information on safe vegetables. The prices of safe vegetables sold on the app are clearly identified with the delivery fee. The distribution channel through e-commerce system is ready to use 24 hours a day. Marketing promotion through e-commerce system has a variety of marketing promotions such as discounting, collecting points, free delivery. The service is to provide information that is useful to individual customers via telephone, email and SMS. For the privacy, the personal data are kept secure and reliable including password security.

The consumers pay much attention to the process of decision making to buy safe vegetables. They research from multiple sources before making the buying decision. They will evaluate the options based on cost, cost-effective price and quality comparison. In addition, behavior after purchase depends on the received experience such as recommending and telling to relatives and friends if the consumers receive good quality products and impressive services. The research model determines the study of behaviors and buying decision of safe vegetables as the input to be adjusted to the proactive marketing model that uses the market to lead the production. The farmers can plan the production correctly suiting their needs and the needs of consumers to achieve maximum satisfaction

2. Process: Leveraging of smart farmers' income through marketing management of safe vegetables in Nakhon Pathom Province is divided into 4 processes as follows:

1st process: The safe vegetable delivery system of the smart farmers in Nakhon Pathom Province is developed. This process will implement the safe vegetable delivery system of the smart farmers in Nakhon Pathom Province. This consists of the development on the quick parcel delivery form of safe vegetables of the quick parcel service providers. There are two types of service quality of express courier service (SERVQUAL) which are the traditional delivery mode (offline). It is the delivery of vegetables from farmers' farms to the distribution sources such as local markets and shopping malls. The online delivery mode uses courier companies to deliver the products to consumers. In comparison, traditional (offline) delivery costs are higher in case of low sales volume. In case of online sales, the delivery costs will be borne by the buyer. In this process, 2 types of packaging for safe transportation of vegetables have been developed, namely 3 types of pre-formed paper boxes which are packaging for transportation to help maintaining the quality of vegetables and 3 types of plastic bags

which are packaging that are attached to the vegetables to reduce spoilage of vegetables and maintain freshness for a long time.

2nd process: The system for safe vegetable traceability is developed among smart farmers in Nakhon Pathom Province. It will display the information from upstream to downstream such as information of producers, vegetable varieties, planting procedures, maintenance, production area and distributor information. It is in accordance with the National Agricultural Commodity and Food Standards. The efficiency of the safe vegetable traceability system that appears in the safe vegetable packaging can ensure the consumers who can monitor the production process. Standard production sources will raise the production standards for farmers who use technology in the production process.

3rd process: The marketing channels are developed consisting of 1) Offline marketing channels, i.e. community market, point-of-sale market, and network market, and 2) Online marketing channels, i.e. e-commerce system and social media via facebook, Instragram, shopee, Line, and online ordering. The process of developing both forms of marketing channels is to enhance farmers by increasing their competitiveness to expand the market to more customer groups. In comparing offline and online marketing channels for safe vegetables among smart farmers in Nakhon Pathom province, it can be divided into Activity Based Costing (ABC). It is found that using offline marketing channels will cost more than offline marketing channels. The efficiency of selling online marketing channels to be better may be due to the impact of the COVID crisis which changes the consumer behaviors. It results in more online shopping. Both traditional offline channel to buy safe vegetables from local markets, department stores, and online channel to buy some rarely-found vegetables such as lettuce will be operated well in online marketing channels. From the researches, the knowledge gained from researches have been managed as a sales guide through offline and online marketing channels in the form of an e-book content. It will consist of Algorithm of selling both offline and online and successful strategies for selling offline and online.

The development has been made in marketing public relations strategy, message public relations strategy, and public relations media strategies. The public relations strategy for participatory proactive marketing is developed in a form of public relations strategy to promote the marketing of safe vegetables with the participation of smart farmers in Nakhon Pathom Province. Personnel from government agencies, private sector, customers and consumers are divided into 11 elements; 1) Main problem or starting point of marketing public relations, 2) Target group, 3) Marketing public relations goals, 4) Marketing public relations objectives, 5) Marketing public relations concept, 6) Marketing public relations strategy, 7) Marketing public relations media strategy, 8) Indicators for monitoring and evaluation, 9) Budget, 10) Responsible person, and 11) Marketing public relations action plan.

The strategy of participatory public relations is determined to promote the marketing of safe vegetables for smart farmers in Nakhon Pathom Province to consumers divided into 6 steps; 1) preparation of specific characteristics of the message, 2) determine the content, 3) select the motivation point in the message, 4) select the form of message presentation, 5) determine the message position,

and 6) determine the method of organizing the message. The most challenging step is to develop a media strategy for participatory marketing to promote the marketing of safe vegetables for smart farmers in Nakhon Pathom Province to consumers considering about message and story, methods/media used to increase consumer's knowledge, change attitude, and create new behaviors to understand abstract things into concrete, reduce misunderstandings, and increase memorization. The group process is applied by allowing farmers to develop messages, contents, tones and design media according to their experiences. The process of producing and distributing media consists of 11 components; 1) issues/problems, 2) contents/messages, 3) stakeholders/key target groups, 4) media goals, 5) format, 6) quantity, 7) budget, 8) production timeline, 9) prototype media testing, 10) field implementation, and 11) training on participatory proactive marketing public relations media strategies. The main knowledge and products are media for public relations for the Nakhon Pathom safe vegetable participatory proactive brand marketing to attract both offline and online for brand communication and promotion of safe vegetable products to the final consumers and customers. This can reinforce and create instant and continuous consumer recognition and drive decision-making.

3. Output: From the development process of all 5 research projects, the produce can be upgraded upstream. The farmers have knowledge of consumer behaviors that can be used in proper production planning and appropriate marketing to lead production. The efficient delivery of vegetables and packaging suitable for transportation can maintain the quality of vegetables safely from the source to the consumer for the highest satisfaction. The farmers have a database system that can disseminate knowledge about the location of safe vegetables, production process and useful knowledge. In the midstream level, the farmers can be leveraged in terms of generating more income from various marketing channels both traditional offline and online marketing channels by adding knowledge of strategies that are explained to be understood and able to implement successful sales methods to increase competitiveness. In the downstream level, the customers can trace the production source, build confidence, build acceptance of safe vegetables through participatory marketing communications. This can raise awareness among consumers, focus on safe food consumption, and create acceptance. The consumers can be aware of buying safe vegetables in Nakhon Pathom Province integrated into all sectors. It will help raising the income for smart farmers for safe vegetables in Nakhon Pathom Province in a concrete way.

Conclusion and Discussion

1. From studying the consumer behaviors, it was found that buying through online channels is different from buying from offline channels that focuses on buying 1-2 kg packaging. The main reason to buy is for health. Meanwhile, for the group buys through traditional offline markets such as local markets, flea markets, the reason for buying is to help farmers. This agrees with the research of Withoon Panyakul and Chaiwat Kongsom (2015) finding that the factors affecting the decision to buy organic products through the membership system are knowing the producers, a system that allows them to know

the farmers and build trust through the membership system by talking to one another. Online shopping behavior is highly price sensitive. The price factor is primarily considered as it is easy to compare prices.

2. The development of safe vegetable delivery by smart farmers in Nakhon Pathom Province was found that private freight forwarders in terms of physical characteristics, trust, reliability, timely response sentiment, and compassion had the high level of quality in all aspects. This was consistent with Worachonok Tengwongwattana (2015) finding that the service quality factor in terms of reliability on demand response, confidence and awareness of the price affects the decision to choose a private company'ss parcel delivery service.

3. Many farmers or entrepreneurs in Thailand are not actively using online marketing channels and making the most of it (Gilmore, Gallagher & Henry 2007). This study provides insight into fundamental changes in customer behaviors and online marketing activities which type is suitable for what kind of target audience and which type of product is suitable. The digital transformation trend is critical to online efficiency (Simmons, Thomas & Truong 2010). The online marketing form is the next generation of proactive marketing that will rapidly transform the traditional commerce model. Everyone has to keep pace with the changes to create competitive advantages to reach more accurate goals, market, interact directly with customers and get real-time feedback to get the right answers that can best meet the customers' needs. Effective marketing will always be a key component of business success.

4. Regarding the approaches for developing the buying decision of safe vegetable products through e-commerce and multi-channel marketing, the entrepreneurs must understand the differences of buyers. Each group of those who use the application to buy must adapt to the context and the changing trend in adopting more technology in a new way of life to follow the marketing channels that are likely to turn into marketing through a mix of marketing channels and through the integration of all channels of change. The sales strategies must be adjusted to respond to customers and such channels. Kushwaha and Shankar (2012) suggested that multi-channel marketing has started to play a role and value to customers. A good turnover will correlate between channel settings and monetary value to satisfy different customers. The results of China's research by Cui, Zhu and Chen (2018) also suggest that use of the application in mobile commerce has caused the impact to reach the local offline retailers. For the substitution effect between mobile commerce and retailers, the trend of change arises because 1) traditional transactions have low mobility and 2) adoption of technology of the new generation becomes higher.

5. The development of public relations strategy for participatory proactive marketing is the formulation of public relations strategy to promote safe vegetable marketing by participation of smart farmers in Nakhon Pathom Province. The proactive public relations will work towards the goals according to the proactive public relations plan that has been identified by the activities. The media that will be used in the public relations as well as the target audience for which the publicity will be disseminated to specify the duration of the operation, clearly specify the budget and the person responsible for the work. This is in the same direction as the study of Chaiyanan Nantaphan (2016)

stating about the public relations strategy that public relations planning strategy is important to make public relations operation to reach the targets or goals set according to the public relations plan. The publicist must be able to identify what the public relations plan has. The policies, goals, and activities must be clearly stated.

Research recommendations

1. The change of the era has led to the shifting of trade patterns to more advanced e-commerce transactions. Operators cannot avoid such changes. The prior adjustment will be able to create an advantage in this competition. For the trends of doing business in the age of globalization, the traders and smart farmers will have to skip from doing traditional business to use the online system to go from single channel marketing to marketing through multiple channels. In an era where online systems are simplified with mobile transactions, the entrepreneurs and farmers may start by learning more in social networks and developing their own sales channels early on before they become outdated in the trading system.

2. Understanding of smart farmer's income leveraging through the management of the safety vegetable market in Nakhon Pathom Province is necessary to develop the entire system from the inputs to understand the part of the customers and entrepreneurs who accept agricultural products to sell. This includes understanding the process factors in the part of the vegetable delivery system which is safe. The development is on the safe vegetable traceability system, marketing channels both offline and online, and marketing public relations strategies. The aim is to expect results or export factors that will help raising the income of smart farmers for safe vegetables in Nakhon Pathom Province in a concrete way.

Recommendations for further researches

1. This research aims to study the smart farmers through the management of the safety vegetable market in Nakhon Pathom Province only. Those who are interested may extend their work to farmers groups in other provinces as well as farmers in other types of markets. It should be interesting research results for further case studies.

2. This research focuses on customer groups and entrepreneurs who are sellers and entrepreneurs who are farmers. However, the data collection is a separate collection of results for specific groups and then gradually integrate the results altogether. In terms of research, it is still considered that the 360-degree view is not complete. Those who are interested in further developments may develop the results of the research together with qualitative data collection with group discussion arrangement to have a meeting among customers, vendors and manufacturers. The deeper dimension should be obtain

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MARKETING OF EDUCATION BUSINESS TO RESPOND TO THE NEEDS OF GEN Y CONSUMERS: A CASE STUDY OF SMART BRAIN FRANCHISE BUSINESS IN SA KAEO PROVINCE

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Abstract

The study attempts to study marketing of education business to respond to the needs of and to compare marketing of education business to respond to the needs of Gen Y consumers. The population in this study were 380 parents of Gen Y consumers using questionnaire as the research tool. Computer software program was utilized to analyze the data and the statistics used were frequency, percentage, average, standard deviation, stepwise multiple regression analysis, and One Way ANOVA.

The findings revealed that: 1) The personal factors of Gen Y consumers in Sa Kaeo Province found that the majority were lower Gen Y (age of 25-29 years old), follow with upper Gen Y (age of 30-34), and teenager Gen Y (age of 15-24), respectively; 2) The study on marketing of education business responding to the needs of Gen Y consumers shows that the majority of the subjects thought that place for distribution and after-sales service should be utilized, follow with the product design, establishing the brand, and marketing; 3) Distinguish characteristics of Gen Y consumers that business sector should emphasize involving selected consumers and flexible to technology at the percentage of 46; and 4) When comparing marketing of education business to respond to the needs of Gen Y consumers classifying by sub-groups of Gen Y consumers, it was found that Gen Y consumers expressed their thought toward marketing of education business to respond to the needs of Gen Y consumers with no statistically significant level.

Keywords: Gen Y Consumers, Education Business, Marketing of Education Business

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Introduction

Generation Y (Gen Y) or Millennial Generation (Gen M) are people born in the years 1981-2000, which is the time when the world has entered the information age. Currently, these people are aged 21-40 years old. This consumer group is the high purchasing power segment, when coupled with the influence of digital technology, they have higher demand and expectation than their predecessors. The growth of startup companies (doing business where business owners starting to do from the first step and expand to the large) around the world trying to meet the needs of the Gen Y group in all dimensions, both products and services. The businesses should accelerate their focus on the Gen Y segment, as they are the largest today and will likely continue to be the largest in the future. (Don Tapscott, 2009)

From the survey of the consumer market in Thailand found that the five key features of Gen Y that businesses should focus on are: Tech-savvy, social, data-driven, selective, and financially literate. These five attributes tend to stick with these consumers over every age group. The business sector should find suitable strategies to be successful with this target audience. Some businesses may have products that can immediately respond to Gen Y, such as IT products, while certain businesses such as financial services and the service sector might not have. Business should prepare in advance to face opportunities and challenges as demand for Gen Y products and services that will rise in the next few decades. In any case, businesses must "transform" their business model to stay competitive in this new consumer market. (Siam Commercial Bank, 2014)

Based on the aforementioned concepts and reasons, the researcher is interested in studying the marketing of education businesses that meet the needs of Gen Y consumers: a case study of the smart brain franchise business in Sa Kaeo Province. This research will benefit the development of the organization to be readily available in the educational business and can continue to create success for the organization in a stable and sustainable manner.

Research Objectives

1. To study marketing of educational businesses that meet the needs of Gen Y consumers.
2. To compare the marketing of education businesses that meet the needs of Gen Y consumers.

Research Hypothesis

1. Education business marketing to the needs of Gen Y consumers is different.
2. The key features of the Thai Gen Y group that businesses should focus on affect the marketing of education businesses that meet consumer needs.

Research Conceptual Framework

The researcher has formulated a conceptual framework from compiling and studying relevant research papers, including theoretical concepts of business educators and business administration

experts, applied to Phillip Kotler's marketing mix concept which the researcher uses as a study guideline. (Thaipublica, 2013) The conceptual framework can show as in figure 1.

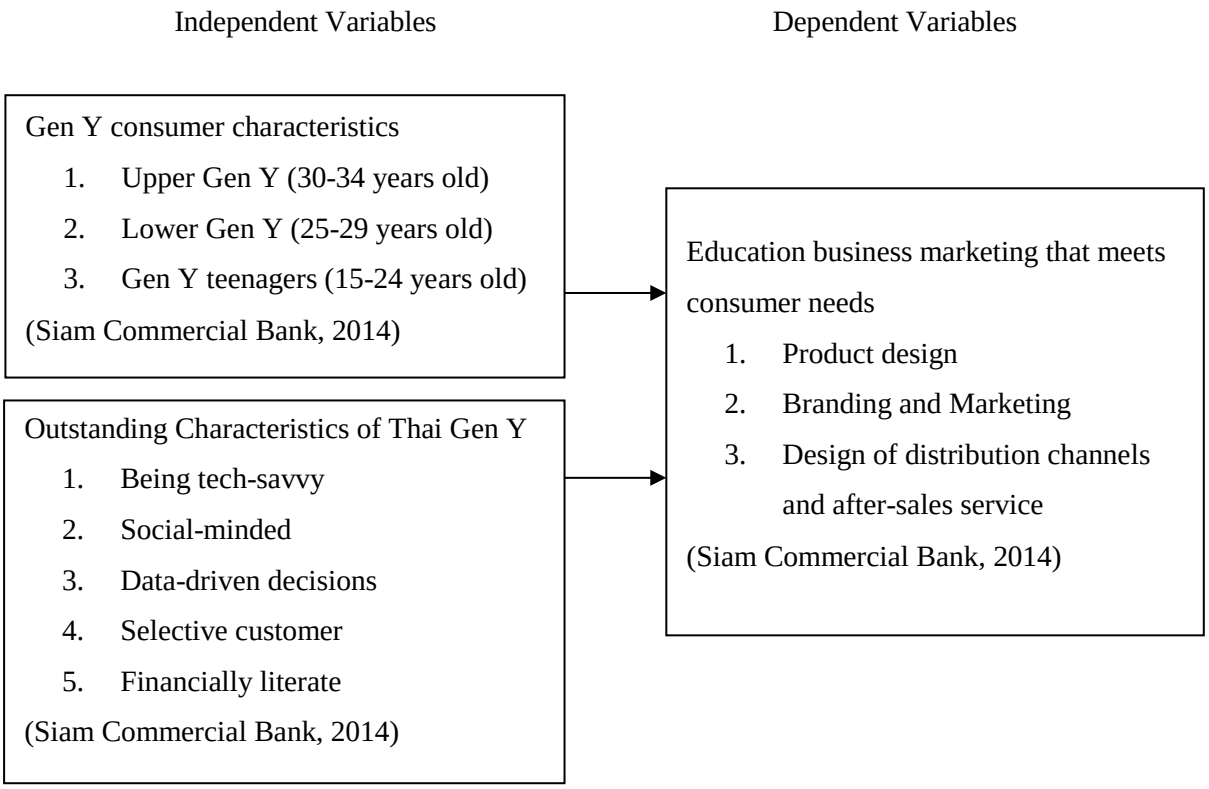

Figure 1 Research Framework

Research Method

The researcher used the quantitative research and using questionnaire to collect data from the sample group in the form of close ended questions, the data were then analyzed statistically by a computer program. The sample group used in the research is 380 Gen Y consumers in Sa Kaeo Province. The tools used for data collection were the business marketing questionnaires that addressed the needs of the Gen Y consumers, and the Thai Gen Y characteristic questionnaires that businesses should focus on.

The researchers used the data obtained from the collection to analyze the data according to the check list questionnaire using frequency and percentage. The closed-ended questionnaire was estimated at five levels, using mean and standard deviation. Analysis of the key characteristics of Thai Gen Y that businesses should focus on using the analysis of multiple regression in a stepwise method and to compare the marketing differences of the study businesses that responded to the needs of Gen Y consumers in each group using One-Way ANOVA Analysis of Variances.

Research Findings

The research can be summarized as follows:

1. The sampling of Gen Y consumer are the consumers in Sa Kaeo Province, most of them are lower Gen Y (25-29 years old) followed by upper Gen Y (age 30-34) and teenage Gen Y (15-24 years old).

2. Education business marketing that meets the needs of most Gen Y consumers are better distribution channel design and after-sales service, followed by product design. The branding and marketing should be applied accordingly.

3. The key features of the Thai Gen Y that businesses should focus on include: 1) being tech-savvy, 2) social-minded, 3) data-driven decisions, 4) selective customer and 5) Financially literate.

The qualifications that can predict the market of educational businesses with the statistical significance are selective customer and begin tech-savvy Gen Y consumers which are able to predict the marketing of the education business for 46%.

Table 1 An analysis of Outstanding Characteristics of Thai Gen Y affecting Education business marketing that meets consumer needs

Variables	b	S.E.	Beta	t	Sig
(Constant)	2.63	0.74		3.15	0.000
Selective customer	0.42	0.12	0.31	4.02	0.001
Begin tech-savvy	0.61	0.25	0.66	3.12	0.000

*Significantly at a level of 0.01

Adjusted R^2 = 0.46: Durbin-Watson = 1.05

4. Comparisons marketing of the study business that address the needs of Gen Y consumers classified by Gen Y consumers in each group found that Gen Y consumers have an opinion on the marketing of the study businesses that meet the needs of the Gen Y consumers. The needs of Gen Y consumers were not significantly different.

Table 2 An analysis of variance of educational businesses that meet the needs of Gen Y consumers Gen Y consumers

Variance	SS	df	MS	F	Sig
Between Groups	982,409,332.7	3	327,102,111.80	1.456	0.327
Within Groups	25,510,875,139.0	96	243,333,949.42		
Total	24,492,183,475.2	98			

*P < 0.05

Discussion

From the research results mentioned above, the research results can be discussed as follows.

1. Education business marketing that meets the needs of Gen Y consumers with a focus on lower Gen Y (25-29 years old) according to the Price Waterhouse Coopers study (PwC, 2013) mentions Millennials, or Generation Y, that they will account for 80 percent of the total workforce in 2016. The business should use a strategy to design distribution channels and after-sales service. This is in line with Natta Changchutoe (2014) research, which studies an analysis of marketing communication factors for online businesses in Thailand. The study has important recommendations that businesses should create brand value and differentiate it for the selling point of the website by using strategies to create a good customer experience. By having good website features, beautiful website design, and easy access will offer unique products through accurate, clear, up-to-date information. Personalized customer relationship management strategies should also be used with the engagement strategies to generate positive referrals. Consistent with Wandee Ratanakaikaew (2011) research, study on shopping behavior in social network Facebook: a case study in Bangkok. The results of the research are service marketing mix factors affecting product purchase in distribution channels. There is an important suggestion from the research that sellers of products in social networks should develop a marketing mix strategy that is appropriate and able to meet the best needs of consumers.

2. Outstanding characteristics of Thai Gen Y that businesses should focus on is a selective Gen Y consumer. This is in line with the Siam Commercial Bank (2014) study that has presented Gen Y's distinctive characteristics as tends to select only the quality and desired products and services because Gen Y has access to a large number of resources online and offline. Therefore, they tend to compare their data until the best option is found. This is in line with Weerapong Chutipat (2013) concept, mentions the attitudes, ideas and habits of Gen Y consumers that they like to study products from “Internet” or “Social Media”. When Gen Y consumers want to buy IT products or discretionary goods, they find information from the Internet or social media. For Gen Y consumers with technology agility, it aligns with a study by Kanpicha Kengkarnchang (2013) presented the characteristics of the Gen Y group as having a keen interest in technology, ingenuity, creativity in problem solving, ability to search for information and use electronic media, and is capable of multitasking. This is in line with the Siam Commercial Bank (2014) study that presented the outstanding characteristics of the Thai Gen Y group as being technology agility. This consumer group grew up with computers and the Internet. Business operators should use technology to their advantage and find channels to reach consumers in order to meet the needs of this group of consumers. This is also consistent with the research of Patra Ruangsawat (2010) that studies lifestyle and social networking behaviors of working people in Bangkok. The research results found that most of the samples were members of the social networking website Facebook which shows that these consumers are technology agile and able to access information online as well.

3. Marketing Comparison of educational businesses that meet the needs of Gen Y consumers have no different opinions about business marketing. Therefore, education marketing that meets the needs of Gen Y consumers should include the three marketing mixes, which are: 1) product design, 2) branding and marketing, and 3) distribution channel design and after-sales service. This is consistent with the research of Rintra Kaewpradit (2012) that studies influencing factors of parents' tutoring school selection of primary school students in Ubon Ratchathani Municipality, Ubon Ratchathani Province. The results of the study found that the factors that influenced the choice of tutoring school of parents were: physical environment, human resources, curriculum and learning materials, and marketing promotion. Consistent with Wandee Ratanakaikaew (2011) research, study on shopping behavior in social network Facebook: a case study in Bangkok. The research results revealed that the factors of the service marketing mix affecting the acceptance of purchasing decisions are as follows: distribution channel, price, product, marketing promotion, personnel service processes, creating, and presenting physical characteristics. This is consistent with Saowalak Chong-Aksorn's research (2010) study the marketing factors in the selection of a mathematics tutoring school of the parents of 6th grade students in Surat Thani Province, Nakhon Si Thammarat Province, and Songkhla Province. The study results revealed that the importance of marketing factors in choosing a mathematics tutoring school of the parents were the quality, product composition, process aspect, pricing, other costs of users, personnel, evidence object, marketing promotion, and customer education. This is consistent with Orawan Wannachot (2008) research study on the synthesis of research on marketing factors and consumer purchasing behavior through e-commerce systems in Thailand. The results of the study revealed that the marketing factors affecting consumers' buying behavior through e-commerce systems through factor of product, price, distribution, and promotion. This is in line with Thichanan Duangchan (2007) research on factors influencing the selection of tutoring schools of parents for the 5th and 6th grade students in Chiang Rai Municipality. The results of the study showed that the parents had opinions on the factors influencing the selection of tutoring schools according to 7P's principles as the factor of product, distribution, personnel, physical characteristics, and the process aspect is at a high level.

Research Suggestion

From the results of this research the researcher would like to suggest the following guidelines and guidelines.

1. Suggestions for marketing of educational businesses that meet the needs of Gen Y consumers

1.1 Products should be meticulously designed to meet or exceed Gen Y expectations and should introduce new products to meet market opportunities that meet their goals. As well as should develop existing products in order to meet the needs and satisfaction of consumers more than ever and to maintain the existing customer base.

1.2 Branding and marketing should focus on presenting businesses with a high level of psychological value by making consumers perceive them as special people. It should showcase your business through social media, online advertising, online video, mobile applications, and blogs. Including choosing to use influential presenters in the Gen Y group.

1.3 Distribution channel design and after-sales service should make a positive first impression that the customer feels and continued reinforce that the impression. Distribution and service channels should be designed that are convenient and fast throughout the purchasing process.

2. Recommendations for the key features of Thai Gen Y that businesses should focus on.

2.1 For the selective customers, the business operator should offer new quality products that are unique and meet the needs of Gen Y consumers with honest and straightforward marketing.

2.2 For consumers with technology agility, businesses should offer products that communicate via e-mail, mobile technology, the Internet, and online media because Gen Y consumers use computers and the Internet in their daily life and enjoy their work and personal life on devices with a monitor.

3. Suggestions for further research

3.1 There should be a research study on marketing of education businesses that cater to the needs of other consumer groups, such as Gen X consumers (born 1965-1980), Gen C consumers (new demographics that based on the digital age enthusiasm rate), etc.

3.2 There should be a research study on education marketing that addresses the needs of Gen Y consumers through qualitative research methods.

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BEHAVIORAL INTENTION MODEL TO PURCHASE ORGANIC VEGETABLES THROUGH ELECTRONIC COMMERCE SYSTEMS AND MULTI-CHANNEL MARKETING

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Abstract

The research aims to study the behavioral intention model to purchase organic vegetables through electronic commerce systems and multi-channel marketing. A validated online questionnaire and convenient random sampling method were used to collect data from organic vegetable consumers purchasing through electronic commerce systems and multi-channel marketing in Bangkok and its vicinity with a sample population of 750 people. The statistics used to analyze the data include percentage, mean, standard deviation, confirmatory factor analysis, and path analysis through structural equation analysis.

The results of this research indicated that the behavior of intention to purchase organic vegetables through multi-channel marketing had been influenced by perceived ease of use (TE = 0.99), attitude (TE = 0.65), and perceived usefulness (TE = 0.24), respectively, with 95 percent of predictive value.

The attitude towards accepting technology in purchasing organic vegetables through multi-channel marketing was influenced by the perceived ease of use (TE = 0.94) and perceived benefits (TE = 0.11), respectively, with the predictive value at 89 percent.

Keywords: Organic Vegetables, Electronic Commerce Systems, Purchase Intent, Multi-Channel Marketing

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Introduction

"Money is not real, but food is" is an immortal speech of Mom Chao Sitthiphon Kritdakorn, the father of new agriculture and Former Minister of Agriculture, President of Kasetsart University Council, and award-winning Ramon Magsaysay Foundation for Public Service of new agricultural development in 2510 (Bunnag, 2009). Time has proven that strength and sustainability must grow on the basis of agriculture in Thailand since food is the basic factor for living. The advantage of topography makes Thailand one of the leading countries in the world with producing quality agricultural products, which can be upgraded to be the kitchen of the world. Therefore, the policy related to agriculture must be in focus of all Thai governments.

The agricultural sector is very important to the economy and society of Thailand. According to the Agricultural Census of the National Statistical Office, the number of populations in the agricultural sector is 25 million, or 40 percent of the total population. Agriculture is Thai largest source of labor and this sector generates approximately 9 percent of the GDP, which is an important source of income for several households. Even though the agricultural sector employs over 40 percent of the country's total workforce, which is the majority of the labors, farmers' average income is lower than other occupations. Besides income inequality, low stability due to seasonal fluctuations affects farmers' quality of life. Reducing the problem of inequality and raising the income per capita of farmers have always been an economic problem of the country's development (Duangnirat, 2020). The results of the survey on debt and income of Thai farmers in the latest year revealed that the average debt of farmers in 2021 was at 262,317 baht/household, 16.54% higher than the number found in 2020 with an average debt at 225,090 baht/household. The average income of farmers in 2021 was 408,099 baht/household, 4.54% higher than 2020 with an average total income of 390,376 baht/household (Wannakhajorn, 2021). Thus, it is necessary that this issue must be solve for sustainable income.

Sustainable income is based on the use of knowledge. Modern farmers have to adapt to farming by considering the society as a whole. Besides agriculture, it is necessary that farmers understand business management and marketing. In other words, the future of agriculture requires the application of management disciplines in order to understand the current needs of consumers. According to the "exploding from within" concept of His Majesty King Bhumibol Adulyadej, it is vital that one should not only wait for fate. Thus, farmers should not only wait for assistance from the government. Instead, they should understand consumer behavior and the popularity of the products that they produce.

At present, the popular trend focuses on "health". People tend to exercise, and use natural and chemical-free products. Organic products attract attention of customers since they are most directly related to health. Another trend that has dramatically changed is the development of communication technology from the Analog Era to the Digital Era. Due to the spread of COVID-19, consumers are forced to work from home and spend more time with technology by using their mobile phone to shop. In addition, the government also supports the use of financial transactions via mobile phones. These change the behavior of consumers to purchase goods and services since they have to make a purchase

decision through electronic commerce. Thus, multi-channel marketing plays a very important role and is the key element of success in the new era by creating marketing proposals through individual customers together with the consistent integration of various marketing channels.

The business should be giving the electronic commerce with multiple marketplaces such as storefronts, subscription services, and also through social media in-app purchases. The variety of digital sales channel or multi-channel will make consumers familiar with products and resulting in more sales volume. The perspective customers are not always lookup for our product, then it is important to diversity business electronic commerce sales via multichannel selling.

According to the fact that consumers tend to buy products via electronic commerce, it is essential to conduct research on the behavior model of intention to purchase organic vegetables through electronic commerce systems and multi-channel marketing in order to find information needed to predict the purchase intention of customers, which would benefit farmers and stakeholders.

Research Objectives

To study the behavior model of intention to purchase organic vegetables through electronic commerce systems and multi-channel marketing.

Literature Review

Organic Vegetables

Organic vegetables are the products of non-chemical production system to prevent and suppress pests. Instead of chemical fertilizers, farmers use organic fertilizers that leave no toxic residues (Department of Agricultural Extension, 2009, pp. 4-5). Since consumers become more aware of the dangers of pesticide residues in vegetables sold in the market leading to more demand for environmentally-friendly products, farmers are more interested in growing chemical-free vegetables while many businesses have turned their attention to organic vegetable products (Dorais, 2007; Porciuncula, Luzviminda & Rex, 2015).

Electronic Commerce System

Online shopping is important nowadays since it provides convenience and fast services (Rittiboonchai, 2021, pp.32). It is subject to electronic commerce system from the process of advertising, purchasing goods, selling goods, delivering goods, paying the price and exchanging goods/services or information over the Internet (Chaffey, 2009). The highlight of the electronic commerce system is cost savings, increasing the efficiency in business operations by reducing the importance of visual elements of the business, such as office buildings exhibition rooms, warehouses, salespersons, and customer service officers. Therefore, geographical restrictions in the form of distance and business hours are no longer an obstacle to run a business. Electronic commerce refers to the sale or purchase of goods or services between businesses, households, individuals or private organizations through electronic transactions carried out on the internet or online communication networks by

exchanging electronic messages or EDI (Electronic Data Interchange) messages. The delivery of goods or services may be carried out either online or offline (Eurostat Statistics-Explained, 2016), as well as financial transactions (Tassabehji, 2003).

Purchase Intention

Purchase intention is one of the factors in the process of purchase decision. It is between others' attitudes and unexpected situational factors. Consumers may have a purchase intention based on other factors, such as expected revenue, price, and expected product benefits (Javornik et al., 2019). However, unforeseen circumstances may alter purchase preferences, and social influence plays a very important role in the purchase intention through the use of the application service (Chanton, Chimmasangkana & Rittiboonchai, 2021). According to Apirungruengsakul and Pasunon (2020), the intention to purchase products online is most influenced from the factors of marketing innovation, consumer loyalty, and consumer satisfaction respectively. The results of the study on the causal relationship analysis show that marketing innovations affect purchase intention through electronic commerce channels which corresponds to the study on cyberspace marketing: factors driving e-commerce adoption (Ching & Ellis, 2010).

Multichannel Marketing

The combination of communication with the delivery of goods or services to customers and channels is a synergy to attract customers and maintain a good relationship with customers. Multi-channel marketing strategy has been developed rapidly to provide more than one marketing channels to reach customers (Rosenbloom, 2004).

This development also focuses on e-commerce marketing channels through electronic commerce systems. This is an alternative to the new generation of consumers with the use of all digital media that have played an increasingly important role in daily life. The role of media is a convenient and easy channel for consumers to purchase goods. With more channels, consumers tend to buy products (Baran, Galka & Struk, 2008).

Key strategies in multi-channel marketing can lead to effective marketing according to Berman and Thelen (2004). The strategies consist of

1. Integration of existing marketing channels by emphasizing product consistency across marketing channels in order to promote marketing channels,
2. Designing an efficient information system,
3. Order and delivery process through all marketing channels, and
4. Finding partners in marketing channels

In the past 5 years, the development of information systems has evolved greatly and continuously until there is research in the marketing field mentioned. Multi-channel marketing was developed from single channel. The current trend of electronic commerce shows that several entrepreneurs have applied more cross-channel and omni-channel. The development of more complete information technology can integrate and process all channels and information (Cui et al., 2019).

Based on the literature review and related research, independent variables, mediator variables and dependent variables were set within the research framework as follows:

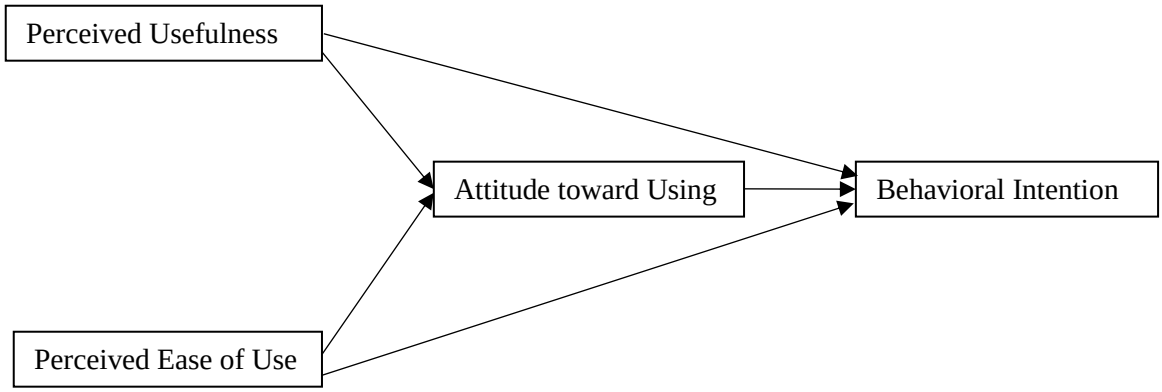

Figure 1 Research Framework

Research methodology

The population is 750 consumers purchasing organic vegetable through electronic commerce and multi-channel marketing in Bangkok and its vicinity. The sample size was based on the formula Hair et.al. (2010, pp. 100-102), who suggested the ratio between The sample per number of parameters or variables for measurement should be at least 20 to 50 samples per 1 observed variable. There were 15 observable variables in this study with the criteria of 50 samples per 1 observable variable. A total of 750 samples were collected. The statistics used in the data analysis consisted of percentage, mean, standard deviation and the confirmatory factor analysis and path analysis through Structural Equation Model (SEM) analysis.

Research Results

The personal data of the respondents showed that most of them were female (68.00%), aged 21-30 years (70.67%), student (53.07%), single (59.47%), with a bachelor's degree (60.13%), with less than 20,000 baht per month income (81.60 %).

Consumer behavior of the respondents regarding the decision to buy organic vegetables through electronic commerce and multi-channel marketing shows that their purchase decision was based on advertising media (41.20%), the time of use to buy organic vegetables was less than 1 hour/day (56.73%), the frequency of purchasing organic vegetables was 1-2 times/month (45.87%), the time to buy organic vegetables through the electronic commerce system was 12.01-16.00 (33.07%), the average price of organic vegetables via electronic commerce system was 100-300 baht (55.87%), the application used to buy organic vegetables was Facebook (66.33%), the payment channel was cash payment upon receipt of goods (pay on delivery) (61.47%). Besides purchasing organic vegetables, the respondents also purchase clothes/accessories (38.00%). Their opinions towards the e-commerce system in Thailand for organic vegetable customers was marketing through multiple channels (37.87%).

Table 1 Perceived Usefulness, perceived ease of use, attitude toward using, and behavioral intention to purchase organic vegetables through electronic commerce and multi-channel marketing.

Results	Mean	SD	Assessment Level
Perceived Usefulness : PU	4.01	0.68	High
Perceived Ease of Use : PEU	4.03	0.68	High
Attitude toward Using : ATU	4.06	0.65	High
Behavioral Intention : BI	4.01	0.71	High

The results in all aspects were at a high level. The aspect that received the highest score was attitude toward using, while the lowest score was perceived usefulness, and behavioral intention.

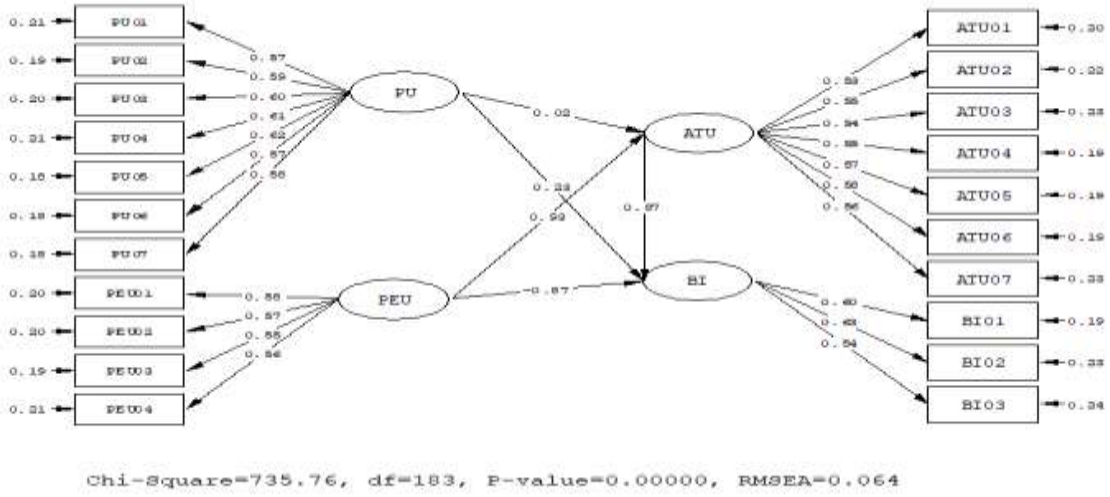

Figure 2 A behavior model of the intention to purchase organic vegetable through electronic commerce systems and multi-channel marketing before adjustment

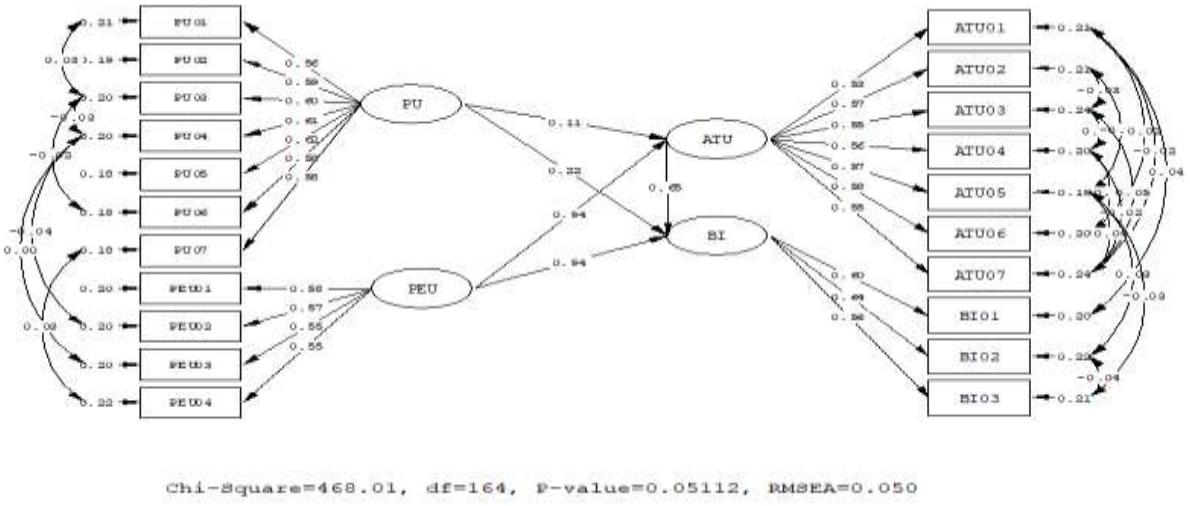

Figure 3 A behavior model of intention to purchase organic vegetable through electronic commerce systems and multi-channel marketing after adjustment

From the results of the index analysis used to verify the coherence and harmony of the model with the empirical data, the results of assessment show that χ^2 = 486.01, df = 164, χ^2/df = 2.85, RMSEA = 0.050, NFI = 0.99, CFI = 0.99, GFI = 0.94, SRMR = 0.02. The index shows that the new model has better empirical consistency since it is consistent with sufficient empirical data. The results of the analysis can be explained from the internal latent variables to the internal observable variables, and from external latent variables to observable variables as follows:

Table 2 The results of the analysis of the behavioral path analysis of organic vegetable purchases through electronic commerce and multi-channel marketing

	Attitude		**ATUa**	**Behavior Intention To purchase organic vegetables through multi-channel marketing Bia**		
	R^2 = 0.89			**R^2 = 0.95**		
	DE	**IE**	**TE**	**DE**	**IE**	**TE**
Perceived Usefulness PUa	0.11**	-	0.11**	0.22**	*0.02*	0.24**
	(0.10)	-	(0.10)	(0.14)	*(0.18)*	(0.13)
	6.62	-	6.62	14.11	*0.77*	16.64
Perceived Ease of Use PEU	0.94**	-	0.94**	0.94**	*0.05*	0.99**
	(0.02)	-	(0.02)	(0.03)	*(0.11)*	(0.03)
	20.06	-	20.06	23.10	*1.61*	24.68
Attitude toward Using ATUa				0.65**	-	0.65**
				(0.05)	-	(0.05)
				17.39	-	17.39

Values: EP = Estimation Parameter, (SE = Standard Error), t-value (*<.05, **<.01)
DE = Direct Effect / IE = Indirect Effect/ TE = Total Effect

The behavior of intention to purchase organic vegetables through multi-channel marketing was based on the overall influence of perceived ease of use (TE = 0.99), attitude (TE = 0.65) and perceived usefulness (TE = 0.24) respectively with a predictive power of 95 percent.

The attitude towards accepting technology in purchasing organic vegetables through multi-channel marketing was influenced by perceived ease of use (TE = 0.94), and perceived usefulness (TE = 0.11) respectively with had 89% predictive power.

The results showed that the behavior of intention to buy organic vegetables through electronic commerce and multi-channel marketing was directly influenced by perceived usefulness (TE = 0.11), perceived ease of use (TE = 0.94), and attitude toward using (TE = 0.65). However, the effects of indirect influence are insignificant to behavioral intention to purchase.

Table 3 Confirmative component analysis of behavioral intention to purchase organic vegetables through electronic commerce and multi-channel marketing

Matrix LAMDA - Y	**AVE =**	**0.63**	**CR =**	**0.84**
Behavioral Intention to purchase organic vegetable: Bia		**λy**	**t-value**	**R^2**
Prefer purchasing through e-commerce system: BI01		0.60	-	0.64
Regularly purchase through e-commerce system: BI02		0.64	23.44	0.65
Recommend others to purchase through e-commerce system: BI03		0.56	22.18	0.60
Matrix LAMDA - Y	**AVE =**	**0.59**	**CR =**	**0.91**
Attitude toward Using ATUa		**λy**	**t-value**	**R^2**
High flexibility and security ATU01		0.53	-	0.57
No difficult process ATU02		0.57	22.22	0.60
Save time ATU03		0.55	21.09	0.55
Reduce risks due to climates during the travel ATU04		0.56	22.31	0.61
The quality is similar or higher than products in general stores ATU05		0.57	22.47	0.62
Satisfaction with the product quality and price ATU06		0.58	24.25	0.62
Able to purchase from anywhere ATU07		0.55	20.40	0.56
Matrix LAMDA - X	**AVE =**	**0.61**	**CR =**	**0.86**
Perceived Ease of Use: PEUa		**λx**	**t-value**	**R^2**
Classification makes it easy to find the products: PEU01		0.58	25.49	0.63
Several channels allow users to access easily: PEU02		0.57	25.33	0.62
Easy procedure which is easy to understand and use: PEU03		0.55	24.78	0.60
Customers can search for information on organic vegetables that meet their needs in the sales channel: PEU04		0.55	24.27	0.58
Matrix LAMDA – X	**AVE =**	**0.64**	**CR =**	**0.93**
Perceived Usefulness PUa		**λx**	**t-value**	**R^2**
Customers can choose a channel to purchase organic vegetable as demanded: PU01		0.56	24.66	0.60
Customers can order organic vegetables at any place and time, which is convenient: PU02		0.59	26.06	0.64
Customers can find organic vegetables precisely: PU03		0.60	25.99	0.65
Ordering organic vegetables allows customers to know a wide variety of agricultural products: PU04		0.61	26.28	0.65
Customers can find the organic vegetables quickly: PU05		0.62	27.20	0.68
Customers recognize the benefits of organic vegetables: PU06		0.56	26.52	0.66
Customers can compare prices and the quality of the organic vegetables: PU07		0.56	26.27	0.65

The results showed that the intention to buy organic vegetables is a result of regular purchases through electronic commerce system ($\lambda y12 = 0.64$), while attitude toward using arises from product satisfaction, quality, and price ($\lambda y26 = 0.58$)

Causal variables show that perceived ease of use is based on the classification which makes it easier to find the product ($\lambda X11 = 0.58$), while the perceived usefulness is based on the ability to find

the organic vegetables quickly (λX24 = 0.62). The element weight values were also tested by convergent validity (AVE), which must not be less than 0.50, and construct reliability (CR), which must be greater than 0.60.

Summary and Discussion

1. Perceived usefulness and ease of use directly affects the behavioral intention to buy organic vegetables through electronic commerce and multi-channel marketing with statistical significance. The findings are consistent with Ozdemir et al. (2008), who suggested that the benefits of using technology and perceived ease of use compared with the complexity of innovative technology can lead to technology adoption. Hart, Heskett and Sasser (1990) proposed that entrepreneurs who perceive the benefits of an application or innovation tend to believe that such applications or innovation can increase productivity, efficiency, and profits for companies, agencies or their organizations. This leads to a strategy to do business in accordance with the amorementioned direction. In addition, Mangkonsila and Bureerat (2018), who studied customer relationship management for good feedback from e-commerce and social media in restaurant business, found that there was a large amount of information, knowledge through transactions in electronic commerce systems to build relationships and deliver products and services to meet the needs of users. Users who provide feedback can help business to have a competitive advantage and create a positive experience with their customers. This is also consistent with Vapeevuttikorn and Changchenkit (2021), who examined how digital marketing communications of online stores on Shopee affect consumers' purchasing decision-making processes. They found that ease of use can lead to efficiency, speed and cost reduction in various aspects of consumer purchasing decisions. The results of the qualitative research found that building awareness of digital marketing communications through search engine, digital media, advertising banner, social media, and word of mouth affect the purchasing decision process. Malaikaew (2018, p. 247) found that doing business in the fruit and vegetable market requires information as a guideline for entrepreneurs to improve products and develop marketing strategies to meet the needs of consumers and remain in the market in a sustainable manner.

2. Attitudes towards usage also affect behavioral intention to buy organic vegetables through electronic commerce and multi-channel marketing with statistical significance. Newstrom and Davis (2002) suggested that purchase intention is an expression of one's attitude or belief towards something, as well as an expression that is related to the action component. Also, it is a person's decision to choose or perform a behavior with a fixed mind direction and goals with a decisive effort to carry out the intended behavior. A person with a high commitment to perform a behavior is also more likely to exhibit the highly targeted behavior. However, the intent to perform this behavior will persist until the right opportunity and time. To achieve a positive attitude, Yadav and Singh (2014) suggested that good communication with customers by providing customers the opportunity to make a suggestion and give some feedback can lead to products or services development. Thus, online stores can effectively respond

to the needs of their customers. According to Sanlai, Thaweesuk and Sakrungpongsakul (2017), it was found that the acceptance of technology, perceived ease of use and attitude toward usage affected the tendency of intention to use online shopping service. Thanasarnsophon and Thaweesuk (2019) also found that technology acceptance in attitude toward usage ($\beta = 0.479$) significantly influenced Generation X's smartphone payment in Bangkok.

Recommendations

1. The results of the research revealed that the behavioral intention to buy organic vegetables through electronic commerce system is based on the ease of use due to the development of technology, followed by a positive attitude towards use. In contrast, perceived benefit is the least influential. Therefore, entrepreneurs who would like to sell organic vegetables through the electronic commerce system should focus on the key factors, especially the use of technology which allow easy access, as well as mobile friendly technology with fast loading. Moreover, creating an active engagement can encourage consumers to purchase the product from such channel, leading to product loyalty. Once customers have decided to buy products, they tend to use the channel they have used rather than finding new channels.

2. Entrepreneurs should focus on developing perceived usefulness which has been the least direct factor of intention to buy organic vegetables. It is necessary to improve the channel by choosing a channel to sell organic vegetables to meet the needs of customers. With this, customers would recognize the benefits of organic vegetables and be able to compare prices and the quality of the organic vegetables.

3. It is essential to integrate the technology from upstream to downstream since good attitudes can lead to engagement in behavioral intention. The study shows that such process still lacks perceived usefulness and ease of use. Thus, entrepreneurs should improve such process in order to create purchase loyalty.

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DEVELOPMENT AND APPLICATION OF VIRTUAL REALITY IN E-LEARNING: A CASE STUDY INTERNET OF THINGS COURSE

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Abstract

Studying of Internet of Things (IoT) allows students to understand the concept of computer systems that automatically read input and control smart devices. Using smart farm environment could be a good case study for IoT. Nevertheless, constructing physical smart farm could be problematic since it involves high budget allocation as well as the management, control and administration of the farm and devices. Developing a virtual environment that can depict smart farms could help solving this limitation. In this paper, we describe the process of getting requirements and developing smart farm virtual reality (VR) system. The system models smart farm device monitoring and management through a dashboard as well as allow students to learn their activities in the virtual environment in order to have a deep understanding on the concept of IoT. This research is funded by Research and Development Fund from the Office of the Broadcasting Commission television business and the National Telecommunications Commission (NBTC). The study result can be a guideline for virtual reality application development in other subjects and future study is also recommended.

Keywords: Virtual Reality, E-Learning, Internet of Things, Application

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Introduction

Electronic learning (e-Learning) is a distance learning system through the Internet. Students can study as if they were in a classroom without any restrictions on time and place. There is a concrete evaluation system. At present, educational institutions in higher education in Thailand pay attention and develop an e-learning system so that students can access the information they need conveniently, quickly and up to date at all times. Various multi-medias have been used as a medium for presenting lessons to make it interesting and learners can understand by themselves, such as pictures, sounds, animations, etc.

At the moment, media for providing electronic education using virtual reality technology (Virtual Reality: VR) is advancing, allowing for the creation of a simulated environment using computer technology. This enables learners to identify and interact with common display and input devices, such as computer screens, keyboards, and mice.

The Internet of Things Course is a course that requires learners to understand the interaction of electronic devices such as sensor technology that assists in reading and collecting data and computer systems that are responsible for processing interesting visualizations (data visualization) that aid in understanding the data in order to achieve automation and assist in decision making for more efficient management in various areas.

Virtual reality technology is being used to create media for providing electronic lessons for an Internet of Things course. It enables students to study, learn, and comprehend the system of numerous devices without having to visit to a physical location, hence minimizing the risk of mishaps and minimizing travel time. Additionally, students may evaluate their knowledge at any moment by logging into electronic classes and accessing instructional resources.

This research has applied virtual reality media in electronic learning in Internet of Things course provided by the Faculty of Engineering, Srinakharinwirot University (SWU) according to the project of “Development Knowledge Based Learning Center using Digital Technology” for the year 2019, funded by the Research and Development Fund from National Broadcasting and Telecommunications Commission (NBTC). Faculty of Engineering, SWU, selected this content to create smart dairy farm applications as a case study in teaching such subjects that can create a more learning experience for learners than the traditional media used today. Additionally, this application demonstrates how virtual reality technology may be used to create media for providing electronic courses for an Internet of Things course.

The NBTC and SWU hope that the digital technology learning center will help prepare and develop the potential of students who will step into working age to become effective national personnel ready for the country's further development.

Objectives

1. To promote the development of teaching materials, creating content for learning, and implement more innovation and creativity in digital technology to the digital economy.

2. To develop virtual reality (VR) media for smart dairy farms for using in teaching and learning the Internet of Things course.

3. To support the application of virtual reality technology into teaching and learning related to agriculture without the need to practice in the field.

4. To encourage students' self-learning, understanding both the theory and practices concretely and applying the knowledge gained from such content to further develop the country.

Literature Reviews

Virtual Reality (VR) is a term that refers to a computer-generated environment that enables users to be aware and interact as if they were in a real setting (Office of the Royal Society, 2019). The majority of perceptual features are visible through a computer screen or three-dimensional display device. The virtual world may be interacted with by users using ordinary importing devices such as a keyboard and mouse (Trakullertyot, 2016).

The benefits of virtual reality include saving time and money on travel to physical locations, avoiding the expense of purchasing expensive real-world equipment, reducing learning time in comparison to on-site practice, and remaining safe in life and property without having to confront a real-world situation (Srifa, 2019)

At the moment, virtual reality may be utilized in a variety of industries, including medical, exhibits displaying rare or large goods, entertainment and tourism, and educational institutions to aid in teaching and learning and to improve learners' learning experiences (Lertpradit, 2017; Phothong, 2018)

In the sphere of education, virtual reality applications assist students in comprehending difficult-to-understand topics. For instance, virtual reality is used in the Netherlands to take pupils on a farm visit. Additionally, students may see the farm area's condition and speak with the farm owner during class (Sakornwasee, 2019).

E-Learning

Electronic learning (e-Learning) is a learning model that uses content transmission through electronic devices and computer networks. Learners can study content from computer-based instructional materials that have been designed and developed efficiently (Laohacharasang, 2002). Students can learn through the electronic learning model by themselves without limitation. both in time distance and place (Vichean et al., 2019). There are many forms of media applications in electronic lessons, including text, images, video clips, and ready-made programs in order to help support self-learning (Kuchontara, 2016)

Virtual reality technology is now being applied in electronic lessons to encourage learners to be interested and understand the content more deeply. For example, Saekow and Prasertsueai (2015) conducted the interactive multimedia lessons on surfing the world of computer equipment for students majoring in Computer meanwhile Wituwinit and Saenraj (2016) developed virtual multimedia teaching media on the history of Ayutthaya architecture: a case study of Rama Temple.

Internet of Things: IoT

The Internet of Things (IoT) is the network of devices that exchange and share data over computer networks with little human intervention. The operating system comprises of intelligent devices, wireless networks, and dashboards that all work together to accomplish automation objectives (Digital Ventures, 2018).

The Internet of Things is capable of storing and processing data with high precision, so reducing the possibility of mistakes and increasing operational efficiency in a variety of industries, including manufacturing and production. Additionally, the Internet of Things may assist transportation and logistics management, health and medical information systems, finance, energy and utility management, and intelligent agricultural management (Thongkamwitoon, 2016).

Thailand is a place of agriculture. At the moment, there is rising interest in bringing the Internet of Things to agriculture, namely the construction of a smart farm system for lemon plantations in Phetchaburi Province utilizing the Internet of Things (Sri-Amnuai et al., 2019). Additionally, IoT was used to create a smart farm system with Gran-Monte Vineyard in Khao Yai and Chawee Chuan Foods Co., Ltd.'s eggplant farm in Wiang Pa Pao District, Chiang Rai Province (Smart farm (Thailand), 2020). Additionally, the Digital Economy Promotion Agency (DEPA) used an IoT short-term course to develop smart agricultural water systems.

Application of virtual reality media in electronic lessons for simulating the operation of the Internet of Things

Several technologies have been created in the past to incorporate virtual reality with electronic learning. However, there is a dearth of educational applications of virtual reality and the Internet of Things. Previously conducted research concentrated on the interaction of virtual reality media and items. For instance, the notion of the Virtual Environment of Things (VEoT) was established via the development of a campus navigation application that interacted with both real and virtual objects (Mohamed et al. al., 2019).

Research by Mohamed et al. (2019) applied virtual reality to the Internet of Things for electronic lessons on the measurement of ultrasonic waves in the air. The students scan the QR code of the selected gadget, and the software provides a three-dimensional view of the equipment's functionality (3Ds). Learners may engage with the app to evaluate device operation through distance learning, without requiring a physical device.

Until now, Internet of Things course in Thailand for distance learning has not made use of virtual reality media in teaching and learning (Akhad, 2020). As a result, the researchers saw the need to design a paradigm for teaching and learning that incorporates both technologies (IoT and virtual reality media) in order to use VR equipment and software to offer material via more realistic experiences. With the advantages of virtual reality technology, it will aid learners in comprehending instructional goals. Additionally, the development cost is not prohibitively expensive in comparison to the current development environment.

This research applied virtual reality media in electronic learning in Internet of Things course of the Faculty of Engineering, Srinakharinwirot University (SWU) according to the project of Development Knowledge Based Learning Center using Digital Technology for the year 2019, funded by the research and development fund, from National Broadcasting and Telecommunications Commission (NBTC) and Faculty of Engineering (SWU) selected content to create smart dairy farm applications as a case study that can create a learning experience for learners than the traditional media used today.

Research Methodology

Demand analysis

The development of virtual reality for Internet of Things teaching and learning can reduce the limitations of practical fieldworks. This research has chosen to develop teaching materials in the form of virtual reality for smart dairy farms. The content of the smart dairy farm that is used in the development of virtual reality media for teaching the Internet of Things course will be the form of environmental observation of the large-scale dairy farm system. However, there is inability to interact with the environment, and there is no sound effects and no data analysis. Also, the system has unique models: 1) the panel scene to show the values that occur in the farm in real time and 2) a large dairy farm system simulation scene with two-dimensional and three-dimensional forms, a low polygon, and a basic animation style. For the use on VR devices, the system is a stand-alone application on the Android platform only, it can be used with Oculus Rift devices or an equivalent device with the following learning objectives:

- To enable students to learn to apply digital technology and the Internet of Things into agriculture.
- To enable students to know the location sensor, pulse sensor, and temperature sensor and apply them into managing animals in the farm through the IoT system.
- To enable students to know water quality sensors and water level sensor and apply them into systematically managing farm water systems through IoT.
- To enable students to know the humidity sensor and light sensor and apply them into controlling the grass watering system in the farm through the IoT system.

For the system development cycle, there are steps as follows.

1. Planning: Meeting team members to understand the work style, data preparation, and content details according to course objectives.

2. Requirement: The Faculty of Engineering compiles and distributes information about the Smart farm's content needs to manufacturers.

3. Storyboard: The Faculty of Engineering has developed a storyboard format for the purpose of determining and planning the quantity and type of layout and materials in the content.

4. Concept: Following approval of the storyboard, the idea for content production in 3D space is established, and the user interface (UI) is constructed.

5. Motion Proto: Writing script and program based on user interface contents such as as creating assets and raycasting of assets, including dashboard animation.

6. Prototype: Bringing all parts together to create a prototype.

7. Testing: Testing prototypes by the system users.

8. Final Product: Delivering the final work and bringing it to the server.

Virtual reality media design

The virtual reality media design is organized into two major scenes: 1) the dashboard, which displays the farm's real-time statistics; and 2) the large-scale dairy farming system model.

- **Designing various relevant elements within a smart dairy farm**

1) Elements within the control panel are shown in Figure 1:

1.1) The figure shows the total number of dairy cows categorized by age: young cows are not yet ready for mating, young cows are ready for mating, cows are ready producing or lactating.

1.2) The figure shows the overall weather conditions: humidity of the air, soil moisture, and temperature inside the farm which is the average value from the sensors installed across the farm.

1.3) The picture depicts the farm's water system, the quantity of drinking water stored in tanks 1 and 2, the amount of water in the raw water well, and the quality of the raw water.

1.4) The figure shows detail of 1.1), 1.2) and 1.3) classified by farm area.

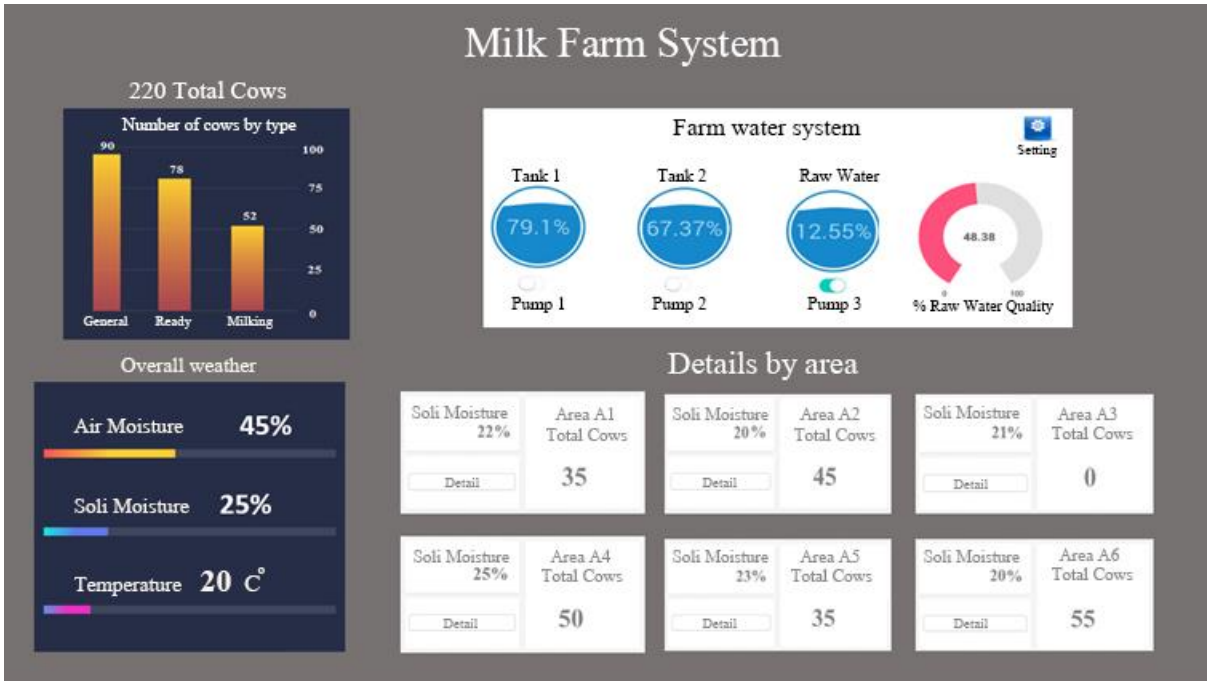

Figure 1 shows the control panel of a smart dairy farm

2) Other elements within the farm are:

2.1) Dairy cows are classified into three groups according on their age: cows who are not yet ready for mating, young cows that are ready for mating, and cows that are producing or nursing.

2.2) The sensor on the collar can monitor the heart rate and body temperature of dairy cows, as well as determine their present position in real time.

2.3) A soil moisture sensor is put in each region to determine the amount of soil moisture.

2.4) The tank's water level sensor is used to monitor the level of raw water and drinking water tanks for dairy cows.

2.5) Sprinklers are used on farms to irrigate the vegetation.

2.6) The pump is used to transfer water from raw wells to two tanks used to store drinking water and milk for dairy cows.

- **Farm scene design**

As seen in Figure 2, the scene within the dairy farm region is separated into six sections: A1 through A6. Each area is equipped with a soil moisture sensor that determines when it is appropriate to irrigate the grass. The soil moisture content was lowered by 2% per 1 hour, and the number of dairy cows in each location was determined. The following timetable applies to each area:

1) Areas A1 and A2 are designated as general greenhouses.

2) Area A3 is for dairies and dairy cows that are producing milk only. There are drinking water tanks and raw water sources.

3) Areas A4 to A6 are areas for releasing dairy cattle in the pasture.

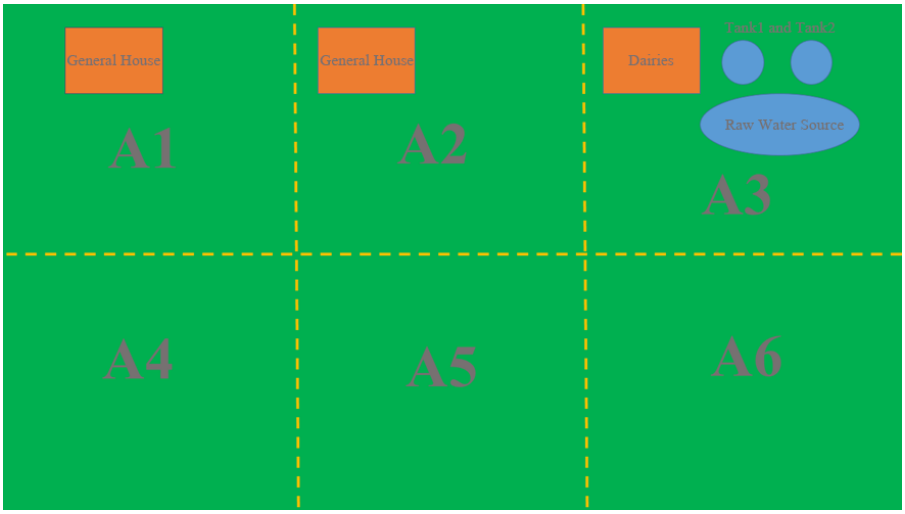

Figure 2 shows the division of the farm area

- **Management design within a dairy farm**

  Management design within a dairy farm can be detailed as follows.

1) All dairy cows are classified according to their age: young cows who are not yet ready to breed, young cows that are ready to breed, and producing or lactating cows. From the outset of the program, the life expectancy of each dairy cow is randomly assigned, and all dairy cows have sensors connected to their collars. The learners may use the dashboard to get detailed information about each dairy cow in each location. The information includes the dairy cow's code, its age, and its body temperature. If any dairy cow's body temperature exceeds 38.5 degrees Celsius, the control panel will illuminate that region with a warning light. When the student chooses to see the region, the computer determines which dairy cows had a body temperature more than 38.5 °C.

2) The collar contains cattle identification data, a central processor board, a heart rate sensor, a temperature sensor, and a location sensor. The learners may click on the collar to display facts about the software, as well as see the construction of the main processor board and sensor. Additionally, learners may observe the cow's location and zone on the control panel, as well as the cow's heart rate and temperature.

3) Water Management utilizes a water control system that is comprised of a central processor board and a water level sensor. The control panel indicates the quantity of raw water used and the volume of water in the tank. When water is pumped or sprinklers are opened to irrigate the farm grass, the amount of raw water in the well lowers. Each hour, the water level in the tank is dropped by 5%. When the water level in the tank is less than 15% of the tank's capacity and the raw water quality

is more than 40%, the program activates the pump placed in the raw water well. Water is pumped into the water tank until it is filled (100%). However, if the raw water quality falls below 40%, the control panel illuminates, and the water pump stops working. Concerning the determination of raw water quality, the learners may personalize it for testing the system by leaving out the pace at which the raw water in the well will be lowered and added.

4) The farm's land is split into six sections: Areas A1 and A2 are for general housing, whereas Area A3 is reserved for milking parlors and dairy cows that are actively producing milk; other dairy cows are not permitted to enter this area, and dairy animals in this area are not permitted to go to other areas. Additionally, sections A4 through A6 are designated for dairy cow pasture release.

5) In terms of soil management, the program shows the soil moisture value on the control panel. By reading the value from the sensor used to measure the level of soil moisture in each area, the soil moisture rate was reduced by 2% per hour When the soil moisture was less than the specified value (such values can be customized at startup), turn on automatic watering according to the sprinkler position.

Developing a virtual reality media prototype

For the smart farm virtual reality media model for teaching internet of things, there is a working procedure as shown in Figure 3.

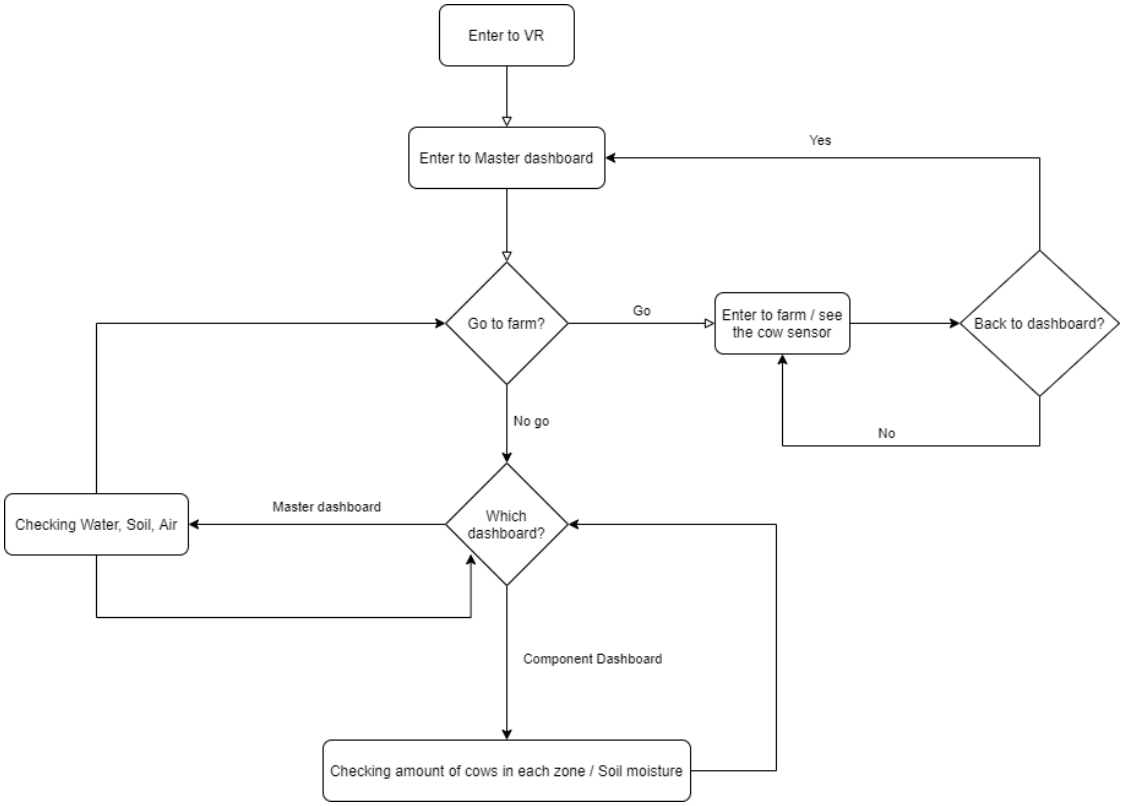

Figure 3 shows the working process of the virtual reality media prototype of the smart farm for teaching the Internet of Things

When a user signs in, the system presents the user with the primary dashboard (master dashboard), as seen in Figure 4.

Figure 4 shows the main instrument panel.

Users have the option of visiting or not visiting the farm. If users opt to visit the farm, the system will display the farm's atmosphere and dairy cows, as seen in Figures 5 and 6.

Figure 5 shows the environment and dairy cows on the farm.

Figure 6 shows the environment and dairy cows on the farm.

The sensor data attached to each dairy cow can be viewed as shown in Figure 7 and Figure 8.

Figure 7 shows a dairy cow in a sensor-equipped farm.

Figure 8 shows the sensor data.

If the users do not go to the farm page, they may return to the main dashboard to access the information. Also, the users may select between two sorts of sub-panels in this section: (1) a panel for viewing data on water, soil, and air quality; and (2) a panel for viewing data on dairy cows and soil moisture in each region, as seen in Figure 9.

Figure 9 shows a sub-panel for viewing dairy cows and soil moisture data for each section.

Conclusion

The construction of virtual reality media for the smart farm's Internet of Things course allows students to learn about digital technology's uses. Agriculture may benefit from the Internet of Things by providing a picture of the system without having to labor in the field. The user can learn about and apply positioning sensors, pulse sensors, temperature sensors, water quality sensors, water level sensors, humidity sensors, and light sensors to benefit various aspects of farm management, including farm animal management, water system management, and grass watering control, via an Internet of Things system. In conclusion, it was determined from the outcomes of system development and implementation in learning management that:

1. The virtual reality media system may be exhibited in any way that the user wishes. It is composed by two- and three-dimensional pictures. By adding more details to the farm's objects, it enables learners to have a more immersive learning experience from 360-degree view, which is controlled by rotating the head in the appropriate direction.

2. The utilization of virtual reality media technology for Internet of Things education provides learners with a novel experience. Additionally, it enables students to overcome physical barriers to accessing the actual environment of a smart farm without the institution investing in farm

construction and operation. This material assists learners in learning via the use of controls and body movement, which allows learners to comprehend the environment and develop knowledge of the course content as intended.

3. Learners may use the information obtained from using this technology to better successfully comprehend other Internet of Things-related topics

4. Virtual reality media technology provides learners with a new learning experience that is different from other types of technology media. The satisfaction survey of 30 learners revealed that were interested and impressed with the format of the media presented, with the students' satisfaction at a high level. In addition, learners provide additional comments for improving the existing environment in a system that requires further improvements such as audio and interactivity.

5. The study discovered issues with employing virtual reality technology with certain students who had motion sickness due to their unfamiliarity with the technology, including issues with the device's weight, which causes discomfort in the region where the device is worn. This is consistent with the study done by Ratanawijarn and Pongsanit (2016), who explain that continuous usage of the device may result in weariness and dizziness. Due to the nature of the graphic media and the device, the distance between the eyes and the screen on the glasses is only 5-10 centimeters. As a result, some users may find the system unsuitable for long-term usage.

Suggestions from study and for future work

The benefit obtained from this research is that the project of Development Knowledge Based Learning Center using Digital Technology, Srinakharinwirot University, can have assistants in teaching in engineering program focused on the Internet of Things course which the content is limited to only IoT. In addition, there are other limitations in terms of system requirements from the research fund which has determined the nature of the device and the nature of the intended content including the specifics that must be preliminary in order to construct the system within the stipulated time period.

However, smart agriculture is a modern farming method that makes use of numerous information technology to aid in enhancing agricultural efficiency and production, whether via increased productivity, resource conservation, or improved product quality. This also enables farmers to give nutrients in the optimal quantity and at the optimal time, as well as to guard and treat insect pests and disease outbreaks in animals in a timely way. Precision agriculture is the practice of this form of agriculture. The Internet of Things (IoT), big data, artificial intelligence (AI), and data science technologies are critical components of smart agriculture. To effectively profit from the development of virtual reality media for teaching and learning in the future, all relevant material should be included.

Additionally, future work should include case studies in additional subject areas, such as industry and business, as well as the use of technology to simulate situations such as fire detection and alarm, in order to provide a diverse range of learning content and adequately meet the needs of learners.

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THE IMPACTS OF THE COVID-19 PANDEMIC ON THE TOURISM SUPPLY CHAIN SYSTEM IN KRABI PROVINCE

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Abstract

The objectives were to study the strengths, weaknesses, opportunities, and obstacles of the tourism supply chain and to study tourism strategies in the tourism supply chain system during the Covid-19 crisis between January and March 2020. Samples were of 400 tourists and 30 Tourism Supply Chain specialists. Data collection was made through a questionnaire survey and in-depth interviews. The data analysis employed descriptive and inferential statistics as well as content analysis.

The results showed that the strengths of tourism supply chains in Thailand consist of 1) price compared to received services, 2) quality of serviced personnel and 3) quality of products or services, respectively. In terms of weakness, the issue includes communication styles in foreign languages. In terms of opportunities, the issues include 1) tourist destination reputation and beauty, 2) diversity of tourism activities, and 3) online media growth. Lastly, the obstacles include 1) attractiveness of tourist destination in other provinces, 2) lack of mutual support during supply chains, and 3) safety standards for tourists.

For the appropriate strategy in the tourism supply chain, the findings were as follows: 1) marketing communication should focus on local identity, 2) tourism personnel should be upskilled and reskilled, 3) technology to communicate via social media should be well considered, and 4) there should be a promotion on tourists' health safety standards. In addition, the future research is also discussed.

Keywords: Strengths, Weaknesses, Opportunities, Obstacles, Tourism Strategies

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Introduction

The present COVID-19 epidemic has had a profound effect on enterprises worldwide. It encompasses investment, economic growth, and commerce across all economic sectors, including manufacturing, real estate, and construction. McKibbin and Fernando (2020) advocated that the COVID 19 pandemic has impacts beyond mortality and morbidity since it also affects economic, for example, Chinese economy encounter the interruption to production as well as global supply chains. In Thailand, COVID-19 situation harms Thailand's economy, especially tourism economy, which was supported by the study of Tantrakarnapa, Bhopdhornangkul and Nakhaapakorn (2020) revealing that COVID-19 influenced tourism in Thailand. Both Thai and international tourists benefited from the enforcement and execution of central and local government regulations, the robustness of Thailand's health care system, the culture and social relationships, and the collaboration between different governmental and business sectors. Literally, tourism goods are value-added chains comprising various service components that originate from complicated interactions among a variety of stakeholders. The cross-cutting, interconnected, and fragmented character of tourist goods pushes enterprises to build ties with multiple industry stakeholders - suppliers, distributors, rivals, governments, and other companies - resulting in Tourism Supply Chains (TSCs) (González-Torres, Rodríguez-Sánchez, & Pelechano-Barahona, 2021).

Historically, Thailand placed a premium on tourist earnings. Foreign visitors numbered around 39,797,604 in 2019 and 3,810,155 in 2020. (Ministry of Tourism and Sports, 2019a). However, there was a decline in international travelers, particularly Chinese tourists, as China stated it would prohibit residents of Wuhan Province from traveling in and out of the country owing to the COVID 19 pandemic. This might result in Thailand receiving 3.71 percent of Chinese visitors. Additionally, it anticipated that this condition would last until May 2020. As a result, COVID 19 influenced the tourist industry sector, which will substantially influence the Thai tourism supply chain, including the airline, restaurant, entertainment, and hotel industries. Given the goals of the many businesses, good upstream and downstream relationship management and coordination within the supply chain are critical to achieving and sustaining competitiveness for the whole supply chain and its agents. (González-Torres et al., 2021). The continuous growth of the tourist sector necessitates activities that allow firms seeking to attain or retain a competitive edge to fulfill the ever-increasing client expectations. Consequently, they are faced with the issue of developing creative and, at the same time, more complicated tourism goods, the preparation of which frequently includes a number of organizations providing diverse services (Szpilko, 2017). As such, the study is concerned with examining the influence of COVID 19 on the tourist supply chain and developing practical advice to assist tourism entrepreneurs in operating their businesses. Krabi province was chosen as the research region due to its renown as a tourism attraction.

Objectives

1. To study the weaknesses, strengths, opportunities, and obstacles of the tourism supply chain system in Krabi province.
2. To study tourism strategies in the tourism supply chain system in Krabi Province.

Literature Reviews

Tourism Industry

The tourism industry is very large and complex in Thailand, comprising the manufacturing and service sectors. From upstream to downstream, the tourism industry is complex. The tourism supply chain also consists of different manufacturers and service providers. There is a relationship with each other both directly and indirectly. For tourism supply chains, Tapper (2004) defined it as the delivery of both goods and services to tourists. This is not just a tour guide, transport, or accommodation for tourists alone. However, it also includes the delivery of all activities to tourists, such as restaurants, souvenir shops, laundry services, and tourism-related infrastructure management for tourists, as shown in Figure 1. This is in line with Intojunyong (2020), which has studied the stakeholders in the tourism business into 6 groups: hotels and accommodation, travel agents, tourism management and public relations agencies, tourism entertainment and activities, food service activities and transportation business.

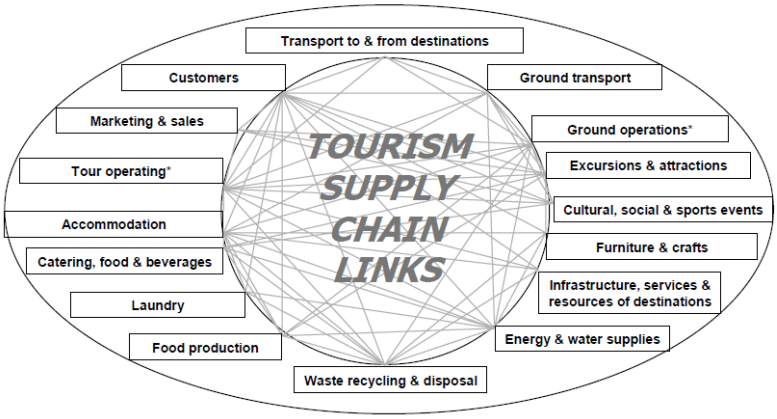

Figure 1 Composition and Connectivity in the Supply Chain System in the Tourism Industry (Tapper, 2004)

Tourism Supply Chains (TSCs)

Tourism Supply Chains (TSCs) refer to a network of tourism organizations involved in various activities ranging from the supply of various components of tourism products/services such as flights and lodging to the distribution and marketing of the final tourism product at a specific tourism destination. It brings together a broad group of people from corporate and governmental sectors (Zhang, Song & Huang, 2009). The tourist supply chain includes housing, transportation, and excursions, but also bars and restaurants, handicrafts, food production, trash disposal, and the infrastructure that supports tourism in destinations (Molefe et al., 2018). For components of the tourism supply chain,

Piboonrungroj and Disney (2009a) has divided the tourism supply chain into 3 phases, shown in Figure 2:

Phase 1 - Before the trip: This phase will include planning the tourism, contacting the hotel, booking a plane ticket, or contacting a travel agency. The information may be obtained from the travel service provider.

Phase 2 – During the travel period: The primary service providers will consist of hotels, accommodation, transportation types, restaurants, laundry, and tour guides.

Phase 3 - After the trip: The activities after the trip can include photo printing services, photo books production, and others.

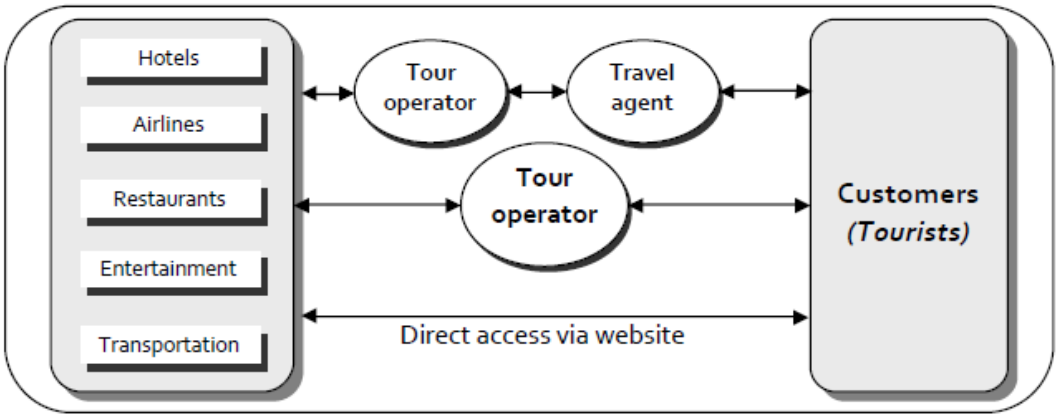

Figure 2 Intermediate Model in Tourism Supply Chain System (Piboonrungroj & Disney, 2009a)

There are three types of marketing intermediaries in the tourism industry in the supply chain (Piboonrungroj, 2009):

1. Tourists contact a travel agency, a business that accepts or sells travel packages created by tour operators in exchange for a commission. Alternatively, a travel agent may create a trip itinerary and offer it cheaply in certain instances. Allowing the travel agency to add different prices to the program allows the travel agency to deliver tourists who have already purchased the travel program to the tour operator. Including the tour operator to continue coordinating with tourism participants in the tourism program, such as owners of lodging, travel patterns, and restaurants.

2. Tourists have a direct touch with travel providers. After then, the tour guide business will look after the guests till the trip concludes.

3. Tourists plan their travel itineraries and communicate with numerous firms along the supply chain involved in the trip itineraries from start to finish.

For the study of the tourism supply chain system in Krabi province, it was found that entrepreneurs in the tourism supply chain system can be grouped into three major groups shown in Figure 3 as follows:

Group 1: Supportive businesses refer to businesses that support tourism, such as the Office of Tourism and Sports, Krabi Tourism Business Association, Krabi Hotel Association, Krabi Tourism Industry Council, and Tourism Authority of Thailand Krabi Office.

Group 2: Main businesses refer to businesses that provide direct services to tourists. It can include transportation business (by plane, car, and boat), hotel and accommodation businesses, restaurant and food business, tour service business, and tour guide.

Group 3: Related businesses refer to the businesses that can benefit from the tourism industry, such as souvenir businesses.

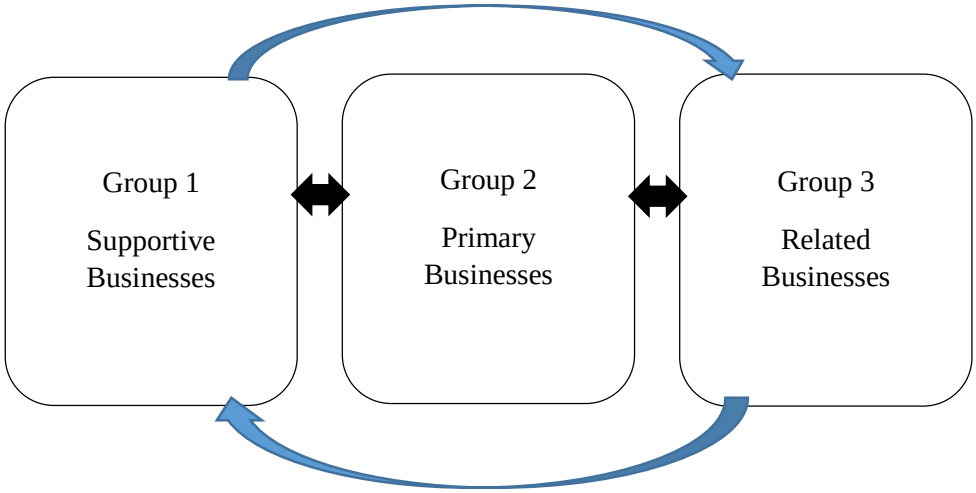

Figure 3 Tourism Supply Chain Model in Krabi

In Thailand, tourism supply chains relate to the tourism networks involved in the development of tourism activities from the start to the delivery of such services to visitors (Huang, Song & Zhang, 2010). Piboonrungroj (2009b) conducted a study of Thailand's tourism supply chain. They discovered that cooperation between hotels, suppliers, and tour operators occurs through information sharing, team formation, collaboration, human resource development, and the development of various technologies in order to reduce operating costs and increase operational efficiency and productivity. The tourist supply chain in Krabi Province comprises supporting businesses, primary businesses, and linked business groupings. It fosters collaboration via information exchange rather than consumer delivery, posing specific difficulties in tourism company management. Meanwhile, Palang and Tippayawong, (2019) studying about performance evaluation of tourism supply chain management in Thailand and found that there are 8 measurement including order process management, supplier relationship management, service performance management, capacity and resources management, customer relationship management, demand management information and technology management, and service supply chain finance. Also, Jermsittiparsert, Joemsittiprasert and Phonwattana (2019) indicated that factors including customer awareness and competitiveness can create sustainable supply chain performance in tourism industry of Thailand.

Research Methodology

This research employed mixed-method research approaches, including quantitative and qualitative approaches. The samples of this study were divided into 3 groups: 400 tourists using Cochran (1977) and 30 experts in tourism fields.

The researchers defined the variables used in the research as consisting of 2 groups: independent and dependent variables. Independent variables can be divided into two groups: the first independent variable group is related to tourist behavior covering Length of travel in Krabi province per time, traveling characteristics, total expense per time, and what expenses were mostly spent on each trip, and the second variable group is related to SWOT analysis covering strengths, weaknesses, opportunities, and obstacles of businesses that are in the tourism supply chain, namely the hotel business, restaurant business, transportation business, souvenir shop business. According to Phillip Kotler's approach, the strengths and weaknesses of tourism enterprises contain the value of the price and the perceived services, quality of service, communication and public relations with tourists, standards for cleanliness and safety of tourists. The aspects of opportunities and obstacles can include the beauty of tourist attractions, social media influence, Government tourism promotion policy, ecotourism trend (green tourism), COVID-19 economy, safety standards, tourist attractions in other provinces. The dependent variables include tourism personnel's skill upgrading, Thailand and Health (SHA) standards, cleanliness, safety and good hygiene, marketing communication with a new image, and communication technology usage.

The data was collected through a questionnaire survey and in-depth interview, which started from August 2019 until September 2020, a total period of 1 year. The data analysis contains descriptive analysis covering mean and standard deviation and content analysis. The detail shows in Table 1.

Table 1 Summary of research methodology

Objectives	Approach	Respondents/Informants	Tools	Analysis Method
1. To study the weaknesses, strengths, opportunities, and obstacles of the tourism supply chain system in Krabi province.	Quantitative approach	400 Tourists	Questionnaire survey	$\bar{X}$, SD
	Qualitative approach	15 Experts	Focus Group	Content Analysis
2. To study tourism strategies in the tourism supply chain system in Krabi Province.	Qualitative approach	15 Experts	In-depth interview	Content Analysis

Results

The SWOT analysis of the tourism supply chain system revealed that the most significant strengths of the supply chain system is that the tourism services are worth payment, service personnel have quality, and the goods or services are qualified.

From comparing the strengths of each business in the tourism supply chain, it is found that: 1) The value of the price concerning the services received by the business in the tourism supply chain with the highest average score was the hotel business, followed by restaurants, rental cars, and boat tours; 2) The hotel industry ranked highest in terms of service quality, followed by restaurants, rental vehicles, and boat trips; and 3) the service quality of workers in the tourist supply chain revealed that hotels received the highest rankings, followed by restaurants and souvenir stores.

Concerning tourism supply chain strategies, the researchers concluded SWOT analysis and TOWS matrix using data gathered from quantitative and qualitative studies, including questionnaire surveys and in-depth interviews from 15 experts. The result can be revealed as follows.

1) Matching strength (S) stating the value between the price and the received service with opportunity (O) stating reputation and beauty of tourist attractions, the expert proposed the strategies focusing on local identity marketing communication.

2) Matching weakness (W) stating communication skill improvement in a foreign language with opportunity (O) stating reputation and beauty of tourist attractions, the expert proposed the strategies focusing on tourism personnel's skill upgrading.

3) Matching strength (S) stating the value between the price and the received service with a threat (T) stating the beauty of tourist attractions from other provinces, the expert proposed the strategies focusing on communication technology usage through social media.

And, 4) Matching weakness (W) stating communication skill improvement in a foreign language with the threat (T) stating the beauty of tourist attractions from other provinces, the expert proposed the strategies focusing on Thailand and Health (SHA) standards.

Discussion and Recommendations

After conducting a SWOT analysis on the views of tourists, it was determined that the supply chain's strengths were value for money with received service, the quality of serviced employees, and the quality of products or services. This is consistent with Srithongphim (2017) findings, who examined Thailand's tourism supply chain system and discovered that the value for money and received services are a strong point for tourism in the country. Therefore, Governments should take a counter-cyclical role in assisting firms in mitigating the impact of economic shocks.

According to the study findings, most SMEs in Thailand give visitors items or services with good values based on the price supplied, rather than emphasizing high quality or premium services. Concerning the tourist supply chain's weaknesses, it was determined that the primary issue in Krabi was the growth of communication through other languages. This is congruent with the findings of

Wong et al. (2014), who conducted a SWOT analysis of medical tourism destinations in Malaysia, Thailand, Singapore, and India and discovered that Thailand's tourism issue is related to foreign language communication.

For opportunity analysis, Krabi's tourism supply chain system is comprised of the renown and attractiveness of its tourist attractions, a diverse range of tourism activities, and the expansion of online media. Additionally, the hazard component indicated the allure of tourist attractions in neighboring provinces and a lack of mutual support for the tourism supply chain's safety requirements. These research results are consistent with a study conducted by Business Monitor International Ltd., which determined tourism opportunities in Thailand. The results show that it can benefit from the country's beautiful natural resources and fascinating culture and the obstacles to tourism in Thailand, which include the attractiveness of tourist destinations in neighboring countries and a lack of safety standards for foreign tourists.

By studying tourism strategies within the tourism supply chain system in Krabi Province, the research identified four tourism strategies: 1) marketing communication that emphasizes local identity, 2) tourism personnel development, 3) communication via social media, and 4) health safety and hygiene standards. The study's findings are consistent with the implementation guidelines for Krabi Province's growth from 2018 to 2021, which emphasize the importance of green tourism to boost Thai tourism's capacity to reach international standards and link regional and worldwide tourism. The study result also is in line with the study done by Palang and Tippayawong (2019) revealing that order process management, supplier relationship management, service performance management, capacity and resources management, customer relationship management, demand management, information and technology management, and tour finance supply chain can benefit the tourism supply chain for Thai tourism industry. Also, Tantrakarnapa, Bhopdhornangkul and Nakhaapakorn (2020) supported that to help Thailand's tourism industry during COVID 19, organizations and individuals can work together to improve regulation enforcement and implementation, public awareness and communication, information updates and distribution across the country, and medical and health personnel preparation and hard work.

From the above solutions, it is just a short-term measure that entrepreneurs can maintain stability and survival in the tourism industry. Even though the tourism drop situation is expected to resolve sooner, the epidemic situation is expected to continue to exist in a county. Therefore, the tourism entrepreneurs in the supply chain will have to rely on the government to come up with more measures to support tourism, such as tax reductions, financial assistance measures, loan interest deduction, and others. A deliver public funds on favorable terms, particularly to businesses with low financial solvency that may struggle to obtain a loan from a commercial bank. To that end, the credit guarantee plan designed to help businesses affected by the pandemic should be appropriate, covering up to 100 percent of new loans and renewal procedures. Thus, for the measures to be effective, coordination must involve the alignment of the goals and interests of the commercial and government banks. These organizations

must fully and authentically explain the benefits of public guarantees to the enterprises (González-Torres, et al. (2021).

As a result, future studies can focus on effective subsidy measures provided by the government affecting tourism business recovery. In addition, the other measures such as technology service provision, knowledge access, heath safety standard and practices, and business networks with other countries should be examined, leading Thai tourism entrepreneurs and enterprises to gain better performance.

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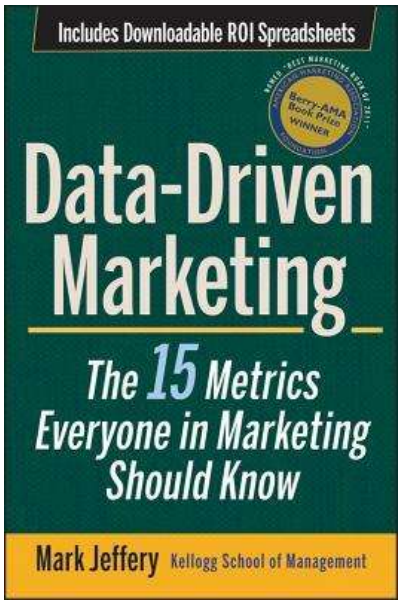
BOOK REVIEW

DATA-DRIVEN MARKETING: THE 15 METRICS EVERYONE IN MARKETING SHOULD KNOW



Author: Mark Jeffery

Reviewed by: Jiaxun Li[1]

The author has divided the content into 4 parts. The first part shows many opportunities. Caused by the data from the subject matter that most people overlook and invisible. The second part will talk about data storage and how we can get data from and how. The third part will talk about the use of social media. To keep it and continue to use it easily as a method that does not require much investment. But it takes creativity. The last part is the tools to access the data that are immediately available. Even without its own data when the reader has read the contents of this book. Can act immediately do it until you see good results and also get inspiration in doing many more.

There are a lot of data and numbers in the book, and beginners need to spend a lot of time to read and understand. Most of the content of this book is to show how to use data to increase revenue, reduce costs, and expand business goals.

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But this book is also very broad. It talks about the hygiene of marketing activities-including the establishment of sound operational processes to continuously organize, analyze and expand your marketing methods; and teach you how to obtain support from decision makers or investors to help achieve your marketing goals.

This book helps marketing practitioners think about data and processes in terms of tactics, strategy and even philosophy. It is an excellent primer for marketing. It is very instructive, with a large number of case studies, figures, tables and charts, showing 15 key indicators, including brand awareness, CLTV, IRR, NPV, etc., and how to accurately cooperate with each indicator to achieve business Good results for the target.

The part of this book on the Internet is not in line with the current status of the Internet. It is very focused on search engine marketing, but the content about social media marketing like Facebook is very basic and limited to the early understanding of Facebook. This book is very good at using measured value as the reason for the work of marketers in driving the success of the company's business goals, but readers still need to think creatively and competitively what these marketing solutions are.

The reading time of this book must be more than 30 days, and about a week is not enough to fully understand all the contents of this book. It also requires a certain amount of knowledge reserve for a large number of proper nouns, and a large amount of literature and information must be consulted to understand it.

This book should not be missed. The most important reason is that this book is based on the new research of the Kellogg School of Management, which clearly and convincingly guides the use of more rigorous data-driven strategy methods to obtain significant performance benefits from marketing. It is not written in a compelling style, but that's not why you'd buy it anyway. A lot of the maths and ideas were over the reader's head but explained in summary at the end of each chapter, so the reader wasn't left completely in the dark. This books gives an overview of some of the most important real-world applications of accounting, data mining, graphical analysis, statistics, and marketing. At the end of the book, you'll have zeal to capture data. After all this book is about data-driven marketing. The book goes over differing marketing activities, evaluation marketing, demand generation marketing, loyalty marketing, trial marketing, awareness marketing, and more. Really, at the end of the book, you'll have a good overview of the state of the art. If you want to deep dive on the individual components to become a subject matter expert, save your time and study math, statistics, accounting, data mining,

algorithms, and basic computer science fundamentals. On the other hand, if you just want to get a good overview, this is a great start.

In the new era of tight marketing budgets, no organization can continue to spend money on marketing without knowing what is effective and what is wasted. Data-driven marketing improves the efficiency and effectiveness of marketing expenditures within the scope of marketing activities, from brand and visibility, tracking and loyalty to new product launches and Internet marketing. Regardless of whether the reader is developing a marketing strategy in a large or small company, the data analysis in this book and the 15 key indicators that every marketer should know will give the reader a clear idea to operate.