Business Guidelines for Environmentally Friendly Plastic Industry in The Digital Era

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Abstract: At present, the total revenue of plastic production in the plastic industry is continuously decreasing. The purpose of this study was to investigate the business practices of the environmentally friendly plastic industry in the digital era and then develop it into a structural equation model. Then it was developed into a structural equation model. Both qualitative and quantitative methods were integrated into this research. The quantitative data were collected with questionnaires from 500 executives of plastic industry businesses. Descriptive, referential, and multivariate statistics were used to analyze the data. It was found that there were 4 components prioritized as follows: 1) Marketing Orientation ($\bar{x}$= 4.28), 2) Innovation ($\bar{x}$= 4.17), 3) Resources ($\bar{x}$= 4.15), and 4) Business alliances ($\bar{x}$= 4.15), respectively. The detailed item found most important in each element was: explore new markets for environmentally friendly plastic products to expand business opportunities, study and develop new raw materials durable for reuse, provide a process of using used plastic products to produce new products to add value, and collaborate with various business groups to improve practice guidelines under the concept of 3R to be environmentally friendly. As for the hypothesis testing, it was found that small, medium and large businesses differently recognized the importance of the studied guidelines at the statistical significance level of 0.05. The analysis of the developed structural equation model revealed that it passed the assessment criteria and was consistent with the empirical data. The calculated values of the probability of chi-square, the relative chi-square, the index of consistency, and the root mean squared error of approximation were 0.101, 1.128, 0.960, and 0.016, respectively.

Key-Words: Structural Equation Model, Plastic Industry, Environmentally Friendly, The Digital Era

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1 Introduction

An international issue, plastic waste has an impact on both land and marine areas. It is an important issue that has to be resolved and is a significant barrier to Thailand's and the ASEAN region's efforts to manage plastic waste. According to the Sufficiency Economy's guiding principles, the Thai government has set a goal for Thailand to be a stable, successful, sustainable, and developed nation during the course of the next 20 years (2018–2037). Additionally, in order to develop all sectors to move in the same direction towards the Sustainable Development Goals (SDGs) to create good environmental quality, reduce pollution, and reduce the impact on people's health and the environment, the government has also developed a national strategy for building growth on the foundation of an environmentally friendly quality of life through organizing a conservation system, including restoring and preventing the destruction of natural resources. On the basis of the nation's rankings for sustainability and sustainable progress in quality from 2018 to 2037, the Environment Performance Index (EPI) aim was established. The goals are to fall below the top 50 countries in the globe from 2018 to 2022, the top 40 countries from 2023 to 2027, the top 30 countries from 2028 to 2022, and the top 20 countries from 2033 to 2037, respectively. Thailand falls short of the desired position, coming in at 108 out of 180 countries, according to a 2022 poll, [1] [2].

Fig. 1: Thailand Environmental Performance Index target values from 2018–2037, [2].

Fig. 2: the number of liquidations in the plastics manufacturing industry, [3].

After the creation of legislation to minimize the quantity of plastic waste in the nation, the amount of plastic output typically declines. This is consistent with the downward trend in production volume seen in the plastics sector.

Figure 2 shows that there are more liquidations now than there were before in the plastics manufacturing sector. As a result, the plastics industry must make adjustments and utilize technology to grow businesses and advance in the digital era. For example, encourage the recycling of plastics, the use of bioplastics, and the use of more alternative materials to emphasize the development of the plastic industry and the use of technology that can strengthen it and promote sustainable coexistence with the environment.

The plastics sector must adapt to this transformation in order to deal with the aforementioned problems. In order to establish an industry that is both environmentally and socially responsible, the researcher is interested in examining the research project titled "Business Guidelines for Environmentally Friendly Plastic Industry in The Digital Era." Including the plastics sector firm, which will be able to maintain its operations if it can coexist peacefully and sustainably with society and the community.

1.1 Research Objectives

1) To research the elements of the eco-friendly plastics industry's business practices in the digital era.

2) To develop a structural equation model of the eco-friendly plastics industry's modern business procedures.

2 Literature Review

2.1 Plastics

Plastic is a term for synthetic organic compounds that hardens when cold and softens when warm.

Artificial rubber is used to create items like clothing, film, containers, boat or automobile parts, etc. Some are permanently toughened, such as nylon, [4]. Based on their intended functions, plastics can be divided into two groups: 1) Thermoplastics, which melt when heated and stiffen when cooled. Grocery bags, food cooler bags, often opened bottle caps, and food containers can all be multiple times annealed; 2) Thermosetting can be melted into a mold. It can only be used once, and when heated or compressed, it undergoes a chemical transformation that is visible in things like household item handles, coating materials, adhesives, etc., [5].

2.2 Concepts and theories Related to Market Orientation

A key tenet of successfully executing contemporary marketing strategy management is the market focus notion, [6]. And what drives action in the company's marketing regarding the needs of both current and potential customers is the use of marketing principles or their integration with a customer-centric approach, [7] . The value of market orientation is recognized in contemporary marketing plan management. It consists of three parts: a competitive focus, a customer focus, and an internal cooperation collaborative focus, [8]. Additionally, brand performance and image are impacted by market orientation, [9]. As a result of a response that considers the needs and the market environment and makes the organization adaptable, the customer receives a cost-effective product, [10].

2 . 3 Concepts and Theories Related to Business Alliance

Business alliances are agreements between two or more organizations or firms to operate a business together in order to meet each other's business needs and accomplish predetermined objectives, [11]. The costs and advantages of business partnerships are the major considerations for firms. There are four different sorts of alliances: 1) An ad hoc pool is a brief-term joint venture in which shares are allotted in accordance with prior agreements. 2) The consortium is where businesses or organizations enter into agreements or delegate duties in a more organized way. 3) A group of business partners known as project-based joint ventures uses a minimal number of resources to develop a strategic value business and to evaluate the effects of venture capital investments. 4) Full-fledged joint ventures are ongoing business partnerships. Business alliances are able to adjust when new events happen and will continue to support investment and resources in manufacturing, [12]. The stakeholders in the company are also benefited from the development of strategic alliances. It is separated into two categories: 1) Outsourcing the knowledge to have the business outsource production and services. This plan can shift risks while lowering organizational costs. 2) Joint Venture, which is a partnership between two or more companies to establish a new firm to carry out operations in a certain area by entering into agreements between them. Its primary goal is to jointly invest in and integrate resources including money, technology, people, knowledge, operations, etc., [13].

2 . 4 Concepts and Theories Related to Resources

Resources are assets that belong to each organization, both tangible and intangible, [14]. Strategic management for organizations is governed by the Resource-Based View (RBV) theory. Its fundamental objective is to use the organization's knowledge and resource skills to develop new products and make changes to existing ones in order to acquire a competitive edge. It has four characteristics: 1) Valuable resources that add value to a company in a situation where it is necessary to employ both its assets and liabilities to seize chances and get rid of barriers. 2) Rare resources, i.e., those with few rivals. The value of a resource will decline if competitors have access to it. 3) Imperfectly Imitable resources are those that are difficult to duplicate or would be expensive to reproduce, and 4) Non-substitutable resources are those with unique qualities that provide them with a competitive edge. In other words, it stops rivals from producing comparable resources, [15]. Additionally, in order to optimize profit, hiring firms should share all the resources needed for their operations. The majority of the resources required consist of machinery, apparatus, and facilities. Corporate data, such as descriptions of current issues, client details, claims or complaints, numbers, or statistics, however, are what matter the most. Moreover, to conduct reliable analysis, it is essential to provide important data, [16].

2.5 Concepts and Theories Related to Innovation

By leveraging current resources or developing new ones, innovation is a crucial organizational tool for increasing business competitiveness, [17]. Additionally, it is the realization of concepts in

order to produce new items or methods, [18]. At the national level, innovation contributes to competitive advantages. As a result, in order to bring knowledge and creativity to produce new ideas that match the needs of the market, it is essential to encourage human resources within the business to be creative and to be able to develop technology to advance, [19]. Three categories are used to categorize innovations: 1) New Market Creating Innovation that opens new markets for nations that lack goods and services or do not have access to them; 2) Sustaining Innovation involves improving already-available goods and services. Existing customers who want a better good or service make up the bulk of the market. Additionally, companies can operate with fewer resources when they use effective innovations. 3) Market Creating Innovation gives a group of individuals access to goods or services that they would not otherwise have had. A new market with a larger basis than before is now opening, [20]. Three categories can be used to categorize innovation: 1) Product Innovation, which involves developing new products or improving existing ones; 2) Process Innovation, which involves developing existing operations or designing entirely new ones; and 3) Business Innovation, which is an innovation used to alter the market in response to consumer demand, [18].

3 Research Methodology

3.1 Composition Synthesis

The theories and concepts lead to the conclusion that the market orientation, business alliance, resource, and innovation components, as illustrated in Figure 3, can be used to categorize the business practices of the environmentally friendly plastics industry in the digital era.

3.2 Population and Sample

The population used in this research was 4 ,2 6 8 industrial businesses that received Green Industry Certification from the Department of Industrial Works, [2 1] , or were represented by a group of executives or environmental representatives in large industrial enterprises with more than 2 0 0 employees, and a group of executives or environmental representatives in organizations of small and medium-sized industrial enterprises with a number of employees not exceeding 200, according to the Ministerial Regulation on the number of employment and fixed asset value, B.E. 2545, [22], for which Comrey and Lee defined the sample size of 500 very good samples, [23], comprising 250 from small and medium-sized businesses and 250 from large businesses, respectively.

3.3 Research Tools

The research tool was a rating scale questionnaire with five criteria for determining the weight of the evaluation using the Likert method, which gave respondents the option to make the best decision, [24]. Then, five experts with knowledge and experience in the field were given the draft questionnaire and the assessment form to review. This was done to determine the tool's quality by looking at the Index of Item-Objective Congruence (IOC). IOC values between the question and the research objectives ranged from 0.60 to 1.00, with a preferred value of 0.50 and higher, [25]. The questionnaire was then evaluated (Try-Out) with a population of 30 people representative of the study's population in order to identify any discrimination. Standard Deviation was used to estimate the checklist and scaled questions (SD). By using correlation coefficient analysis and questionnaire

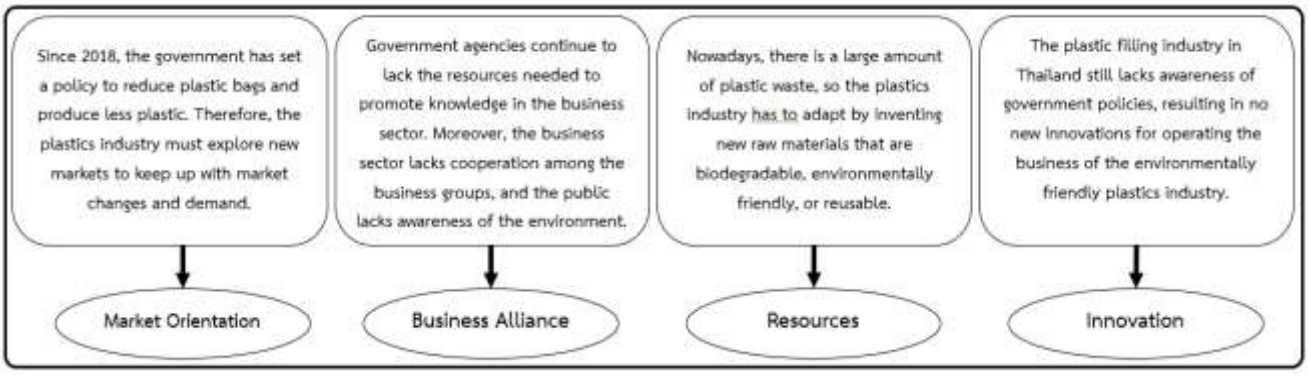

Fig. 3: Conceptual Framework

reliability, scaled questionnaires were estimated; the discriminant index ranged from 0.35 to 1.46. The overall confidence score for the questionnaire was 0.98; a score above 0.9 was regarded as being at a very good level, [26]. After that, use the tool to gather data by asking the sample to complete the survey.

3.4 Data Analysis

Both descriptive analysis and statistical analysis using SPSS were used in the content analysis. Multiple statistical analyses and the construction of the structural equation model were conducted using the Analysis of Moment Structure software package (Analysis of Moment Structure: AMOS), and the data-model fit was assessed using the following four criteria: 1) Greater than 0.0 Chi-square probability, 2) Relative Chi-Square less than 2.00, 3) Greater than 0.90 Goodness of Fit Index (GFI), and 4) Root Index of the Squared Mean of the Approximation Error Less Than 0.08 are all requirements, [27].

4 Results

1) Analysis of the Market Orientation components found that focus on the market, which is at a high level in the overall median ($\bar{x}$ = 4.09). When considering each aspect, it was found that the survey of new markets for environmentally friendly plastic products and goods for expanding business opportunities which is at a high level in the overall median ($\bar{x}$ = 4.28).

2) Analysis of the Resources components found that entrepreneurs focus on resources, which is at a high level in the overall median ($\bar{x}$ = 4.06). When considering each aspect, it was found that there was a process that uses used plastics to create new products with added value, which is at a high level in the overall median ($\bar{x}$ = 4.15).

3) Analysis of the Innovation components found that entrepreneurs focus on innovation, which is at a high level in the overall median ($\bar{x}$ = 4.04). When considering each aspect, it was found that there was a study and development of new raw materials used in the production of plastic products and products that are durable to reuse, which is at a high level in the overall median ($\bar{x}$ = 4.17).

4) Analysis of the Business Alliance found that entrepreneurs focus on business alliances, which is at a high level in the overall median ($\bar{x}$ = 4.02). When considering each aspect, it was found that there is a cooperation between business groups to develop guidelines to improve products or processes under the concept of 3R (Reduce, Reuse, Recycle) to be environmentally friendly, which is at a high level in the overall median ($\bar{x}$ = 4.15).

Table 1 shows how important business practices are to the environmental plastics sector as a whole in the digital era. When the business size was taken into account, there was a statistically significant difference at 0.05.

In order to develop a structural equation model, it is necessary to first reprocess the model by removing some incorrect observational variables one at a time while taking into account the modification indices and the value of the result from the packaged program. Continue doing this until the model contains each of the four statistical values: Among other metrics, there are the following: 1) Chi-square Probability Level (CMIN-p); 2) Relative Chi-square (CMIN/DF); 3) Goodness of Fit Index (GFI); and 4) Root Mean Square Error of Approximation (RMSEA).

5) The findings of the objective analysis conducted to determine the components of the business practices used by the environmentally friendly plastics industry include four elements: market orientation, business alliances, resources,

Table 1. The statistical value used to compare the importance of business practices components of the environmentally friendly plastics industry in the digital era is classified by industry business size overall and by sector

Elements of business practices in the environmentally friendly plastics industry in the digital era	t-Value	P-Value
The level of importance of the overall composition	-6.59	0.00*
Market Orientation)	-5.69	0.00*
Business Alliance	-5.22	0.00*
Resources	-5.62	0.00*
Innovation	-7.64	0.00*

and innovation. All four elements came from the analysis of pertinent literature. In accordance with the literature and empirical data that met the required standards, as shown in Table 2 and Figure 4, it appeared that the empirical data was consistent with p-value = 0.101, CMIN/DF=1.128, GFI = 0.960, and RMSEA = 0.016, which was statistically significant at 0.001.

Table 2. Observational Variables of Business Guidelines for Environmentally Friendly Plastic Industry in The Digital Era

Abbreviation	Business Guidelines for Environmentally Friendly Plastic Industry in The Digital Era
Market Orientation	
MKO2	Forecast the trend of environmentally friendly plastic instead of general plastic in the market to design new products.
MKO5	Explore opinions and market demands on the use of environmentally friendly plastics for production planning.
MKO6	analyze internal and external situations in order to adapt environmentally friendly plastic product design strategies.
MKO12	received "green label" certification to demonstrate the use of environmentally friendly plastics.
MKO16	Make marketing materials (Content Marketing) by making a story of environmentally friendly plastic products.
MKO20	Exchange of knowledge between the marketing department and other departments about customer needs for new products.
Business Alliance	
ALN5	Clarify details or rules for working together, and communicate with one another if problems or doubts arise.
ALN7	Join government agencies in promoting the infrastructure needed for waste sorting systems.
ALN10	Use all channels of social networks to coordinate with the network to build strength and continuity.
ALN19	Organize activities to exchange knowledge within the network about the process of handling plastics after use.
ALN21	Encourage employees to exchange knowledge with relevant departments to benefit the organization and apply policies to the organization.
Resources	
RCS3	Provide channels to communicate information about personnel development, such as circular notices, intranets, and public relations boards.
RCS6	Create a culture of building environmental awareness among personnel.
RCS15	Set up a system to remind about the maintenance of the machinery at the specified time to reduce the loss of production.
RCS19	Plan the use of resources in the organization, both short-term and long-term, to support resource allocation to meet demand.
RCS20	Create a process for reusing used plastic to make new products that add value to existing ones.
Innovation	
INN1	Create an effective knowledge management system to be used as information for organizational innovation.
INN3	Create an agency to study foreign innovation information to look for new opportunities and lead to research and development in Thailand.
INN9	Study and develop new raw materials used in the production of durable plastic products and products to be reused.
INN14	Manage innovations that receive new innovations from abroad to enhance the capabilities of innovators.
INN23	Provide clear performance indicators for innovation.
INN25	Use feedback from customers' responses to research and develop plastic innovations that are modern and meet the needs of reducing the use of plastic bags.

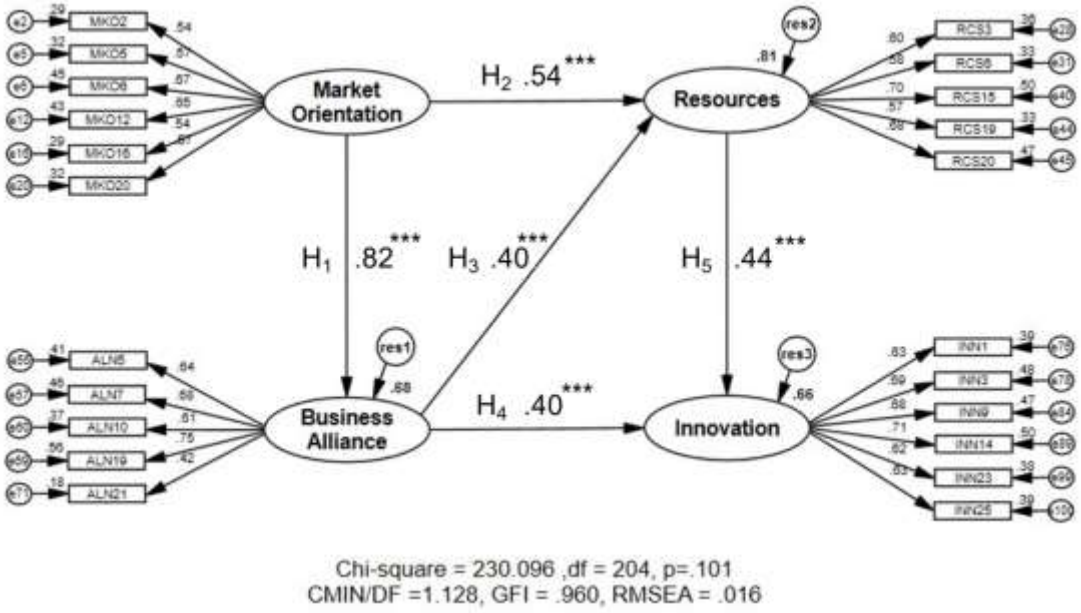

Fig. 4: Represents the structural equation model relationship path (Source: prepared by the authors)

In standardized estimate mode, Figure 4 displays the findings of the analysis of the overall influence of latent variables in the business model equation model for the environmentally friendly plastics industry. After the model was improved, it was discovered that the market-focused component, which had a standardized regression weight of 0.71, had the most overall impact on the innovation component.

5 Discussion and Conclusion

The research results can be concluded by using descriptive statistics and structural equation modeling, as follow:

1) The component of market orientation had a direct impact on the composition of the business alliance, according to the standard regression weight of 0.82 with a statistical significance level of 0.001, which demonstrates empirical data that is consistent with Han and Kang's research on the market focus component orientation that can lead to market uncertainty due to demand volatility and fierce business competition, [28]. In other words, market uncertainty affects business partners, and in this situation, business alliances are made, especially with organizations that have the marketing know-how and expertise to profit from the hedging of the plastic resin price war. Kurniawan et al.'s research indicates that, [29], the market frames business partners to simplify procedures and boost organizational effectiveness. This is one of the factors that encourage business partnerships in order to maintain and grow a company. And also, it is in accordance with the research of Farooq and Vij, [30], that said Marketing-focused development requires customer orientation, competitor direction, and marketing links, which many organizations tend to overlook.

2) The Market Orientation component directly influences the resources component. The standardized regression weight was 0.54 with a statistical significance level of 0.001, which is in accordance with the research of Zhao et al., [31], that said exploring new markets can use social media and social networks for marketing and want to optimize marketing strategies. And it is also in accordance with the research of Nurhilalia et al., [32], that said the coordination between departments can take place until marketing efficiency is improved. If SMEs in the silk business focus on competition, customers, and complex innovation orientation according to Resource-Based View (RBV) theory, and Structure-Conduct-Performance (SCP) theory that provides an overview of resource optimization strategies for silk traders to implement strategic steps, including using digital technology to access marketing strategies and the need for promotion to reach a wider market and consumers in order to gain a competitive advantage in the future.

3) The Business Alliance component directly influences the resource component. The standardized regression weight was 0.40 with a statistical significance level of 0.001, which is in

accordance with the research of Golmohammadi et al., [33], which includes studying cooperation between sellers and buyers in order to improve the efficiency of sellers to improve product quality, reduce costs, and increase the ability to increase profits for members. The results of this study revealed that seller development programs are widely implemented in various industries by striving for collaborative efforts between sellers and buyers through a seller-related strategy as follows: 1) wholesale price adjustments; 2) investment share payment; and 3) investment control, all three of which are related to corporate resources. It is also in accordance with the research of Peterman et al., [34], which aims to explore the role that multisector organizations can accept in sharing knowledge through partner networks to support sustainability. The research examines stakeholders from US government agencies whose research labs are funded by the federal government, private companies, and trade associations. Research has found that managing environmental and social challenges is too much of a responsibility for any organization due to policy, organizational, and innovation obstacles. Therefore, the researchers proposed a framework in which different organizations play different roles in the partner network depending on the organization's resource objectives and the relationship between the partner members. If the alliance has a similar pattern, it results in the alliance sharing knowledge that focuses on sustainability, sharing technology, and allocating resources to reduce costs.

4) The Business Alliance component directly influences the Innovation component. The standardized regression weight was 0.40 with a statistical significance level of 0.001, which is in accordance with the research of Ybarra and Yurk, [35]. The results show that to compete effectively in a changing environment requires innovation to stay competitive and to build partnerships, which are powerful tools that reach customer needs. Moreover, it is also in accordance with the research of Ferreira et al., [36], which said that integrating knowledge acquired from partners to develop new knowledge could increase the effectiveness of innovative work. Furthermore, it is also in accordance with the research of Zeng, [37], which found that the relationship between the network of partners and the results of operations has resulted in the creation of innovative SMEs and their competitive advantage.

5) The Resources component directly influences the Innovation component. The standardized regression weight was 0.44 with a statistical significance level of 0.001, which is in accordance with the research of Riana et al., [38], which said that strategic resource management is a focus, especially on technology and innovation resource management. Moreover, it is also in accordance with the research of Sinkovics et al., [39], that studied the commitment of resources, innovation, and collaboration. It explores the creation of shared value between manufacturing companies and third parties known as logistics service providers (3 PLs). The goal of examining the relationship between resource commitment, collaboration, innovation, and performance. The results showed that the cooperation between manufacturers and 3 PLs is a relationship between resource commitment, innovation, and efficiency that results in 3 PLs becoming collaborative partners that support the concept of strategic value creation. The results are also in accordance with the research of Onprasirt et al., [40], who conducted a research study on the management of rubber processing for sustainable competition. The research found that the Resources component directly influences the Innovation component. The standardized regression weight was 0.79 which shows that the organizational resources required to achieve innovation in rubber processing are financial resources, human resources, physical resources, and business competency resources. And also in accordance with the research of Srihabut et al., [41], who conducted a research named Strategies for Value Added Creation in Thai Rice Industry in which the result found that the rice industry is highly competitive due to the current age of news and information, so consumers can compare products quickly. If entrepreneurs focus on price competition, they will not be able to compete sustainably. However, if entrepreneurs want to have an advantage over competitors in the market, they need to innovate different products to deliver superior value to consumers.

6) The overall importance of business practices components of the plastics industry in the digital era differed by business size by a statistically significant difference of 0.05. That is to say, the large plastics industry has enough capital to explore new markets for the development of plastic products and products to expand business opportunities. This is different from the small and medium-sized plastics industry, which does not have enough capital to explore new markets. Parsons, [42], said that Marks & Spencer's product development was intended to preserve and enhance the company's core values of standards, quality, safety, freshness, hygiene, and convenience. In

addition, large-scale plastics industry businesses have the advantage of communicating marketing with creative content that meets customers' needs across multiple channels and having exchanges between different departments regarding customer demand for new products. The aforementioned is in accordance with the research of Ozuem et al., [43], which used an integrated approach in marketing communication to develop a concept model using strategic principles to organize marketing communication activities that are different from the small and medium-sized plastics industry with traditional production models. There is also no improvement in new products that meet the needs of customers. Moreover, large plastics industry businesses have the ability to set up an in-house plastics innovation incubator. This gives the organization a dedicated research and development department and makes it different from the small and medium-sized plastics industry, which can only join government agencies and apply government policies to develop products that cause business practices that are slow to meet the needs of customers.

6 Suggestions

1) The novel coronavirus disease 2019 (Covid-19) situation has led to an increase in plastic waste. Although the roadmap for Thailand's plastic waste management aims to reduce plastic waste, the COVID-19 situation directly affects the industrial sector that operates under environmentally friendly restrictions. Therefore, it is important to focus on planning to cope with the uncertain situations that will arise, and it is a challenge that all sectors must work together to reach in order to maintain effective operational performance.

2) The plastics industry business should concentrate on management by clearly defining the direction of innovation management and establishing an organization innovation unit to act as a driving force in innovation management in accordance with the objectives that focus on the results of improving the original and building on the idea of change. For this reason, executives need to focus on the policy by defining a clear structure of duties, supporting budgets, personnel, training, and leading change in order to gain a competitive advantage.

3) Plastic industry businesses should create social responsibility by not emitting pollution, wastewater, or polluted air that affects the nearby communities and by helping society on various occasions, such as having an environmentally friendly production process, campaigning to raise awareness among employees about environmental protection, participating in activities related to helping communities, and implementing the ISO international standard system in the production process, etc. These are measures to enhance competitiveness.

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