BIG DATA MODEL FOR FUTURE STRATEGIC FORMULATION OF FOOD AND BEVERAGE BUSINESSES IN THAILAND

Jirachat Boonsuk, Khon Kaen University
Kulthida Tuamsuk, Khon Kaen University

ABSTRACT

This research was aimed at developing a big data model for future strategic formulation of food and beverage businesses in Thailand. The Mixed Research Method was used comprising both the quantitative and qualitative studies. The process carried out involved 3 steps, namely: (1) Analysis and categorization of data for formulating the future strategies by content analysis based on Porter's Five Forces Competitiveness and Strategic Foresight White Paper. (2) Study of data for formulating the future strategies by quantitative research and collection of data from administrators and data-managing officers of 60 food and beverage business firms whose benefit turnovers are high. (3) Verification and evaluation of the big data model developed by experts. The big data model was derived from the outcomes of the research, and is used for formulating future strategies. The model is composed of 6 data sets, 12 data subsets and 262 data elements. The mostly used big data sets for future strategic formulation are: business environments, products and services, manufacturing technology, laws and effects, people involved in the future business, and organization image, respectively.

Keywords: Big Data, Big Data Model, Food Business, Beverage Business, Future Strategies.

INTRODUCTION

Big data refers to the data in enormous amount and in various forms, both structured and non-structured. Mostly, big data sets are used in businesses, including both internal and external data of an organization or a firm. The data are managed and have been analyzed for benefits in business operations and strategic setting that result in competitive competency and chances of future advantages (Galetto, 2016; Techopedia, 2021). Management of big data enables a firm to understand its customers more clearly, to produce new products, and to accurately make important financial decision, all of which rely on the analyses of the firm's big amount of data (Techopedia, 2021). Harvey (2017) explained that big data management is a broad concept that covers policies, processes and technology used in collecting, storing, regulating, systematizing, making reports and efficiently administering a big data repository. Formulating future strategies or foresight strategies necessitates analyses of both internal and external data. An organization may place emphases on different implementations or processes, but most commonly policy and structural setting is involved as well as analysis of needs for information that leads to strategic formulation, location of the sources of data for formulating strategies, and compiling, analyzing, presenting, reporting, and utilizing the data (Galetto, 2016; Harvey, 2017; Markgraf, 2021).

The food and beverage industry is a business that has significant roles and importance towards consumers and the national economy. It is a big-sized business that has continually

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

expanded. The 2nd/2021 quarterly report on the economic situation of the food industry by the Office of Industrial Economics, Ministry of Industry, estimated the overall product indicator and export values of foods to expand more than during the same quarter of the previous year. This is owing to the increasing production of raw agricultural materials such as cassava, pineapple, oil palm, etc. At the same time, Thailand's major partner markets, i.e., China, America, and Europe have shown continually increasing tendency and restoration because of the ability to contain the spread of Covid-19. Increasing tendency has also been anticipated for export food products such as canned pineapple, canned sweet corn, frozen vegetables and fruits, condiments, ready-to-use animal feeds (The Office of Industrial Economics, 2021). For the beverage industry, a report by the research team of Sri Ayudhya Bank estimated the 2019-2021 beverage consumption to grow slightly according to the economic situation. The markets of major beverages including soda, energy drinks, beer, and liquor are entering their saturation stage. Meanwhile, the government has come up with various measures to decrease consumption of the high-risk drinks such as alcoholic drinks and high sugar-content beverages. In addition, the purchasing power of the root consumer group is still low and an obstacle to the market growth (Yongpisanpop, 2019). There are other factors and risks that bring impact on the food and beverage industry such as the prolongation of trade war between the US and China, changes of policies and laws within the country and overseas, limited sources of raw materials, risks from natural disasters, and technology changes, etc. (Government Saving Banks, 2018; Oishi Group, 2019).

The rapid changes and development of food and beverage businesses have brought about impact on many firms, forcing them to find ways to adjust and improve themselves for greater competitive competence. This is usually done through strategic management, requiring analyses of the surrounding factors and the present business competition situation. The issues to be analyzed are, for instance, (1) the already existing competitors in the industry, (2) the entering of new competitors into the industry, (3) the increase of alternative products, (4) the bargaining power of buyers, and (5) the bargaining power of the suppliers, etc. (The Investopedia Team, 2020). Tools for strategic management have been introduced, for example, foresight and scenario planning, to be used in the strategic development that raises confidence in terms of survival and sustainable growth of the business in the long run (Strategic Foresight Consultancy, 2013; Promsri, 2015). In so far as future strategic formulation is concerned, big data has acquired its roles in assisting business organizations to understand the causes of consumers' behaviors and estimate their needs, enabling the organizations to respond to consumers' expectations and create good experiences for the consumers from the time the product is not known to selection of the product and re-buying it (Zulkarnain & Anshari, 2016; Technopia, 2021). If a business can more efficiently develop the organization by compiling data in the digital form while the data is systematically analyzed, then the problematic point of the business shall be discovered or anticipated in order to be urgently mitigated or solved. This enables timely management that decreases losses and increases productivity on the production line (Koochaiyasit, 2013; Amornvivat et al., 2017).

The study by Amornvivat et al. (2017) showed that a number of Thai firms have introduced big data analyses in their corporations. Most are targeting benefits in development of selling and marketing. However, the use of big data necessitates self-adjustment and selection of suitable methods in order to step past the 4 key limitations (Zulkarnain & Anshari, 2016) namely, (1) investment in laying the foundation for collecting data and for acquiring the technology, (2) policy in personal data protection, (3) readiness in terms of personnel, and (4) clarity of objectives, queries and data to be used. At present, different firms' data is under the

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

storing status, is dispersed and lacks investigation of quality, classification, analyses, and connection of data for further extension. Moreover, most personnel still have no idea about big data while there are few big data experts. This research findings agreed with Dubey et al. (2019), who found that utilization of big data does not only rely on investment and time, but also on appropriate skills of personnel that will help answer the market's needs. Teo et al. (2003) similarly found that management of big data involves problems in provision and compilation of suitable data, problems related to lack of knowledge of which data is necessary or which is unnecessary, and lack of personnel that posses skills in data management, statistics or advanced calculation.

Although big data is mostly unstructured, selection of the data for analyses that are direct to needs is still an important problem of business organizations (Tansiri, 2013). Thus, if the data sets and details of data to be used are formulated, with complete data management, the decision making and foresight of the business will be more accurate (Srinivasan & Swink, 2018; Aydiner et al., 2019). If, on the contrary, the data has no quality or has not been managed and appropriately used, the decision making process as per the analytical method for big data may be erroneous, bringing negative effects to the business (Hazen et al., 2014; Janssen et al., 2017).

Since food and beverage businesses in Thailand take very important roles towards consumers and are large-sized as well as continuously growing; their future growth estimate is still not high, which is in accordance with the national economic growth. There is also the impact that arises from the government's measures to reduce consumption of the group of drinks that can bring about side effects to the people's health such as alcoholic drinks or drinks with high sugar content. At the same time, the markets for major beverages like soda pops, energy drinks, and liquors are entering their saturated stage. Meanwhile, the purchasing power of the root consumers is low and is an obstacle to market growth. Setting strategies for food and beverage businesses is thus seen as an important issue and is of high interest. In this digital era, big data is an important element in setting competitive strategies and business development for the present as well as the future. The researcher therefore became interested to study the development of big data for formulating strategies for the future of food and beverage businesses in Thailand. The results of the research would provide the big data for future strategic formulation that would benefit academics and researchers in setting the guidelines and management approaches for organizations' big data. The other outcome would be the concept for extending big data management approaches for formulating future strategies in other businesses.

OBJECTIVES

This research was aimed at developing the big data model for future strategic formulation for food and beverage businesses in Thailand. The data model is a structure with data sets, divided into data subsets and data elements, with data descriptions and data sources necessary for the analyses that lead to future strategic formulation.

METHODOLOGY

The mixed method was used, involving quantitative and qualitative research and 3 steps of procedures: (1) analysis and classification of the data for formulating future strategies, based on documentary analysis, (2) study of the use of data for formulating future strategies, based on quantitative research, and (3) verification and evaluation of the data model developed by experts.

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

Step 1 Analysis and classification of the data for formulating future strategies – The data was analyzed and synthesized according to Porter's Five Forces Competitiveness (Porter, 1980; The Investopedia Team, 2020) and Strategic Foresight White Paper (Strategic Foresight Consultancy, 2013), as well as a summative content analysis. The following processes were performed: (1) analyses of baseline data and settings to acquire the key words for each subject content; (2) comparison and removal of redundant data; and (3) selection of data and explanation of each data set according to the set criteria (Hsieh & Shannon, 2005). Next, the outcomes were classified into categories for formulating organizational strategies. From the analyses of the data for formulating future strategies according to Porter's Five Forces Competitiveness, the data was classified into 5 groups, with 80 data elements. According to the Strategic Foresight concept, the data was classified into 7 groups, with 174 data elements. The analyses were conducted, however, through consideration of data redundancy, similarities and relationships of data; and thus led to re-classification of the data groups into 6 data sets with 311 data elements (Table 1).

Table 1
DATA SETS FOR FUTURE STRATEGIC FORMULATION: CONTENT ANALYSIS

Five Forces Competitiveness (Porter, 1980; The Investopedia Team, 2020)	Strategic Foresight White Paper (Strategic Foresight Consultancy, 2013)	Data sets for this research
1. Bargaining power of customers (14 data elements)	1. Competitors (27 data elements)	A. Customers and competitors (28 data elements)
2. Bargaining power of suppliers (14 data elements)	2. Business environments (21 data elements)	B. Products and services (49 data elements)
3. Threat of new entrants (13 data elements)	3. Technology (30 data elements)	C. Corporate images (22 data elements)
4. Industry rivalry (21 data elements)	4. Future (34 data elements)	D. Laws and effects (38 data elements)
5. Threat of substitutes (18 data elements)	5. Sales activities (38 data elements)	E. Business environments (135 data elements)
	6. Legal environments (9 data elements)	F. Technology (39 data elements)
	7. Reputation (15 data elements)	
Total 80 data elements	Total 174 data elements	Total 311 data elements

Step 2 Study of the use of data for formulating future strategies – The study was conducted by means of quantitative research method on firms in the food and beverage industrial groups registered with the Ministry of Industry as the research unit. Thailand Industrial Council classified these businesses into 12 groups as follows: (1) meat and products, (2) fishery products, (3) fresh and processed fruits and vegetables, (4) flour and flour products, (5) spices and condiments, (6) milk and dairy products, (7) sugar and confectionary, (8) beverages, (9) tea, coffee, and cocoa, (10) oil and fat, (11) animal food, and (12) food supplement products and others (Pornchalermpong & Ratanapanond, 2021). A survey was conducted by selection of the firms in each industrial group based on the following criterion: being a leading firm in the food and beverage industrial markets. The first 5 firms showing the highest business benefits and profits in 2019 of each group were selected, totaling 60 firms. Informants included 1-2 officers working on data management from each firm, totaling not fewer than 60 people. Data was collected by sending out questionnaires online, by email, and by post. The researcher also collected some data to obtain information from the administrator group who did not have time to answer the questionnaire. The collection of data was conducted from October 2020 until March 2021. The number of questionnaire forms returned was 108 (90.00%), which was analyzed into percentages, after which the data sets from the results were drawn and drafted.

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

Step 3 Verification and evaluation of the data model developed – This step was done by means of qualitative research method. Three experts verified and evaluated the data model, one being a high-rank administrator of a food and beverage firm, one being an academic officer who formulated organizational strategies and marketing, and the other being an information specialist. The results were revised and adjusted before the big data model was constructed for the formulation of future strategies for food and beverage businesses in Thailand.

RESULTS

From the 108 informants answering the questionnaire in the study of the use of big data to formulate future strategies, 56.48% are males and 43.52% are females. Most (54.63%) have over 10 years of experience in working with a firm, followed by 29.63% who have worked for 5-10 years. As for the position in the firm, 59.30% are executives in their firms, while 40.70% are officers. When classified by the 12 groups of food and beverage industry under Thailand Industry Council, it was found that most are in fishery business (12.97%), followed by tea, coffee, and cocoa (11.1%), meat and products (10.1%), sugar and confectionary and beverages (9.3%, equally). The business receiving the least answers are oil and fat industry, and milk and daily industry (5.6%, equally) (Table 2).

Table 2
INFORMATION OF THE QUESTIONNAIRE'S RESPONDENTS

Information		**(N=108)**	**%**
1. Sex			
1.1	Male	61	56.48
1.2	Female	47	43.52
2. Working experience in the company (years)			
2.1	Less than 5 years	17	15.74
2.2	5 - 10 years	32	29.63
2.3	More than 10 years	59	54.63
3. Position in the company			
3.1	Manager/Director	64	59.30
3.2	Operation/Practitioner	44	40.70
4. Food and Beverage Businesses			

Businesses		**N**	**%**	**Businesses**		**N**	**%**
4.1	Meat and products	11	10.19	4.7	Sugar and Confectionery	10	9.26
4.2	Fishery products	14	12.97	4.8	Beverages	10	9.26
4.3	Fresh and processed fruits and vegetables	7	6.48	4.9	Tea, coffee, and cocoa	12	11.11
4.4	Flour and flour products	8	7.40	4.10	Oil and fat	6	5.56
4.5	Spices and condiments	7	6.48	4.11	Animal food	8	7.40
4.6	Milk and dairy products	6	5.56	4.12	Food supplement products and others	9	8.33

The analyses and classification of the big data for formulating future strategies for the food and beverage businesses from the questionnaires showed 311 data elements, 13 of which were removed, leaving 298 elements. The deletion was due to little use of the data for formulating strategies. In the next step, which was the verification by experts, 36 elements were removed from the 298 elements, due to the ground that they lacked clarification, were redundant, while some were irrelevant to the formulation of future strategies for the food and beverage businesses. Finally, the outcomes include 6 data sets (DS) or Sets A-F; 12 data subsets (DSS);

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

and 262 data elements (DE) (Table 3), with data descriptions, data sources, divided into external sources and internal sources. An example is shown in Table 4 for the Data Set A.

Table 3
DATA SETS AND SUBSETS FOR FUTURE STRATEGIC FORMULATION OF FOOD AND BEVERAGE BUSINESSES

Data Set (DS)		Data Subset (DSS)		Internal Sources	External Sources	Total No. of Data Elements (DE)	
A	Customers and Competitors	A_1	Customers	-	11	11	23
		A_2	Competitors	-	12	12	
B	Products and services	B_1	Production raw materials	-	15	15	46
		B_2	Distributors	2	17	19	
		B_3	Substitute products	-	12	12	
C	Corporate images	C_1	Corporate reputation	10		10	18
		C_2	Product and service brands	2	6	8	
D	Laws and effects	D_1	Laws and effects	-	33	33	33
E	Business environments	E_1	External environments	22	67	89	106
		E_2	Internal environments	17		17	
F	Technology	F_1	Communication technology	6	21	27	36
		F_2	Manufacturing technology	2	7	9	
Total				**61**	**201**	**262**	**262**

From Table 3, it can be seen that the formulation of future strategies for food and beverage businesses mostly requires big data related to the business environments, followed by the data of products and services, manufacturing technology, laws and effects, customers and competitors, and corporate images, in that order. (Details of the big data model is given in Figure 1, and Figure 2 below)

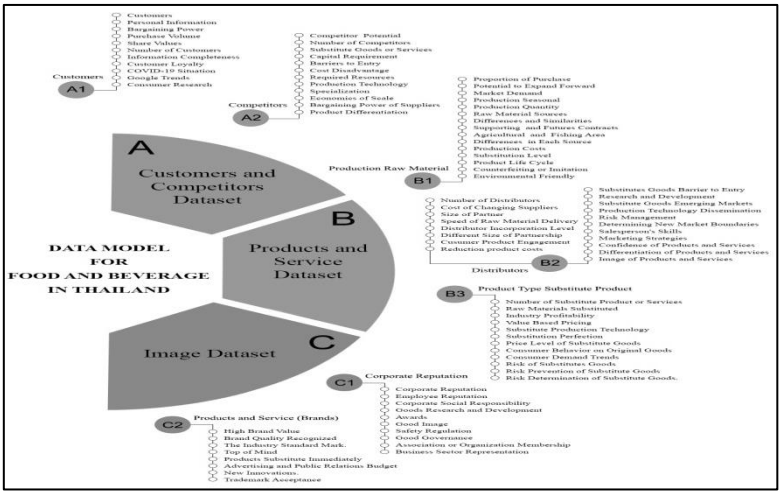

FIGURE 1
BIG DATA MODEL FOR FUTURE STRATEGIC FORMULATION OF FOOD AND BEVERAGE BUSINESSES IN THAILAND, DATA SETS A-C

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

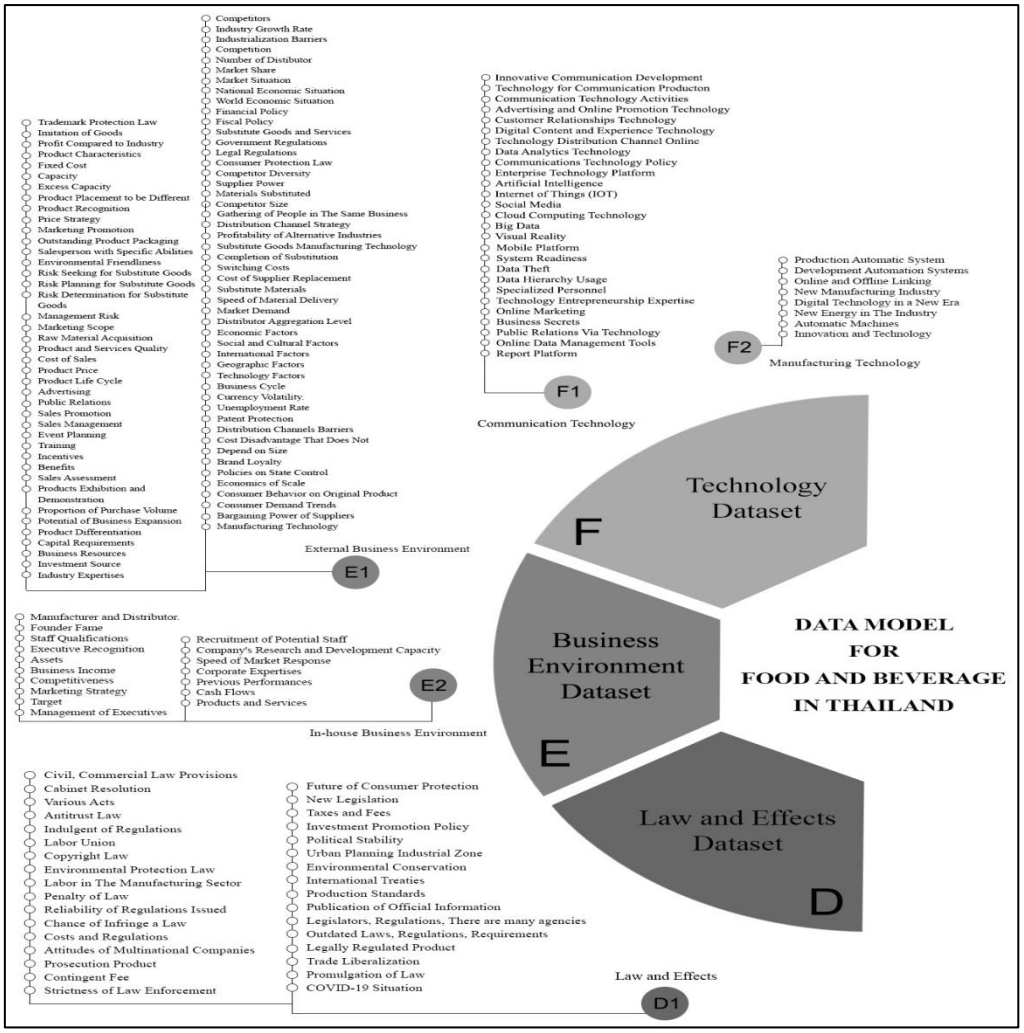

FIGURE 2
BIG DATA MODEL FOR FUTURE STRATEGIC FORMULATION OF FOOD AND BEVERAGE BUSINESSES IN THAILAND, DATA SETS D-F

Data Set A: Customers and competitors – consists of 2 data subsets and 23 data elements: Subset A_1: Customers, with 11 elements and Subset A_2: Competitors, with 12 elements.

Data Set B: Products and services –consists of 3 subsets and 46 elements: Subset B_1: Production raw materials, with 15 elements; Subset B_2: Distributors, with 19 elements; and Subset B_3, with 12 elements.

Data Set C: Corporate images –consists of 2 data subsets and 18 data elements: Subset C_1: Corporate reputation, with 10 elements and Subset C_2: Products and services, with 8 elements.

Data Set D: Laws and effects –consists of one data subset, Subset D_1: Laws and effects, with 33 elements.

Data Set E: Business environments consists of 2 data subsets and 106 elements: Subset E_1: External environments, with 89 elements and Subset E_2: Internal environments, with 17 elements.

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

Data Set F: Technology–consists of 2 data subsets and 36 elements: Subset F_1: Communication technology, with 27 elements and Subset F_2: Manufacturing technology, with 9 elements.

When analyzing the data according to the sources, it was found that from the 262 elements, 201 were from external sources whereas only 61 elements were from internal sources.

Table 4
DETAILS OF EACH DATA SET (THIS TABLE SHOWS EXAMPLE OF DATA SET A)

Data	Descriptions of data for future strategy	Data sources	
		Internal	External
Data set A: Customers and Competitors			
A1 Customers			
A1.1 Customers	Users of goods and services who pay for the goods as an exchange	-	✓
A1.2 Personal information	The indicators of social status and demographic characteristics	-	✓
A1.3 Bargaining power	Bargaining power of the customers for goods and service prices	-	✓
A1.4 Purchase volume	Buying more means lower price per unit than buying less.	-	✓
A1.5 Share Values	Acceptance of goods and service values by customer groups	-	✓
A1.6 Number of customers	More customers demanding limited goods means higher price than usual.	-	✓
A1.7 Information completeness	If a customer uses complete information from various sources, decision-making is difficult.	-	✓
A1.8 Customer loyalty	Customer loyalty towards the brand affects sales.	-	✓
A1.9 COVID-19 situation	Covid-19 situation changes the buying styles of goods and services.	-	✓
A1.10 Google trends	Customers' behaviors, needs, and popularity of goods and services are available from the keywords.	-	✓
A1.11 Consumer research	Consumer research indicates behaviors, needs, and preference towards goods and services.	-	✓
A2 Competitors			✓
A2.1 Competitor potential	Competitor has potential in expanding business to reduce cost and prevent shortage of raw materials.	-	✓
A2.2 Number of competitors	A great number of sellers result in high business competition.	-	✓
A2.3 Substitute goods or services	There are substitutes of old goods and services in the market.	-	✓
A2.4 Capital requirement	The competitor requires investment capital.	-	✓
A2.6 Barriers to entry	Selling channel is the barrier for new competitors entering the market.	-	✓
A2.7 Cost disadvantage	The size of investment money affects the entering of new competitors. If investment cost is low, competitors can easily enter.	-	✓
A2.8 Required resources	If resources for business are readily available and cheap, competitors will enter the market.	-	✓
A2.9 Production technology	High technologies are the obstacle for entering the market.	-	✓
A2.10 Specialization	High specialization and experiences of competitors means high competition in the industry.	-	✓
A2.11 Economics of scale	Mass manufacturing saves and reduces costs more.	-	✓
A2.12 Bargaining power of suppliers	Bargaining power of suppliers is high if there are few suppliers when the materials are of high demand.	-	✓
A2.13 Product Differentiation	There is the capacity in product differentiation.	-	✓

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

DISCUSSION AND CONCLUSION

The results of the research showed that food and beverage businesses in Thailand that registered with the Ministry of Industry have high business benefits and profits. These firms have introduced the big data in formulating their future strategies, the fact that reflects foresight strategies or future strategies of the firm administrators. In order to come up with these strategies, it is necessary to study the internal and external environments. The administrators must understand the crisis and changes that bring about high impacts on the business, and must have up-to-date information from multiple sources in order to be able to perform analyses and formulate the future strategies. Thus, success in managing big data of the firm for formulation of future strategies is a very essential issue (Markgraf, 2021).

In this research, the researcher has analyzed and categorized the big data necessary for formulation of the future strategies. This was done by studying the details from Porter's Five Forces Competitiveness, which, even though publicized for over 40 years, is still up–to-date and can be continuously used in formulating the future strategies until today (The Investopedia Team, 2020). Another study has been performed on Strategic Foresight White Paper, which explains the difference between foresight and other planning. The significance of foresight is that it is composed of long-term future perspective, holistic study of information and factors, and provision of a system and tool for regularly monitoring and verifying the arising changes. Therefore, formulation of future strategies requires estimation of information related to the competitors, business environments, technology, sales activity, legal environments, and business reputation (Strategic Foresight Consultancy, 2013). An important point is that formulation of future strategies for food and beverage businesses in Thailand uses a lot of information related to laws and regulations. This agrees with what is indicated in Strategic Foresight White Paper. However, the problem encountered is the difficult access to laws and regulations announced and enforced by governmental organizations, which are external sources. Moreover, the quality of the sources is not good enough (Norathas, 2009; Kanjanasalee et al., 2019). On the other hand, the big data related to business environment, which is the most necessary data for formulating future strategies, may differ from the past. The study by Wicharat (2019) also demonstrated that the big data important for managing data for success of present businesses is online social media and website information.

In conclusion, big data is important for formulating future strategies for food and beverage businesses. In the disruptive technology era, management of big data is important for all types of businesses. Therefore, besides formulation of future strategies for prosperous business future, a firm requires big data strategy. APMG International (2018) suggested that big data strategy that enables a firm to become successful requires the following steps: (1) define business objectives, (2) execute a current state assessment, (3) identify and prioritize 'Use Cases', (4) formulate a 'Big Data Roadmap', and (5) embed through 'Change Management'. It can be seen that formulation and prioritization of the use of big data is one step in formulating big data strategy. Hence, a complete big data model will enable a business firm to envision the whole data and formulate necessary data for its business.

REFERENCES

Amornvivat, S., Charoenpol, W., Khantachawana, S., Jeerasuwannakij, N., Kaweewiwitchai, N., Chayanond, W., & Kantaumong, I. (2017). *Insight business perspectives with big data*. Bangkok: Economic Intelligence Center, Siam Commercial Bank PCL.

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.

APMG International (2018). *Enterprise big data professional: An introduction to big data and data science for the enterprise*. Bonn, Germany: APMG International.

Aydiner, A.S., E. Tatoglu, E. Bayraktar, S. Zaim, & D. Delen (2019). Business analytics and firm performance: The mediating role of business process performance. *Journal of Business Research, 96*, 228-237.

Dubey, R., Gunasekaran, A., Childe, S., Blome, C., & Papadopoulos, T. (2019). Big data and predictive analytics and manufacturing performance: Integrating institutional theory, resource-based view and big data culture. *British Journal of Management*, *30*(2), 341-361.

Galetto, M. (2016). *A definition of data management*. Retrieved June 10, 2021 from https://www.ngdata.com/what-is-data-management/

Government Savings Bank (2018). *Food and beverage industries*. Bangkok: Economics, Business, and Grassroots Economy Research Center, Government Savings Bank.

Harvey, C. (2017). *Big data management*. Retrieved June 10, 2021 from https://www.datamation.com/big-data/big-data-management/

Hazen, B.T., Boone, C.A., Ezell, J.D., & Jones-Farmer, L.A. (2014). Data quality for data science, predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications. *International Journal of Production Economics*, *154*, 72-80.

Hsieh, H.F., & Shannon, S.E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277-1288.

Janssen, M., van der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, *70*(C), 338-345.

Kanjanasalee, C. (2019). The intricate problem: open government data is unusable. Retrieved March 2, 2021 from http://codeforthailand. github.io/2019-local-administrative-budget-and-projects/reflection-on-our-open-data/

Koochaiyasit, S. (2013). Transforms a new era of data "big data". *Executive Journal*, *33*(1), 22-28.

Markgraf, B. (2021). *What is strategic forecasting*. Retrieved March 2, 2021 from https://smallbusiness.chron.com/strategic-forecasting-42245.html

Norathas, T. (2009). *Strategy for development of the successful government information system*. Bangkok: Chulalongkorn University.

Oishi Group (2021). *Risk factors for restaurant business*. Retrieved March 4, 2021 from https://invstor.oishigroup.com/th/about-oishi/corporate-government/risk-factors.>DATA0000.a8f.pdf

Pornchalermpong, P., & N. Ratanapanond (2021). Structure of food industry. Retrieved February 19, 2021 from http://www.foodnetworksolution.com/wiki/word/3114

Promsri, C. (2015). Concept of scenario planning for applying in Thai automotive industry. *Executive Journal*, 35(2), 107-123.

Srinivasan, R. & M. Swink (2018). An investigative of visibility and flexibility as complements to supply chain analytics: An organizational information processing theory perspective. *Production and Operations Management*, *27*(10), 1849-1867.

Strategic Foresight Consultancy (2013). *Strategic foresight: From theory to practice-methods, tools and culture*. Retrieved February 19, 2021 from https://nanopdf.com/download/strategic-foresight-5b31dadec866a_pdf

Tansiri, P. (2013). Big data and challenges. *Executive Journal*, *33*(1), 15-21.

Techopedia (2021). *Big data management*. Retrieved February 19, 2021 from https://www.techopedia.com/definition/29587/big-data-management#techopedia-explains-big-data-management

Teo, H.H., Wei, K.K., & Benbasat, I. (2003). Predicting intention to adopt interorganizational linkages: An institutional perspective. *MIS Quarterly*, *27*(1), 19-49.

The Investopedia Team (2020). *Porter's 5 forces*. Retrieved June 6, 2021 from https://www.investopedia.com/terms/p/porter.asp

The Office of Industrial Economics (2021). *Report on the industrial economics, first quarter 2021., and trends of second quarter 2021*. Bangkok: The Ministry of Industry, Thailand.

Wicharat, N. (2019). A study of the relationship of big data and data management towards the business success. *Journal of Information Technology and Innovation Management*, *6*(2), 39-46.

Yongpisanpop, W. (2019). *Trends of Businesses and industries, 2019-021*. Bangkok: Krungsri Bank.

Zulkarnain, N., & Anshari, M. (2016). Big data: Concept, applications, & challenges. *Proceedings of the 2016 International Conference on Information Management and Technology (ICIMTech)*, 307-310. Bandung, Indonesia.

Citation Information: Boonsuk, J., & Tuamsuk, K. (2022). Big data model for future strategic formulation of food and beverage businesses in Thailand. *Academy of Entrepreneurship Journal, 28*(S1), 1-10.