

# NIDA



## Case Research Journal

National Institute of Development Administration

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# NIDA

## Case Research Journal

### Aim and Scope

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NIDA Case Research Journal's main objective is to publish high quality, double-blind peer review, previously unpublished case studies—preferred but not required to be in the context of Thailand and should be archival or field based research. NIDA Case Research Journal publishes two issues per year (January-June, July-December). The main theme of case studies published in NIDA Case Research Journal relates to development administration in the field of Public Administration, Economics, Business Administration, Social Development, Environmental Management, Human Resource Development, Language and Communication, Applied Statistics, Decision Technology, Financial Investment and Risk Management, Population and Development, Computer Science and Information System, Tourism Management, Law, Legal Studies, and Communication Arts and Innovation.

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## Eco Collective: A Case Study of Social Enterprise, Eco-Friendly, Bulk Stores

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### Abstract

This case is designed to illustrate the concept of social enterprise, eco-friendly, bulk store and to understand how to make effective decisions based on location analysis. The case starts when Jane, the head of the business strategy department, was assigned by Kan, the CEO of Furniture Collective, to develop a new business expansion plan by collaborating with small enterprises located in many small communities throughout the country. The case is divided into three parts. Case A provides an overview of Eco Collective bulk store, which offers a variety of organic and environmentally friendly products from local community partners with the concept of “Bring your own containers” for customers to refill. Case B focused on the concept of market segmentation, competitor analysis, and market positioning. Case C implicitly outlines factors that should

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be considered when narrowing down the location choices for Eco Collective's first branch. As the head of the business strategy department, Jane needed to convince Kan to agree with her ideas about this social enterprise bulk store, identify the characteristics of customers, who were more eco-conscious, and identify which segment strategy is suited for an Eco Collective store. On the other hand, Kan needs to make a decision whether the Eco Collective initiative should be approved, and if so, which location should be selected for its first branch.

**Keywords:** Bulk Stores, Eco-Friendly, Social Enterprise, Location Analysis

## Eco Collective: กรณีศึกษาสำหรับ ธุรกิจเพื่อสังคมและผลิตภัณฑ์ที่เป็นมิตรต่อสิ่งแวดล้อมสำหรับร้านขายสินค้าสไตล์ Bulk Stores

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### บทคัดย่อ

กรณีศึกษานี้มุ่งเน้นแนวคิดของการทำธุรกิจเพื่อสังคมและผลิตภัณฑ์ที่เป็นมิตรต่อสิ่งแวดล้อมสำหรับร้านขายสินค้าที่ลูกค้าสามารถนำขวดหรือภาชนะต่าง ๆ มาเติมผลิตภัณฑ์เองได้ และเพื่อให้เข้าใจถึงกระบวนการตัดสินใจและการวิเคราะห์ทำเลที่ตั้งของร้าน Eco Collective โดยกรณีศึกษานี้จะแบ่งออกเป็น 3 กรณีศึกษาย่อย (Cases A, B, และ C) โดยที่ผู้คุณเจน ซึ่งเป็นผู้อำนวยการของแผนกการวางแผนกลยุทธ์ทางธุรกิจของบริษัท และคุณกานต์ ซึ่งเป็นซีอีโอของบริษัท Furniture Collective กำลังปรึกษารหาหรือแผนการขยายธุรกิจเพื่อสังคมที่สามารถสร้างความร่วมมือกับวิสาหกิจชุมชนทั่วประเทศ เพื่อส่งเสริมกิจกรรมของชุมชนในแต่ละพื้นที่ ในขณะเดียวกันก็นำเสนอผลิตภัณฑ์หรือแนวทางการทำธุรกิจที่เป็นมิตรต่อสิ่งแวดล้อมให้กับบริษัท Case A จะเป็นจุดเริ่มต้นของแนวคิดการตั้งร้านค้า Eco Collective เพื่อนำเสนอสินค้าออร์แกนิกที่ได้จากธรรมชาติ ที่ไม่มีการปนเปื้อนของสารเคมีและเป็นมิตรกับสิ่งแวดล้อมโดยสินค้าต่าง ๆ ที่ขายจะเป็นสินค้าที่มาจากชุมชนหรือหมู่บ้านทั่วประเทศด้วย แนวคิด Bring Your Own Containers หรือการลดใช้ถุงพลาสติกหรือบรรจุภัณฑ์โดยลูกค้านำภาชนะหรือบรรจุภัณฑ์มาใส่หรือเติมสินค้าด้วยตัวเอง Case B จะมุ่งเน้นการวิเคราะห์ทางการตลาด เช่น การแบ่งส่วนการตลาด การวิเคราะห์คู่แข่ง หรือการวางตำแหน่งทางการตลาด ที่จะมีผลกระทบต่อ Eco Collective ส่วน Case C จะเป็นการศึกษาและกำหนดตัวชี้วัดที่มีผลต่อการตัดสินใจที่จะเลือกที่ตั้งสาขาแยกของ Eco Collective ซึ่งคุณกานต์

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จำเป็นที่จะต้องตัดสินใจว่า แนวคิดของการทำธุรกิจเพื่อสังคมประเภทนี้เป็นแนวทางที่บริษัท ควรจะสนับสนุนตามที่คุณเจนนานำเสนอหรือไม่ และถ้าแนวคิด Eco Collective นี้เป็นไปได้ คุณกานต์ ต้องตัดสินใจเลือกที่ตั้งของ Eco Collective สาขาแรก โดยคุณกานต์ได้เตรียมข้อมูลพื้นที่ทั้งหมด 6 พื้นที่ เพื่อประกอบการตัดสินใจ

**คำสำคัญ:** Bulk Stores เป็นมิตรกับสิ่งแวดล้อม ธุรกิจเพื่อสังคม การวิเคราะห์เชิงพื้นที่

## **Case A: The Initiative**

On July 01, Jane, the head of the business strategy department, was assigned by Kan, the CEO of Furniture Collective, to develop a new business expansion plan by collaborating with small enterprises located in many small communities throughout the country.

Furniture Collective specialized in the collection of beautifully designed, high-quality furniture, which supported the unique, locally made and marketed products of local communities. Furniture Collective's policy was not only to share its values and lead positive change by being accountable and transparent to positively impact people, local communities, and the environment, but also to support a wide range of local enterprises by offering eco-friendly home furnishings such as table sets, wooden chairs, and other durable products made with regard for the environment. Currently, Kan was thinking about expanding Furniture Collective's business to provides services that were sustainable and designed to have less-damaging effects on the environment. Kan knew Jane was the right person for the job when, during the last meeting, Jane discussed environmental issues with her product-development (PD) team and the fact that our country was confronted with many problems posed by improper human resource management capabilities that could arise from urbanization, the development of technology, and ineffective waste management, resulting in water, land, and air pollution in various areas.

Jane spent a whole week drafting an initial proposal to present to Kan and other top management at the next monthly meeting, which was scheduled on July 15. Looking around her office, she spotted a lot of empty containers and started thinking:

When we bought consumable products, we used up all the stuffs inside the containers and discarded them in a short period of time. How could we help reduce this wasteful use of resources?

One of the problems our country were facing today was plastic waste. When it decomposed, it was not completely decomposed and the process took many years; also,

it released toxic chemicals and would break down into microplastics that could infiltrate everything. Whether in the environment or in living things in the food chain, these toxic wastes might enter the human body through consumption.

## **International Policy on Waste Management Practices**

While Jane was researching the idea, she started looking at the bigger view, trying to find business opportunities with effective plastic waste management practices. She found out that the most promising and sustainable future scenarios for improving the management of plastic waste were from Sweden and Japan. Sweden had promoted its public environmental awareness for years and developed key measures for waste prevention, reuse, and repair of the products to encourage waste management policies. Specifically, the legal basis for waste management systems was established to prevent waste generation. An important practice was the deposit/return scheme for households, in which the citizens of Sweden would receive refunds after using and returning plastic materials. Japan also had very efficient waste management systems and introduced recycling technologies that could turn waste into resources or appropriately dispose of it. The goal was to initiate a material-recycling society to preserve the environment by generating as little waste as possible and utilizing waste incineration technology, waste disposal technology, PET bottle and home appliance recycling technology, and even efficient waste transport technology to recycle and reuse waste as a valuable resource. Consequently, plastic waste had been reduced by 40% since the national legislation began to be enforced 10 years ago. In Thailand, however, the Natural Resources and Environment Ministry had just started a voluntary campaign to ban single-use plastic bags in convenience and department stores nationwide. The waste management law remained unclear, and the ministry only announced an ambitious plan to have 100% of plastic waste in Thailand land recycled by 2027.

## **Eco Collective Bulk Stores**

After a week of studying best practices from global companies abroad to local business owners, Jane told her PD team that there were many ways to reduce plastic

waste, such as by carrying a reusable bag to convenience or department stores, taking a container to purchase food at restaurants, and bringing one's own mug to purchase beverages. She threw out the idea of promoting a bulk store where customers could bring their own containers to refill with consumable products such as soap, shampoo, dishwashing liquid, toilet cleaner, sauces, grains, spices, and pasta for a discounted price compared to the standard retail price in traditional stores. This shopping alternative would generate public environmental awareness and encourage consumers by creating incentives to decrease waste generation and reuse containers. The bulk store could also offer environmentally friendly products which could be reused, such as collapsible silicone mugs, stainless steel water bottles, glass straws, and bamboo toothbrushes, following the ministry's policy to reduce single-use plastic consumption. Her team quickly reported:

This type of bulk store emerged in Thailand in 2017 and currently there were more than 20 shops in Bangkok. Such an expanding trend implied that there should be niche markets, which met the needs of customers, who, to some extent, instilled a sense of responsibility for nature and the environment.

### **Social Enterprise Business Model**

For the upcoming monthly meeting on July 15, Jane planned to introduce the idea of promoting a bulk store, called "Eco Collective," integrating the concept and mindset of social enterprise (SE) and waste management practices. Her PD team totally agreed on the idea of a social enterprise business model, where the primary focus was on solving social and environmental problems by encouraging good management mechanisms in the business sector combined with knowledge and social innovation. Jane added that the social enterprise strategy should be of interest to Kan and the top management as it was relevant to the direction of Furniture Collective, which included supporting both social and environmental goals. The proposed Eco Collective store should be financially sustainable from its main source of income, which would be from product or services, without relying on donations, while the profits incurred would be reinvested to expand the social impact. Jane added:

Eco Collective would be self-sustaining, with the goals of achieving financial stability while being socially and environmentally responsible over time. All the products in Eco Collective would be directly from local communities. By reducing the intermediaries, both Eco Collective and small enterprises in the communities would gain a stronger presence, build strong relationships, and reasonably manage their pricing structures. Profits would be returned to the society, while Eco Collective would be operated transparently with good governance.

### Sustainable Development Goals (SDGs)

Eco Collective would be committed to solving social problems by adhering to the following sustainable development goals (SDGs) (see Figure 1):

- Goal 12: Responsible Consumption and Production: Reducing resource consumption through reuse supports the community's becoming sustainable and self-reliant as local product entrepreneurs were increasingly aware of the impact of our daily consumption.
- Goal 13: Climate Action: Encouraging behavior that does not cause global temperature changes.
- Goal 14: Life Below Water: Prevention and reduction of marine pollution by encouraging consumers to reduce the use of plastic packaging.
- Goal 15: Life on Land: Supporting the sustainable use of terrestrial ecosystems by receiving products from producers in the community who use production methods that do not destroy the environment.



Figure 1: Sustainable Development Goals (SDGs)

## **Eco Collective Bulk Stores**

Jane elaborated on the Eco Collective store idea, explaining to the PD team that the store would bring together a wide range of consumer products from our local community partners. The products have to be organic and environmentally friendly. The Eco Collective store would support local entrepreneurship and encourage village communities to improve their local product quality to preserve the environment. Unlike traditional stores, whose products such as cosmetics, laundry detergents, and kitchen soap are sold in a small bottles, tubes, or jars that were difficult to recycle, Eco Collective would feature unpackaged household, cosmetics, and even food, products with the concept of “Bring your own containers” for customers to refill. Customers would visit the store with their own Tupperware, bottles, or jars. After scanning their member ID, they weighted the containers and put small weight stickers on them. These stickers could be reused for the next visits. In case customers forgot their containers; they would be able to buy environmentally friendly ones from the store. When they filled their containers, the price was then calculated based on the weight of the goods without the weight of the containers.

## **The Initial Decision Making**

As Jane was drafting the proposal and preparing for the presentation to the CEO the next day at the monthly meeting, she needed to convince Kan to agree with her ideas about this social enterprise bulk store. First, she needed to clarify the pros and cons of the Eco Collective store concept for the top management. Second, she needed to identify the characteristics of customers, who were more eco-conscious. What was their needs? How were their needs different from those less eco-conscious customers? As the head of the business strategy department, how should she plan for the upcoming meeting?



Figure 2: Eco Collective Bulk Store

## Case B: Marketing Analysis

### Market Segment

At the monthly meeting, a lot of issues were discussed. Kan seemed to be very supportive and really like the Eco Collective initiative. Kan, however, challenged Jane a bit regarding the targeted customers, testing whether Jane had done her homework well enough or whether the Eco-Collective would be just a dream, an infeasible business plan.

Jane explained that there were several ways to select and evaluate a market segment: single-segment concentration, selective specialization, market specialization, product specialization, and full-market coverage. For the Eco Collective, she had selected the market specialization method, determining its potential customers by offering a wide range of environmentally friendly products for a more-eco-conscious customer segment (see Appendix A).

Kan agreed with Jane that an Eco Collective store should concentrate on serving the many needs of eco-conscious customers by offering a variety of eco-friendly products, rather than by serving the mass market. This market specialization strategy should strengthen the store's reputation among the eco-conscious target groups with features and or campaigns that were relevant to what they needed.

### Competitor Analysis

A quick direct and indirect competitor analysis from the PD team helped strengthen the Eco-Collective idea by identifying the store's potential and opportunities. Jane pointed out five distinct competitors:

- *The Refill Station: Direct Competitor*

The first well-known bulk store in Bangkok, the Refill Station was established in 2017 in the On Nut area. It shared the space with the Better Moon Guesthouse & Cafe, a small eco-friendly restaurant promoting plastic reduction by not using plastic straws and glasses but used environmentally friendly paper cups as well. If customers brought their own cup, the price would reduce by 5 baht and they able to use the common co-working space upstairs.

The Refill Station merchandise included both popular brands from major manufacturers and brands from small producers.

- *The Zeromoment Refillery: Direct Competitor*

Located at @Home Residence, an apartment in the Rama 9 area, the Zeromoment Refillery sold only refillable quality products that were selected from the local community and could also be purchased directly from the local producers. There were more than 160 products to choose from, including fresh foods such as organic eggs, fresh-squeezed orange juice in bottles that customers can return for a 15-baht rebate, and snacks like soft cookies and brownies.

- *The Refill Shoppe: Direct Competitor*

Located in Thammasat University's dormitory area, Rangsit campus. The Refill Shoppe sold organic products and was decorated like a small café, with eco-friendly containers for sale such as foldable containers, bamboo straws, and 150 other products. The thing that makes this store different from others was its prime location in the student dormitory zone.

- *The Gourmet Market: Indirect Competitor*

The Gourmet Market was a supermarket with many branches located in The Mall group department stores. It sold premium quality imported products from various countries. Customers could find unique products that could not be found anywhere else, excellent quality fresh produce, and organic products for health-conscious people.

- *The Tesco Lotus: Indirect Competitor*

The Tesco Lotus discount stores, located in large retail malls, currently served 15 million customers weekly. Its branches and online channels aimed to appeal to the lifestyles of customers by selling a wide variety of products such as mother and baby products, health and beauty products, and electronics.

## **Positioning**

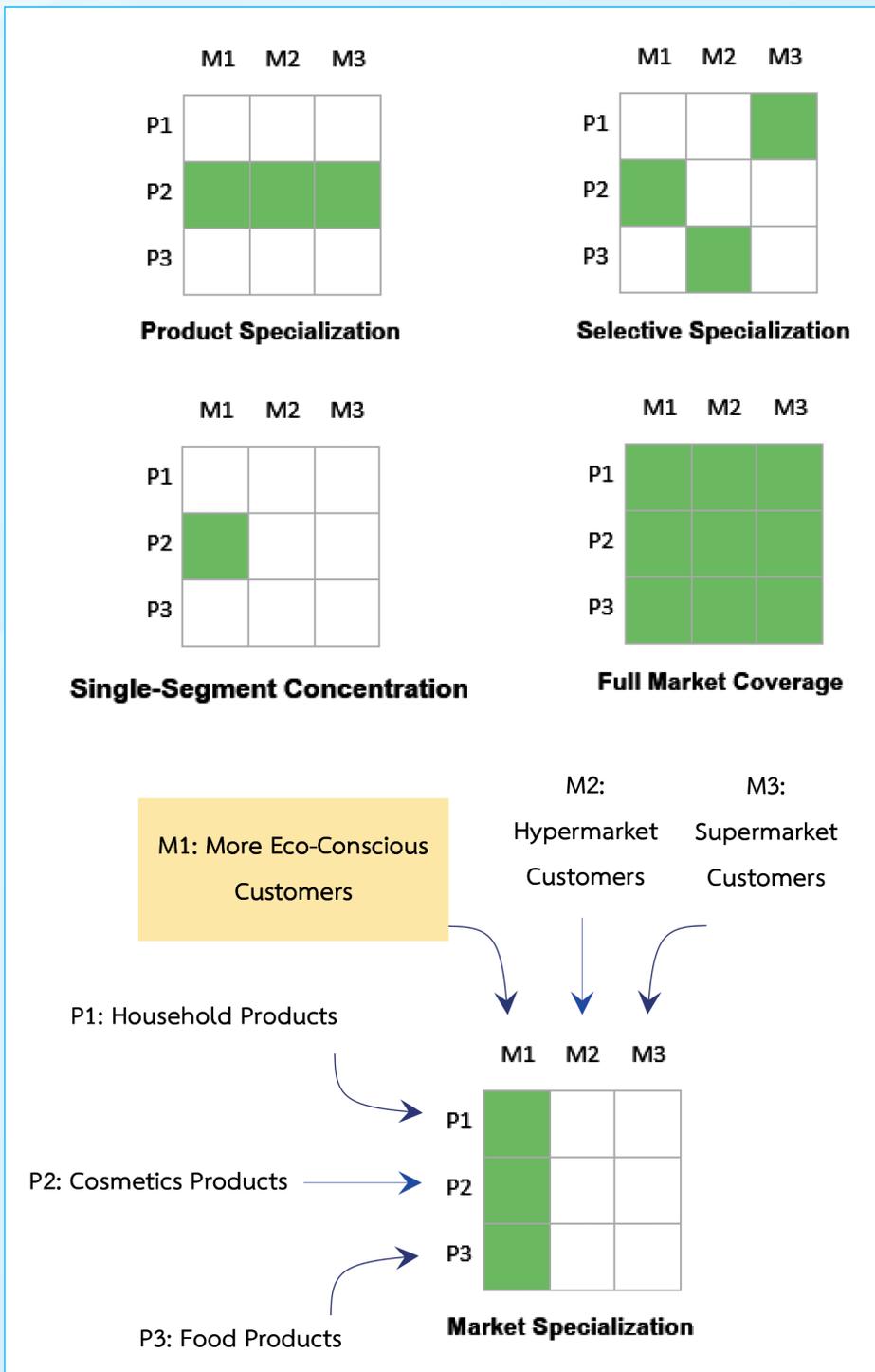
Another key point Kan would like to clarify was how Eco Collective positioned itself against these competitors. In addition to selling environmentally friendly, high-quality products, Kan believed additional factors such as social responsibility, price, variety of products, and convenience should be considered. Information gathered from the PD teams helped facilitate the discussion during the meeting. One of the strengths of Eco Collective as opposed to the other competitors was its supplier networks and its experiences in eco-friendly products from Furniture Collective (see Appendix B). The perceptual map in Appendix C indicated how customers should perceive the positioning of Eco Collective and how Eco Collective differed from its direct and indirect competitors.

Kan emphasized the importance of points-of-difference (POD) and points-of-parity (POP). The POD was very explicit, focusing on selling quality products selected from socially responsible producers and offering household, food, and cosmetic products as alternatives for customers who cared more about the environment. For the POP, the first Eco Collective store should be very clean, and hygiene and the products must be fresh, while reducing the use of disposable packaging.

## **Location Choices: The Second Decision**

The first meeting went very well, and Jane's Eco Collective initiative was approved. The next step was to decide where the first branch would be located. Kan believed Jane might have a fairly good idea, geographically, where the location would be. Jane had about a month to propose the location strategies to the top management. She knew that she could not afford to overlook any factors that could help maximize profit or increase market share. Of course, among the location choices, Jane expected Kan to definitely ask how to decide which location was better. As the head of the business strategy department, Jane needed to develop key measures for what factors needed to be considered when narrowing down the location choices.

Appendix A: Market Segmentation



### Appendix B: Market Positioning

Brand	Social Responsibility	Product Variety	Price	Convenience
Eco Collective	E	E	E	??????
Refill Station	E	G	G	G
Zeromoment Refillery	E	E	G	G
The Refill Shoppe	E	G	F	G
Gourmet Market	G	E	G	E
Tesco Lotus	G	E	E	E

Note: E = Excellent, G = Good, F = Fair, P = Poor

### Appendix C: Perceptual Map



### Case C: The Final Verdict

Time flew by fast, and it had been over a month since Jane and her PD team had spent times discussing and identifying six comparable locations as candidates for Eco Collective’s first branch.

1. The Mall Bang Kapi, Bang Kapi District
2. Home Village, Kasetsart University, Chatuchak District
3. U-Delight (Chatuchak), Chatuchak District
4. Metro Mall Rama 9, Huai Kwang District
5. Min Buri Market, Min Buri District
6. Boon Niyom Market, Santi Asoke Community, Bueng Kum District

## The Mall Bang Kapi, Bang Kapi District

The Mall Bang Kapi was a large shopping mall where residents in Bang Kapi and nearby districts would visit on a daily basis. The mall had complete facilities, compared to the other five locations, including restaurants, fashion and clothing stores, supermarkets, and a large water park, which is the preferred choice for families. The area for rent was located on the ground floor near the escalator, the exit gate, the food court, and the supermarket zone. It was always a crowded area, expensive, and a prime location. The opening hours of the department store were Monday to Friday from 11.00 to 21.30 and Saturday and Sunday from 10.00 to 22.00.



Figure 3: The Mall Bang Kapi

## Home Village, Kasetsart University, Chatuchak District

The Home Village was a community mall with small shops such as restaurants, cafes, and barbershops, located at Soi Ngamwongwan 52, opposite Ngamwongwan Gate 1, Kasetsart University (Bang Khen). Students could walk to the shop easily by just using the overpass. Many student dormitories were nearby and a 7-Eleven convenience store. The community mall was open from 10.00 to 22.00.



Figure 4: Home Village

### U-Delight (Chatuchak), Chatuchak District

The U-Delight was a high-rise condominium, a large project with more than 900 units (with 100% occupancy). Customers were able to access the U-Delight from various routes, either through Vibhavadi Soi 3, Phahon Yothin Soi 18 and 18/1, or Inthamara Soi 15. There were also many condominiums nearby. The store would be located on the first floor of the condominium.



Figure 5: U-Delight

### Metro Mall Rama 9, Huai Kwang District

The Metro Mall Rama 9 was a collection of shops that were open daily from 7.00 to 21.00. It was located in the MRT Rama 9 Station with various shops including convenience stores like LAWSON 108, coffee shops, and a common area. In addition, the station area was very close to many attractions, such as the Central Rama 9 Department Store, the Fortune Town Building, and large office buildings such as the CP Tower 2 and the Grand Mercure Fortune Bangkok Hotel.

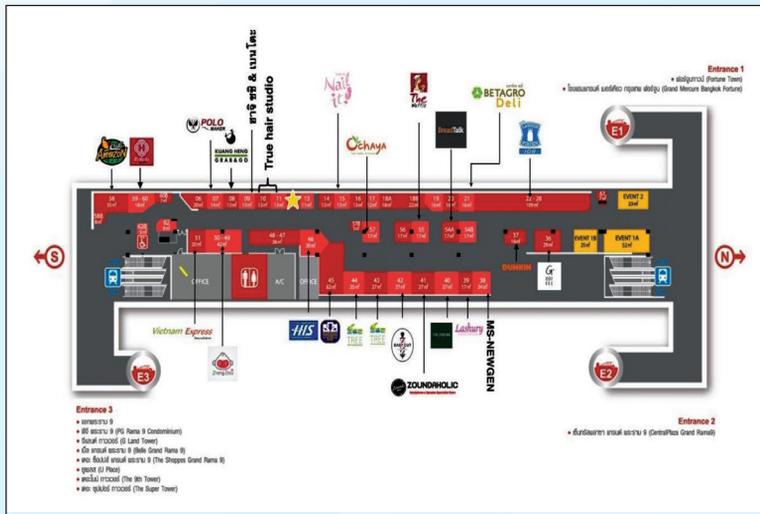


Figure 6: Metro Mall Rama 9

### Min Buri Market, Min Buri District

Located at Sihaburanukit Road, Minburi District, Min Buri Market was the first and was the only old market in Bangkok that gathered all types of markets together in the same area, for example, a fresh market, wholesale market, retail market, Khlong Thom, and Xiang Gong market, along with office buildings and a convenient public transportation system. The market was clean, and the environment was good, so customers were happy when visiting, buying food, and choosing products at reasonable prices. The market was open from Monday to Sunday from 02.00 to 14.00 for the wholesale zone and from 09.00 to 20.00 for the plaza zone.



Figure 7: Min Buri Market

## Boon Niyom Market, Santi Asoke Community, Bueng Kum District

Located in Soi Nawamin 46, the Boon Niyom Market was open daily from 08.00 to 18.00 but closed on Monday. The market consisted of many restaurants and health shops. There was a flea market zone that is open only on weekends. The flea market sold mostly organic vegetable, fruits, fresh and dried foods, and a variety of ready-to-eat vegetarian foods and had many food stalls.



Figure 8: Boon Niyom Market

During the monthly meeting on Aug 15, Kan kicked off the meeting with the expected question “What were the nifty-gritty details your team considered when narrowing down their choices to these locations?” Jane responded that seven criteria were used to evaluate the team’s choices.

## 1. Rental Expenses

Jane credited her team with compiling the information needed to assess each location. The first issue was related to the budget for a retail space, especially the rental fees. The team was able to get some solid figures from the building owners or management companies.

Kan agreed that knowing the high end and the low end of the retail rents in different areas where the Eco Collective store might be located helped in accurately picturing whether the choice was a viable one. Jane explained further that a store in a popular shopping center run a very high price per square meter (8,333.33 Baht/m<sup>2</sup>); meanwhile, a similar sized stand-alone market could cost significantly less (108.7 Baht/m<sup>2</sup>). The sizes of the locations also varied greatly, from 12 to 92 m<sup>2</sup>.

## 2. Population Statistics

Data on population density indicated the number of potential customers in each district. In addition to the traditional population density statistics, Jane asked her PD team to get details on population density by age and gender. Jane added that, according to a seminar on “Voice of Green” marketing from the College of Management, Mahidol University on Jan 11-12, 2020,

Baby Boomers were more likely than younger generations to support clean energy and environment protection, followed by Gen X, Gen Y, and Gen Z, respectively, and females were more likely than men to be green.

Kan argued that this might be a little bit in contrast to the statistics from the 2020 World Wealth Report that indicate that “Generation Green, millennials and Gen Z demonstrated environmentally and socially-conscious consumer behavior. In other words, they were leading the charge and driving sustainability on global and corporate agendas, as well as in their daily lives.”

The debate as to which generation or gender were most environmentally conscious could continue on and on. So many factors needed to be considered, especially when national policy must play an important role in facilitating sustainable development to encourage our citizen to work toward a cleaner environment, compared to the leading countries like Sweden and Japan.

### **3. Waste Volume**

Jane presented another interesting statistic regarding the amount of waste generated in each district. The assumption was that the areas with the lower amounts of household waste or plastic waste might signal that people in those areas were aware of eco-conscious practices. Kan agreed and added that green-oriented behavior could be indirectly measured from these waste statistics and that our potential target customers might make a habit of such preventive practices in a sensible and responsible manner.

### **4. Facilities, Transportation Mode, and Parking Lots**

Another factor for evaluating whether a location was best for the Eco Collective store was, inevitably, the facilities, public transportation, and parking lots. Jane explained further that some of the locations were in outdoor areas like local markets, some were in community malls, and others were in department stores or bigger shopping malls. Public transportation modes such as bus, boat, BTS, and MRT and the availability of parking spaces were important in any business location decisions. The cost of transportation was also important; and the selected locations must have convenient access to public transportation as well.

### **5. Environmental Policy**

Kan emphasized to Jane and her team that the green policies to support sustainable communities should be considered for each location. A quick search from the PD team showed that only four locations explicitly disclosed information on environmental initiatives creating basic green practices.

## The Mall Bang Kapi

At the Mall Bang Kapi, there was a drop-off location for dangerous waste such as batteries, cell phone carcasses, and containers contaminated with hazardous substances. The mall also had a policy "Every Day Say No to Plastic," meaning that shopping malls, as a mandatory practice, do not use plastic bags in order to support environmental sustainability.

## Metro Mall Rama9

The metro mall had a very effective waste segregation practice, keeping wet and dry wastes separate, so that the dry waste can be reused or recycled, and the wet waste could be composted. Lamps had all been completely changed to LED to save energy and reduce carbon dioxide emissions. The metro mall has also implemented lighting control systems to turn lights on and off as needed as well as smart thermostats to turn the AC units on or off automatically or seasonally to save energy.

## Min Buri Market

The Min Buri Market had also implemented a segregation policy for sorting dry and wet wastes. Dry waste was reused or recycled, and the wet organic waste was used to make fermented water, which was used to clean the market. Such practices helped reduce the use of chemicals that were harmful to the ecosystem, prevent them from going into landfills, and reduce the amount of waste for disposal.

## Boon Niyom Market

The Boon Niyon Market had initiated campaigns to reduce unnecessary consumption and a reuse and recycling policy all participants should follow. Additionally, no plastic bags were allowed in this market.

## 6. Local Ownership

Kan had been involved for years in many activities to promote a sustainability mindset, to create resonance and ownership among Eco Furniture's local suppliers, and to encourage environmentally conscious communities. It had been quite a challenge and she believed that the involvement of people in the community along with their being

responsible for solving environmental problems together would definitely drive the success of our Eco Collective initiative. Jane added that a sense of belonging in the community had been the driving force for community development. Only three locations were communities empowered to be involved in the development of local green policy.

### **Metro Mall Rama9**

The Thap Kaeo Community, Huay Kwang District, had many activities to promote education for those with inadequate educational opportunities. The health of its residents was the top priority. More importantly, the focus was on the community involvement and participation in sustainable development projects.

### **Min Buri Market**

Minburi District hold regular meetings for its residents to promote community engagement and share any community issues that must be resolved. Such public hearings and meetings were effective ways to reach its residents, listen to their opinions, and address any questions and problems, from business aspects and social problems to environmental issues that affected individuals or the community.

### **Boon Niyom Market**

The Boon Niyom Market had a long history, over 30 years, of promoting community involvement for those who are a part of the market and Bueng Kum District. The Organic Farming Network of Thailand (OFNT) was established as a collaboration between the Bank for Agriculture and Cooperatives (BAAC) and the Institute for Agricultural and Rural Development, Jamnian Sananak (KMITL) to provide support for farmers who participated in the project: to promote career opportunities, enhance their quality of life, create a non-toxic agriculture network, and promote the sufficiency economy guidelines to balance their way of living.

## **7. Community Participation and Support**

The last aspect Jane wanted to discuss was how these location choices supported local businesses, small enterprises, and small communities throughout the

country, either at the policy level or in operational practices. Jane believed that helping local communities, nearby communities, and society to improve their quality of life; promoting social enterprises; and providing efficient, innovative, and sustainable solutions to social and environmental problem aligned with the goals of Eco Collective.

**The Mall Bang Kapi** had often collaborated with the Department of Community Development to organize trade shows and exhibitions on "One Tambol One Product (OTOP) TO THE TOWN" to support small farmers. **Metro Mall Rama9** had partnered with Bangkok Expressway and Metro (BEM) to organize the activity "M Care, Good Health, Safe Life" for the surrounding communities for 10 consecutive years. It had also collaborated with many hospitals in the district to introduce fundamental health care, to provide health-related examinations and consultations, to hold basic CPR sessions for the communities, and to promote healthy nutrition programs to improve the quality of life for the residents. **Min Buri Market** had developed a plan to promote community-based tourism and to revitalize its old market to promote sustainable tourism practices historically and culturally, helping visitors experienced the local way of life. Lastly, **Boon Niyom Market** adopted a rotation policy for farmers to bring organic fruits and vegetables to sell. This rotation encouraged equality of income and prevents anyone from being a monopoly supplier in the market.

## Time to Make the Final Location Decisions

Based on what Kan and Jane discussed in the meeting, Kan believed that the Eco Collective store was the new direction for Eco Furniture to add to its business unit. Transforming the organization toward an eco-social enterprise would be challenging, but it was a great opportunity for Kan to revisit Eco Furniture's social enterprise and eco-friendly strategy. The success of an Eco Collective store will determine whether Kan, as the CEO, had made the right decision. Based on the information on market segmentation and market positioning, the competitor analysis, and the seven measurement criteria for each location, Kan now needed to decide the location for the first Eco Collective store. Of course, she could still turn down the Eco Collective initiative as well.

## Discussion Questions

1. Discuss the pros and cons of the Eco-Collective concept.
2. Discuss different types of market segmentation and identify which segment strategy is suited for an Eco Collective store.
3. Please list all factors that should be considered when narrowing down the location choices.
4. Discuss whether the Eco Collective initiative should be approved, and if so, which location should be selected for its first branch.

## Appendix D: Rental Fees

	The Mall Bang Ka Pi	Home Village KU	U-Delight Chatuchak	Metro Mall Rama 9	Min Buri Market	Boon Niyom Market
Monthly Rental Fees	100,000 Baht	19,000 Baht	20,000 Baht	28,000 Baht	12,000 Baht	10,000 Baht
Size (m <sup>2</sup> )	12 m <sup>2</sup>	18 m <sup>2</sup>	36 m <sup>2</sup>	14 m <sup>2</sup>	16 m <sup>2</sup>	92 m <sup>2</sup>
Rental/Square Meter (m <sup>2</sup> )	8,333.33 Baht/m <sup>2</sup>	1,055.55 Baht/m <sup>2</sup>	555.55 Baht/m <sup>2</sup>	2,000 Baht/m <sup>2</sup>	750 Baht/m <sup>2</sup>	108.7 Baht/m <sup>2</sup>

## Appendix E: Female Population by Age and District

Age/District	Bang Kapi	%	Huai Kwang	%	Bueng Kum	%	Chatuchak	%	Min Buri	%
Less than 23 years old	16,180	20.7%	8,221	18.2%	16,028	21.0%	14,922	18.1%	19,604	26.4%
23-38 years old	17,051	21.8%	12,148	27.0%	16,531	21.7%	19,205	23.3%	16,355	22.0%
39 -54 years old	22,728	29.1%	12,323	27.4%	21,204	27.8%	21,736	26.4%	20,808	28.0%
55 -73 years old	17,360	22.2%	9,472	21.0%	18,076	23.7%	19,316	23.4%	14,539	19.6%
More than 73 years old	4,842	6.2%	2,891	6.4%	4,438	5.8%	7,290	8.8%	2,973	4.0%
Total Female Population	78,161		45,055		76,277		82,469		74,279	

## Appendix F: Male Population by Age and District

Age/District	Bang Kapi	%	Huai Kwang	%	Bueng Kum	%	Chatuchak	%	Min Buri	%
Less than 23 years old	16,617	25.7%	8,148	22.6%	16,331	25.6%	15,892	22.6%	20,200	30.6%
23-38 years old	15,174	23.4%	9,966	27.6%	14,728	23.1%	17,171	24.4%	15,010	22.7%
39 -54 years old	17,514	27.0%	9,407	26.1%	17,052	26.8%	18,181	25.9%	17,304	26.2%
55 -73 years old	12,608	19.5%	6,680	18.5%	13,047	20.5%	14,525	20.7%	11,742	17.8%
More than 73 years old	2,834	4.4%	1,853	5.1%	2,578	4.0%	4,471	6.4%	1,833	2.8%
Total Male Population	64,747		36,054		63,736		70,240		66,089	

## Appendix G: Population Density per Square Kilometer

District	Bang Kapi	Huai Kwang	Bueng Kum	Chatuchak	Min Buri
Population Density per square meter (m <sup>2</sup> )	5,122	5,344	2,235	4,371	5,865
Population Density per household	1.39	1.03	1.89	1.29	2.34
Total population	142,908	81,109	140,013	152,709	140,368

## Appendix H: Waste Statistics.

	Bang Kapi	Huai Kwang	Bueng Kum	Chatuchak	Min Buri
Waste Generated (Tones/Day)	329.61	225.17	201.50	412	185.79
Waste Generated (Person/Day)	2.31	2.78	1.44	2.70	1.32
Plastic Proportion from The Total Waste	5%	19.61%	7.52%	9.26%	10%
Plastic Waste (kg/person/day)	0.12	0.54	0.11	0.25	0.13

**Appendix I: Facilities, Transportation Mode, and Parking Lots**

Location	The Mall Bang Kapi	Home Village KU	U-Delight Chatuchak	Metro Mall Rama 9	Min Buri Market	Boon Niyom Market
Air-Condition	√	√	√	√		
Parking Lot	√ Free for 2 hours Later charges 20 baht/hour		√	√ 40 baht/hour	√ Free for 20 mins 1 hr. 10 baht 2 hrs. 20 baht 3 hrs. 40 baht 4 hrs. 60 baht 5 hrs. - 1 day 250 baht	√
BTS/MRT	Finished by 2021	√	√	√	Finished by 2021	
Bus	√	√		√	√	√
Boat	√				Planned for expansion	

# Teaching Notes Eco Collective: A Case Study of Social Enterprise, Eco-Friendly, Bulk Stores

## I. Synopsis

This case is designed to illustrate the concept of social enterprise, eco-friendly, bulk store and to understand how to make effective decisions based on location analysis. The case starts when Jane, the head of the business strategy department, was assigned by Kan, the CEO of Furniture Collective, to develop a new business expansion plan by collaborating with small enterprises located in many small communities throughout the country. The case is divided into three parts. Case A provides an overview of Eco Collective bulk store, which offers a variety of organic and environmentally friendly products from local community partners with the concept of “Bring your own containers” for customers to refill. Case B focused on the concept of market segmentation, competitor analysis, and market positioning. Case C implicitly outlines factors that should be considered when narrowing down the location choices for Eco Collective’s first branch. As the head of the business strategy department, Jane needed to convince Kan to agree with her ideas about this social enterprise bulk store, identify the characteristics of customers, who were more eco-conscious, and identify which segment strategy is suited for an Eco Collective store. On the other hand, Kan needs to make a decision whether the Eco Collective initiative should be approved, and if so, which location should be selected for its first branch.

## II. Teaching and Learning Objectives

- Understand the international policies for waste management practices.
- Understand the concept of the social enterprise business model.
- Understand the concept of market segmentation, competitor analysis, and market positioning.
- Understand how to make effective decisions based on location analysis

### III. Potential Courses and Target Audiences

This case is primarily intended for MBA and doctoral level students in strategic decision-making courses. Additionally, students can learn how to evaluate decision choices based on different criteria including location analysis, market segmentation, competitor analysis, and market positioning.

#### Topics Covered in the Case

The following topics are discussed in or raised by the case:

- Location analysis
- Social enterprise
- Market segmentation
- Market positioning
- Competitor analysis

### IV. Conceptual Analysis

#### Social Enterprise

Social enterprise has emerged as a businesslike contrast to the traditional nonprofit organization. Social enterprise differs from the traditional understanding of a nonprofit organization in terms of strategy, structure, norms, and values and represents a radical innovation in the nonprofit sector. Social enterprise is likely to continue its evolution away from forms that focus on broad frame-breaking and innovation to a narrower focus on market-based solutions and businesslike models. Social enterprise is being accorded the status of a significantly important emergence in—if not quite a panacea for—the societal management of key social needs. Given our contemporary social fascination with market-based solutions and mechanisms, social enterprise is likely to both retain and expand its moral legitimacy.

Social entrepreneurs play the role of change agents in the social sector, by:

- Adopting a mission to create and sustain social values (not just private values),
- Recognizing and relentlessly pursuing new opportunities to serve that mission,
- Engaging in a process of continual innovation, adaptation, and learning,

- Acting boldly without being limited by resources currently in hand, and
- Exhibiting a heightened sense of accountability to the constituencies served and for the outcomes created.

**Reference:** (Dart, R. (2004). The legitimacy of social enterprise. *Nonprofit Management and Leadership*, 14(4), 411 - 424.)

## Market Segmentation Analysis

With full market coverage, a firm attempts to serve all customer groups with all the products they might need. Only very large firms such as Microsoft (software market), General Motors (vehicle market), and Coca-Cola (nonalcoholic beverage market) can undertake a full market coverage strategy. Large firms can cover a whole market in two broad ways: through differentiated or undifferentiated marketing.

With selective specialization, a firm selects a subset of all the possible segments, each objectively attractive and appropriate. There may be little or no synergy among the segments, but each promises to be a moneymaker. When Procter & Gamble launched Crest Whitestrips, initial target segments included newly engaged women and brides-to-be as well as gay males. The multisegment strategy also has the advantage of diversifying the firm's risk.

With product specialization, the firm sells a certain product to several different market segments. A microscope manufacturer, for instance, sells to university, government, and commercial laboratories, making different instruments for each and building a strong reputation in the specific product area. The downside is that the product may be supplanted by an entirely new technology.

With market specialization, the firm concentrates on serving the many needs of a particular customer group, such as by selling an assortment of products only to university laboratories. The firm gains a strong reputation among this customer group and becomes a channel for additional products its members can use. The risk is that the customer group may suffer budget cuts or shrink in size.

With single-segment concentration, the firm markets to only one particular segment. Porsche concentrates on the sports car enthusiast and Volkswagen on the small-car market; its foray into the large-car market with the Phaeton was a failure in the United States. Through concentrated marketing, the firm gains deep knowledge of the segment's needs and achieves a strong market presence. It also enjoys operating economies by specializing its production, distribution, and promotion. If it captures segment leadership, the firm can earn a high return on its investment.

Individual marketing, the ultimate level of segmentation, leads to "segments of one," "customized marketing" or "one-to-one marketing." As companies have grown proficient at gathering information about individual customers and business partners (suppliers, distributors, retailers), and as their factories are being designed more flexibly, they have increased their ability to individualize market offerings, messages, and media. Mass customization is the ability of a company to meet each customer's requirements, to prepare on a mass basis individually designed products, services, programs, and communications.

**Reference:** (Kotler, P., Keller, K.L., Manceau, D., & Dubois, B. (2016). *Marketing Management*, 15e Edition. : Pearson Education.)

## Guidelines for Implementing Location-Based Decision Systems

The proposed 10 steps to guide implementation of any business analytics (BA) projects are outlined. A case study of a retail supermarket illustrates the deployment of the proposed BA framework.

### Step #1: Setting Up Business Goals and Objectives

The first step is to define appropriate business goals and the objectives for the analysis in the domain of a retail supermarket. For instance, the supermarket has had its customer loyalty program for a decade but has not fully utilized the data collected from the loyalty program to understand its customers' purchasing behavior. Currently, the supermarket is offering a new campaign, "BOGO-50%OFF," for a gift set of "Dark-Spot

Remover,” meaning that customers who purchase any product of \$50 or more are eligible to purchase a gift set at a 50% discount. This gift contains 4 main products: Dark-Spot Cleanser, Dark-spot Day Care, Dark-Spot Night Repair, and Dark-Spot Lotion. Before launching this campaign, the supermarket’s management wants to determine which customers are likely to participate.

## Step #2: Defining Key Performance Indicators

The second step is to properly set up the key performance measurements so that the analysts know which metrics or indicators are used to measure, monitor, and manage the performance of its loyalty program and marketing strategies. Usually the business performance management (BPM) layer identifies the key performance indicators, such as sales, profits, orders, customer acquisition rate, customer attrition rate, and customer retention rate, which must be linked to the organizational strategies.

## Step #3: Collecting Data Pertinent to the Business Domain

The next task, in Step #3, is to collect the data relevant to the problem or business domain. For instance, the data used to analyze the effectiveness of its loyalty program can be categorized into the following three sections. Below are examples of the enterprise data management layer with examples of data used in the analysis, such as customer profiles and transaction data by months and stores.

- Demographic information includes Age, Gender, Affluence grade, Residential Zone, Geographic Region, and Advertisement Zone
- Loyalty card member information includes Loyalty Class, Loyalty Time, Total Spending, Time Since Last Purchase, Total Day Care Products Purchased, Total Night Repair Products Purchased, Total Cleansing Products Purchased, and Total Lotion Products Purchased
- Marketing-channel-related information includes social media information (Facebook Likes on the “Dark Spot Remover” advertisement), the use of mobile applications, and the campaign email response.

## **Step #4: Data Integration and Data Preparation**

In Step #4, preparation of the data, cleaning, formatting, and organizing it, may take some time, especially when the data comes from different data sources (the database management layer). Problems of data duplication, data inconsistency, and data errors are usually found while preparing or integrating data, before further analysis.

## **Step #5: Making Senses of the Collected Data through Descriptive Analytics**

At this point, the data/business analysts can start making some sense of the performance measures defined in Step #2 (sales, profits, orders, customer acquisition rate, customer attrition rate, and customer retention rate). Dashboard, web, or mobile platforms (the user interface layer) can facilitate such data exploration activities so that analysts understand how these measures are captured and are able to figure out from the historical data what is happening to those measures.

## **Step #6: Gaining Insights into the Behavior**

The key activity for data/business analysts in Step #6 is to look for insights into the data, whether they can discover any patterns based on the preliminary analysis of the targeted performance measures. For instance, the analysts may find that only approximately 25% of customers responded to the “BOGO-50%OFF” campaign, and only 3% of customers who have been a loyalty member less than three months purchased the gift set, indicating that the supermarket is not doing a good job of acquiring new customers. Another key finding is that customers who are under 35 years old are more likely to purchase the gift set than customers, who are over 35 years old.

## **Step #7: Setting up Research Questions Pertinent to the Business Goals and Objectives Indicated in Step #1**

In Step #7, specific research questions relevant to the business goal and objectives indicated in Step #1 are set up. This process helps guide the selection of methodologies or statistical analysis techniques that should be used to answer the research questions. For instance, the research questions might be

- What are the characteristics of customers who are likely to respond to the promotions/campaigns?
- What products would our customers consider buying?
- What products do our customers purchase together?
- What is the best time of the year to launch the “BOGO-50%OFF” campaign?

### **Step #8: Creating a Data Analysis Framework and Scenarios**

Step #8 focuses on creating a data analysis scenario where a variety of data mining techniques (the Business Analytics Layer) such as neural networks, logistic and polynomial regressions, and decision tree models can be employed. Cluster analysis can also be used to segment customer data into sub-groups that share similar characteristics before building models to explain and predict the behavior of customers who are likely to respond favorably to the “BOGO-50%OFF” campaign.

### **Step #9: Turning Knowledge from Data Analysis into Actionable Plans (Model Deployment)**

In Step #9, the key findings from the data analysis, either from the data exploration in Steps #5 and #6 or from the predictive models in Step #8, are used to provide feedback to the data/business analysts so that actionable plans can be developed to predict the right target group or to personalize campaigns that are suitable to particular clusters defined in the previous step.

### **Step #10: Monitoring, Measuring, and Comparing the Specified Performance Indicators**

The last step is to monitor those strategies to ensure that the targeted performance indicators can be managed and controlled.

The framework presented in this chapter provides fruitful avenues and guidelines for exploring the implications of BA in a retail supermarket and can be applied to any other industry.

**Reference:** (Chongwatpol, J. (2017) Business Intelligence and Analytics for Managers. Bangkok, Thailand: Chulalongkorn University Printing House)

## V. Discussion Questions and Analysis

### A. Discussion Questions

1. Discuss the pros and cons of the Eco-Collective concept.
2. Discuss different types of market segmentation and identify which segment strategy is suited for Eco Collective.
3. Please list all factors that should be considered when narrowing down the location choices.
4. Discuss whether the Eco Collective initiative should be approved, if so which location would be selected for its first branch.

### B. Analysis

#### 1. Discuss the pros and cons of Eco-Collective concept.

Pro:

- a. Zero Waste Shopping Concept
- b. Helps combat food waste
- c. Buy only what you need.
- d. Plastic-free cleaning products or homewares
- e. Independently owned, stocked by local suppliers, meaning that we can put more money back into the local community/economy.
- f. Glass, wood, and metal containers are less likely to crack or stain and even last longer.
- g. These containers can be much easier to recycle at the end of their life than plastic is.

Con:

- a. Reaching the store from distances might mean driving to the store. Are you doing more damage to the environment using your car than reducing the amount of plastic used?
- b. If the customer replaces one piece of single-use plastic packaging with a Tupperware container, it may take reusing the container multiple times (maybe 100 times) before it's a better solution in material consumption terms.

- c. Customers may find it is inconvenient to bring their own containers to the stores, as they might be too heavy to carry.
- d. It may take time to process the products purchased. For instance, the raw ingredients require home cooking or refilling the original detergent containers from the Tupperware .

**2. Discuss different types of market segmentation and identify which segment strategy is suited for Eco Collective.**

**There are different types of marketing segmentation.**

With full market coverage, a firm attempts to serve all customer groups with all the products they might need. Only very large firms can undertake a full market coverage strategy. Large firms can cover a whole market in two broad ways: through differentiated or undifferentiated marketing.

With selective specialization, a firm selects a subset of all the possible segments, each objectively attractive and appropriate. There may be little or no synergy among the segments, but each promises to be a moneymaker.

With product specialization, the firm sells a certain product to several different market segments (academic, public, government, and private segments). The downside is that the product may be supplanted by an entirely new technology.

With market specialization, the firm concentrates on serving the many needs of a particular customer group. The firm gains a strong reputation among this customer group and becomes a channel for additional products its members can use. The risk is that the customer group may suffer budget cuts or shrink in size.

With single-segment concentration, the firm markets to only one particular segment. Through concentrated marketing, the firm gains deep knowledge of the segment's needs and achieves a strong market presence. It also enjoys operating economies by specializing its production, distribution, and promotion. If it captures segment leadership, the firm can earn a high return on its investment.

Individual marketing, the ultimate level of segmentation, leads to “segments of one,” “customized marketing” or “one-to-one marketing.” As companies have grown proficient at gathering information about individual customers and business partners (suppliers, distributors, retailers), and as their factories are being designed more flexibly, they have increased their ability to individualize market offerings, messages, and media.

Mass customization is the ability of a company to meet each customer's requirements to prepare on a mass basis individually designed products, services, programs, and communications.

**Answers:** The market segmentation strategy for Eco Collective should be “Market Specialization”

**3. Please list all factors that should be considered when needed to take into consideration when narrowing down the location choices.**

- Waste management practice
- The concept of bulk stores
- Social enterprise business model
- Sustainable development goals (SDGs)
- Market segmentation
- Competitor analysis
- Positioning
- Rental expenses
- Population statistics
- Waste volume
- Facilities, transportation mode, and parking lots
- Environmental policies
- Local ownerships
- Community participation and support

4. Discuss whether the Eco Collective initiative should be approved, if so which location would be selected for its first branch.

#### Key Factor Comparison

Location	Rental Expenses	Population Statistics		Waste Volume Plastic Waste (kg/person/day)	Facilities, Transportation Mode, and Parking Lots	Local Ownerships	Environmental Policy	Community Participation and Support
		Population Density per household	Gen Y, 23-38 years old					
The Mall Bang Kapi	8,333.33 Baht/m <sup>2</sup>	1.39	32,225	0.12	Air-con, Parking Lot, BTS/MRT, Bus and constructing BTS/MRT	N/A	YES	YES
Home Village KU	1,055.55 Baht/m <sup>2</sup>	1.29	36,376	0.25	Air-con, BTS/MRT, Bus	N/A	N/A	N/A
U-Delight Chatuchak	555.55 Baht/m <sup>2</sup>	1.29	36,376	0.25	Air-con, Parking Lot, BTS/MRT	N/A	N/A	N/A
Metro Mall Rama 9	2,000 Baht/m <sup>2</sup>	1.03	22,114	0.54	Air-con, Parking Lot, BTS/MRT, Bus	YES	YES	YES
Min Buri Market	750 Baht/m <sup>2</sup>	2.34	31,365	0.13	Parking Lot, Bus, constructing BTS/MRT and expansion plans for boats	YES	YES	YES
Boon Niyom Market	108.7 Baht/m <sup>2</sup>	1.89	31,259	0.11	Parking Lot and Bus	YES	YES	YES

## Key Advantages and Disadvantages of Each Location

**Scenario #1:** Considering population statistics (Gen Y, 23-28 years old), population density per household, waste volume statistics (Plastic Waste – kg/person/day), and rental expenses, the decision would be Boon Niyom Market, followed by U-Delight Condominium, and Min Buri Market.

**Scenario #2:** Considering population statistics (Gen Y, 23-28 years old), population density per household, waste volume statistics, rental expense, facilities, environmental policy, local ownership, and community support/participation, the decision would be Boon Niyom Market, followed by Min Buri Market, and The Mall Bangkok.

**Scenario #3:** Considering brand positioning, potential market, brand awareness, and increased public awareness of the eco-conscious practices, the decision would be The Mall Bangkok, followed by Metro Mall Rama 9.

**Scenario #4:** Considering the potential residential target market group and the younger generation, Home Village KU would be the first choice to test its first Eco Collective branch, followed by U-Delight Chatuchak.

Location	Descriptions	Advantages	Disadvantages
The Mall Bang Kapi	Shopping Mall	Convenient, Well-known, Popular, and Many parking-lots High-Quality/High-Price Brand Perception	Costly rental expenses, long payback period
Home Village KU	Community Mall nearby campus	More people from the younger generation High-Quality/High-Price Brand Perception	No parking-lots
U-Delight Chatuchak	Condominium	Residential area, more needs for consumable products	Limited to residents in the area, less exposure to non-resident customers
Metro Mall Rama 9	Retail spaces inside the metro station	The so-called New CBD of Bangkok, Convenient shopping place on the way home, High-Quality/High-Price Brand Perception	Transportation hub, people tend to rush home rather than browsing or looking around
Min Buri Market	Traditional Marketplace	Open-air market that you can find everything you need	Many choices of inexpensive substitutes Low Quality/Low-Price Brand Perception
Boon Niyom Market	Organic Farmer's Market	Eco-friendly, good market and environmental policies	Not famous, inconvenient parking spaces Low Quality/Low-Price Brand Perception

## VI. Teaching Plan

The case study should be used as a practicum exercise in an one-to-two-hour class discussion. The instructors can spend a half an hour reviewing the concept of the eco-friendly type of stores, the social enterprise business model, and sustainable development goals (SDGs). If the students already have background knowledge on these concepts, the instructors can start with the case discussion right away.

### Expected Flow of Discussion & Key Issues to Raise at Specific Points

The case study is divided into three parts:

- **Case A** is intended to provide an overview of the Eco Collective concept, the eco-friendly store. Students should get a sense of the public environmental awareness and the importance of waste management practices. At this point, students should be able to identify the characteristics of customers who are more eco-conscious. What are their needs? How are they different from those less eco-conscious customers?

**Note that Case A can be distributed as a homework assignment (for a one-hour session or at the beginning of the class (for a 2-hour session)).**

**The estimated time for Case A: 30 minutes**

- **Case B** is all about marketing analysis. Students should understand different types of market segmentation and which segment strategy is suited for Eco Collective. Students then have a chance to tap into the competitor analysis and how Eco Collective should position itself against the competitors. At the end of the case, students should be able to develop key measures for what factors need to be considered when narrowing down the location choices.

**The estimated time for Case B: 30 minutes**

- **Case C** focuses more on location analysis. Students need to decide which of the six 6 locations should be the one for the first Eco Collective branch. Key measures identified in Case B are used as criteria to justify the decision choices. At the end of

the cases, student should be able to list the advantages and disadvantages of each decision choice. Depending on how students weigh each criterion, there are no absolute right or wrong answers. The purpose of this case is to encourage students to develop logical thinking skills when they think about what data is needed to justify the decision choices. Analytical skills start when they evaluate and weight each criterion based on the data support provided. Critical thinking skills start when they discuss with their classmates, especially when they have different opinions when they narrow down the location choices. Lastly, strategic thinking starts when they have to make decisions as the CEO of Eco Furniture.

**The estimated time for Case C: 30 minutes to an hour.**

## VII. Research Methodology

This case study was part of business intelligence and data analytics course. Students learn how different analytical tools and techniques are used in managerial decision-marketing. The focus of this case study is the practice of extracting and analyzing business data to make accurate decisions in determining market opportunities relevant to the enterprise. Further reading on how to integrate decision support system and business intelligence to make better decision making can be found in the following three studies.

Kanchanapoom, K., & Chongwatpol, J. (2021). Applications of business intelligence and marketing analytics in the complementary and alternative medicine industry. *Journal of Information Technology Teaching Cases*, 11(1), 30-42.

Chongwatpol, J (2018) "Credit Card Application Pending -- Who Are Our Best Prospect Cardholders?: Improved Decisions through Business Analytics and Business Intelligence", *Journal of Information Technology Teaching Cases (JITTC)*, 8(1), 29-44

Chongwatpol, J (2016) “Data Analysis and Decision Making: A Case Study of Re-accommodating Passengers for an Airline Company”, *Journal of Information Technology Teaching Cases (JITTC)*, 6(1), 23-35

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# Benchmarking Open Government Principles: Quantitative Evaluation and Prediction Analysis of Logistics, Health, Agriculture and Economics

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## Abstract

The concept of Open Government is a new idea that the cabinet has recently resolved. Government agencies at different levels, including the central government, regional governments, and local governments, have not been aware of this issue. Simultaneously, some of this concept is part of the country management, supported by laws and regulations. The result has not been well achieved as it should be. Disclosure is often limited. This research was conducted to study and analyze the current status of Open Government in improving the quality of public services, and analyze the relationship and data open that affect the four dimensions of an Open Government: Transparency, Open Data, Accountability, and Governance Network in public health, economy, Transport, and Agriculture. To this end, this research offers Thailand's Open Government policy and

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the transaction data from the public manual database's transaction processing and the frequency of data browsing to analyze the gap for Improvement for each dimension in order to improve the quality of operation and public services to support the changes in the future. The key findings illustrated that to promote the Open Government; the government should realize the importance of adopting digital technology in the public administration process by urgently formulating a policy for the development and management of extensive databases which can help analyze and develop public services that respond to the public's needs. Big data is required to support proactive and preventive government policies effectively under the drive to integrate public databases and enhance public services quality, as well as monitor and evaluate the data linkages of various agencies periodically.

**Keywords:** *Open Government, Integrity and Transparency Assessment, Corruption Perceptions Index, Public Good Governance Indicators, Data Governance for Government*

## การเปรียบเทียบตัวชี้วัดตามหลักการบริหารราชการแบบเปิด : การประเมินเชิงปริมาณและการวิเคราะห์เชิงคาดการณ์ กรณีศึกษา ด้านสาธารณสุข เศรษฐกิจ การขนส่ง และด้านการเกษตร

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### บทคัดย่อ

แนวคิดเรื่องราชการแบบเปิดถือเป็นแนวคิดใหม่ที่คณะรัฐมนตรีเพิ่งมีมติให้เริ่มดำเนินงานได้ไม่นาน หน่วยงานรัฐในระดับต่าง ๆ ทั้งราชการบริหารส่วนกลาง ส่วนภูมิภาค และส่วนท้องถิ่นยังไม่ค่อยมีการตระหนักในเรื่องนี้มากนัก แม้ว่าบางส่วนของแนวคิดนี้เป็นส่วนหนึ่งของการบริหารจัดการบ้านเมืองที่ดีซึ่งมีกฎหมายและระเบียบต่าง ๆ รองรับ แต่ผลการดำเนินงานยังไม่บรรลุผลเท่าที่ควร ดังจะเห็นว่าหน่วยงานภาครัฐยังไม่สามารถเชื่อมโยงข้อมูลข้ามหน่วยงานได้ทั้งระบบ เนื่องจากอุปสรรคด้านวัฒนธรรมองค์การของภาครัฐเรื่องการหวงข้อมูล งานวิจัยฉบับนี้จึงจัดทำขึ้นเพื่อศึกษาและวิเคราะห์สถานการณ์ของบริหารราชการแบบเปิดในการยกระดับคุณภาพการให้บริการสาธารณะ และวิเคราะห์ความสัมพันธ์และความเชื่อมโยงของข้อมูลที่ส่งผลต่อการเป็นการบริหารราชการแบบเปิด ทั้ง 4 มิติ ได้แก่ มิติความโปร่งใส มิติเปิดเผยข้อมูล มิติการรับผิชอบ และมิติการบริหารราชการแบบเครือข่ายของด้านสาธารณสุข เศรษฐกิจ การขนส่ง และด้านการเกษตร วิเคราะห์และเสนอแนะนโยบายการบริหารราชการแบบเปิดของประเทศไทย ควบคู่กับข้อมูลการดำเนินการจรรยาบรรณจากฐานข้อมูลคู่มือสำหรับประชาชน และความถี่ในการเรียกดูข้อมูล

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เพื่อวิเคราะห์แนวทางในการพัฒนาในแต่ละมิติ เพื่อช่วยในการปรับปรุงคุณภาพการดำเนินงานและการให้บริการสาธารณะ สามารถรองรับกับการเปลี่ยนแปลงในอนาคต ผลการศึกษาพบว่า ภาครัฐควรตระหนักถึงความสำคัญของการนำเทคโนโลยีดิจิทัลมาใช้ในการกระบวนการบริหารราชการ ด้วยการกำหนดนโยบายเร่งด่วนในด้านการพัฒนาและจัดการฐานข้อมูลขนาดใหญ่ เพื่อใช้ในการวิเคราะห์และพัฒนางานบริการที่ตอบสนองต่อความต้องการของประชาชน ทำให้ภาครัฐมีข้อมูลขนาดใหญ่ที่สามารถสนับสนุนในการกำหนดนโยบายรัฐในเชิงรุกและเชิงป้องกันได้อย่างมีประสิทธิภาพ ภายใต้การขับเคลื่อนแนวทางการบูรณาการฐานข้อมูลประชาชนและบริการภาครัฐให้สำเร็จอย่างเป็นรูปธรรม

**คำสำคัญ:** การบริหารราชการแบบเปิด ตัวชี้วัดการประเมินคุณธรรมและความโปร่งใสในการดำเนินงาน ตัวชี้วัดธรรมาภิบาล ตัวชี้วัดดัชนีการรับรู้การทุจริต ตัวชี้วัดธรรมาภิบาลข้อมูลภาครัฐ

## Introduction

The changing context of technological advancement, the more complicated socio-economic situation, the government's operation requires cooperation from different sectors to meet the public's needs. The government must seek a new governance way (Estevez & Janowski, 2013). The government needs to focus on the private sector's participation, the public sector, and the civil society in promoting a participatory governance system toward an Open Government. This will help develop the public's feedback dynamics to establish policy and improve public services to meet the public's needs (OECD, 2018).

The government administration in Thailand was originally focused on bureaucratic polity (Riggs, 1966), or a closed administration system, which later reformed the bureaucratic system by adopting new public management (Hood, 1991) implemented during B.E. 2541-2549 (1998-2006). The concept of private sector management was a new organizational model that was more efficient, independent, and agile. It changed in a way that disaggregates departments from ministries to reduce the government sector's size. However, the concept has been criticized for its emphasis on leaders' role and ignored government's accountability (Denhardt & Denhardt, 2015; Barzelay, 2001). The advancement of technology also challenged the new concept of government administration in democratic governance (Denhardt & Denhardt, 2011; Dunleavy et al., 2008)

During B.E. 2550 (2007), the New Public Governance (NPG) influenced the bureaucratic reform concept. As society became more diverse, the concept was more focused on the role of the civil society sector and public engagement and the New Public Service concept (NPS). This emphasized the role of digital technology that helped improve public services more efficiently. The improvements could be seen in government processes that adopted technology such as online tax payments, ID cards, mobile utility payments.

Currently, the Government has demonstrated its intention to adopt an Open Government concept, which can be seen in the Kingdom of Thailand's constitution, B.E. 2560 (2017). It has adopted good governance principle, focusing on transparency and accountability of public services, rights to disclose the public data, and civil society's role in the government's policy decision-making process. The state shall listen to the opinions of the concerned persons and consider them in all legal process, whether it is a 20-year national strategy (2018 - 2037), formulation of the 6th strategy on balancing and developing government administration system by allowing the government to adhere to the principle of "Government of the people, for the people and public interests" by following the good governance principle, adjusting the work culture to achieve the overall achievements and benefits, adopting innovation, big data technology, and digital working systems. Also, the cabinet has adopted a resolution on December 4, 2018, and has assigned OPDC to proceed with the participation as a member in the Open Government Partnership (OGP)<sup>1</sup>. OPDC by the sub-committee of Public Sector Development Commission for developing and promoting participatory government administration is currently carrying out the abovementioned subject.

The concept of Open Government aims to enhance culture-based management on the state's policy and operation that emphasizes innovation and sustainability and

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<sup>1</sup> The International Cooperation Organization aims to promote Open Government at both national and sub-national levels. Established in 2011, it currently has 78 member countries.

the principle of open data. Government agencies can disclose government data to the public to create transparency, accountability, and ecosystems contributing to public participation (OECD, 2016). People are the center in creating shared value, formulating public policies and services for the government sector, responding to the public's needs efficiently, and building public trust (Janowski, 2015).

However, the concept of Open Government is a new idea that the cabinet has recently resolved. Government agencies at different levels, including the central government, regional governments, and local governments, have not been aware of this issue. There are very few research studies on this issue in Thailand. Simultaneously, some of this concept is part of the country management, supported by laws and regulations. The result has not been well achieved as it should be. Disclosure is often disclosed as requested or as limited disclosure. In addition, Thailand's main challenge is the lack of effective coordination among government agencies and other sectors and the resolution of conflicts arising in collaboration with policymakers and stakeholders. There is no platform to express honest opinions and utilize them seriously. Disclosure is characterized as one-way communication. It lacks the use of comments or complaints from different sectors to improve operation. In general, the complaint system is portrayed as a ritual. Inequality in Thai society leads to a hierarchical control mechanism of the government sector and a unicentric system.

Therefore, the overarching research question is how does the process of open data, transparency, accountability, and governance network shape the emergence and strategy of Open Government initiative? This paper aims to explore the state of Open Government data initiatives, as well as existing tools and approaches. To achieve the aim and answer research question, data analytics related to publishing and consuming open data through government portals, and data catalogues were conducted with four main areas: Transparency, Open Data, Accountability, and Governance Network in public health, economy, transport, and agriculture. Data analysis was conducted from 27 databases 14 agencies. Additionally, there very few studies of benchmarking Open Government and this

research was designed to address this shortfall obtaining indicators and the resulting measures of government openness.

Benchmark results will offer the Thai government some practical policy recommendations toward weak features and technological dimension that contribute to the government operation based on the Open Government concept to improve public service quality and public well-being and help government agencies become more adaptable and agile to meet people's needs better.

## **Research Objectives**

1) To study and analyze the current status of Open Government in improving the quality of public services, and analyze the relationship and data openness that affect the four dimensions of an Open Government: Transparency, Open Data, Accountability, and Governance Network in public health, economy, transport, and agriculture.

2) To analyze and propose Thailand's Open Government policy and the transaction data from the public manual database's transaction processing and the frequency of data browsing to analyze the gap for improvement for each dimension in order to improve the quality of operation and public services to support the changes in the future.

## **Research design**

Research design or framework is an initial and holistic stage that helps researchers to achieve objectives and avoid the situation in which the evidence cannot answer the research questions (Yin, 2009; Bryman, 2016). This research focuses on studying and analyzing Open Government through the elements of open data against transparency, accountability, and governance network. The research explores which level of Thailand's current open data status has been achieved and how transparent, accountable, and participatory the open data's creation and mechanism are. Then policy-based recommendations are developed by performing documentary analysis and data analytics and Open Government's level analysis from 14 government agencies, 27 databases,

consisting of transport and logistics databases (4 databases), public health (4 databases), agriculture (4 databases), and economic, financial, and industrial (15 databases) and from the High-Value Dataset and the highest data browsing statistics, classified by category from www.data.go.th website to analyze the correlation and data linkages that affect the Open Government being in four indicators: Transparency (from Corruption Index database: CPI and Integrity and Transparency Assessment: ITA), Open Data (from Open Government Data of Thailand database), Accountability (from Good Governance Index database), and Governance Network (from the Good Governance Index database) of each category, to determine which aspects are the outstanding and current status of Open Government. Then analyze the correlation of four-dimensional factors associated with Open Government together with the transaction data generated from the citizen manual database and frequency of data browsing, to analyze the gap for improvement for each dimension associated with each category of data, to develop suggestions, to improve and prepare the policy proposal, to promote the Open Government in each dimension based on the correlation and data linkages using dimension index's processing technique and determining the weight of each dimension by analyzing and processing big data (R programming) and displaying a dashboard with Tableau Tool.

## Research Method

This research, designed to be quantitative research with statistical data analysis (Data Analytics), is based on the analysis of four areas, including transportation and logistics, public health, agriculture, and economic, financial, and industrial areas. It analyzes the factors' linkages related to the Open Government's development in four dimensions: Transparency, Open Data, Accountability, and Governance Network. The analysis is divided into four steps: Step one Basic analysis, through the availability of High-Value Data and highest data browsing statistics by performing correlation analysis of the data from 27 databases 14 agencies Step Two The analysis of factors related to Open Government's development by performing statistical factor analysis and determining factors related to development (related factors x weight of each area). It consists of four-dimensional factors: Transparency, Open Data, Accountability, and Governance Network. They are linked to high-value data analysis in four areas (transport and logistics, public health, agriculture, and

economic, financial, and industrial). Step Three Diagnostic model data analysis with consideration of four factors relating to Open Government’s development, perform data linkage analysis obtained from High-Value data and determining the weight of individual factors in comparison with the diagnostic results and the relevant transaction data relating to the High-Value data categories and highest data browsing statistics to compare the status results of the Open Government’s development. Step Four Recommendation-based analysis, analyze the distinctive points of the Open Government’s development in all four-dimensional factors, to determine and to make policy recommendations to promote an Open Government based on each dimension according to the correlation and data linkages results, using dimension index’s processing technique and determining the weight of each dimension by analyzing and processing big data (R programming) (Forkan et al., 2015) and displaying a dashboard with Tableau Tool (Veljković et al, 2014).

## Literature review

The research presents a framework used in research, including Open Government, governance networks, transparency, data openness, and accountability (see Figure 1).

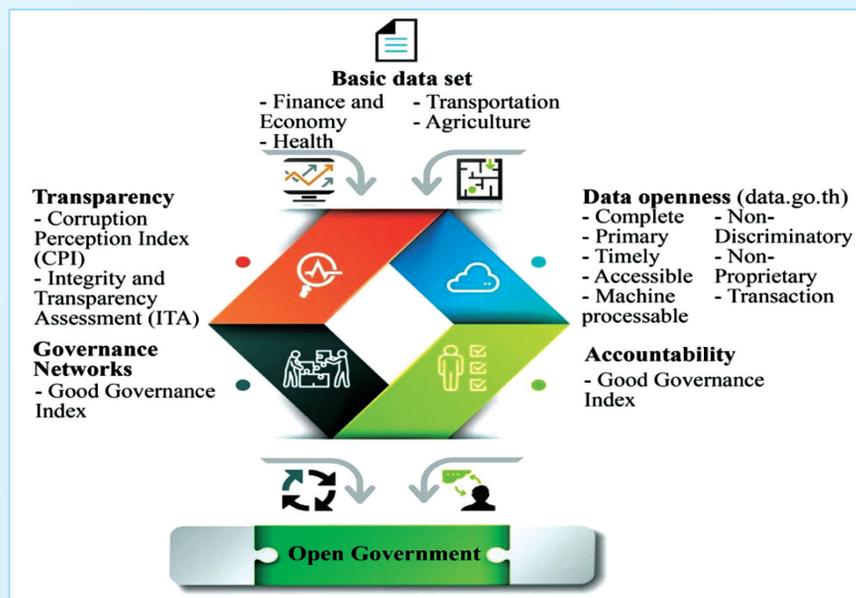


Figure 1. Conceptual framework of Open Government

## Open Government

Over the past decade, governments worldwide have increasingly focused on the Open Government's concept because Open Government has brought many benefits to many different dimensions, including increasing efficiency, reducing corruption, and increasing the government agencies' accountability. However, the definition of Open Government is differentiated by each country's political, social, and cultural context, reflecting each country's priorities (Mutuku & Colaco, 2012; OECD, 2014). An OECD survey in 2016 found that 51 percent of member states have defined definitions of Open Government Administration or adapted it from abroad, while the other 30 percent have defined their definitions. The OECD has defined Open Government Administration as creating a governance culture based on public policy innovations and practices based on transparency, accountability, and participation, leading to promoting democracy and equal growth. The OECD also suggested that the successful Open Government Administration must begin with the definition recognized by all sectors, including all stakeholders. In addition, Geiger and von Lucke (2012) suggest that Open Government consisted of transparency, participation of the private sector, people, government sector, and information technology adoption as part of the public administration. Meijer et al. (2012) proposed that it allowed the people to participate in public administration audits by accessing the public sector's information and decision-making processes. Open Government is a practical approach integrating external knowledge with the political and bureaucratic processes through information technology deployment. Evans and Campos (2013) also featured technological contexts that helped encourage participation between policymakers and the public.

Open Government consists of open data to ensure transparency and participation, enhancing public value by utilizing social media and technology (Lee & Kwak, 2012). Reddick and Ganapati (2011) studied public satisfaction and government administration success by interviewing 80 Chief Information Officers (CIO). It was found that 76 percent of senior information technology executives believed that Open Government enhanced effectiveness, transparency, and fulfilling the mission of the organization with regards to

transparency, accountability, and technological infrastructure that enabled transparent operation (Relly & Sabharwal, 2009), leading to enhancing trust in the public sector (Nam, 2012; Grimmelikhuijsen & Meijer, 2014)

Piotrowski et al. (2009) provided a view of enhancing Open Government culture by studying key issues related to data regulations implementation. The case study found that factors affecting Open Government Administration, including transparency, were evaluated by the public sector's information dissemination, public governance, and accountability assessment mechanism. Janssen et al. (2012) identified the benefits of Open Government to politics and society, such as transparency and democratic accountability, through greater engagement and confidence in the public sector. The economic benefits were to create value for the economy and increase data availability for investors and companies.

In summary, Open Government is a reform of government management. It consists of 4 key principles: (1) transparency, (2) accountability, (3) participation, and (4) open data with focuses on developing public service systems and promoting bureaucracy by adopting digital technology. Digital allows more systematic (system approaches) to be implemented in government operation. It is crucial to strengthen networks and decentralization by taking substantial advantage of new technologies such as data sharing and implementing consistent and comprehensive technologies with broader policies. This leads to decisions driven by a network of partners among government, private and public sectors to address today's challenges, help reinforce innovations, promote the ecosystem for public services delivery, and improve government administration efficiency. The transition of culture, bureaucracy, and politics is at the heart of the transitional drive into Open Government.

### **Open Data**

Open data about public sector operation includes storing and disseminating information about government budget spending and performance. It provides both insights and receptive information. The disseminated information must be accessible, easy to understand, and convenient to the users and allow civil society to access the government

data and facilitate the collaboration in maintaining data storage among government agencies. The public's opinion is used to give the public a sense that their views have the highest value and benefits (Harrison & Sayogo, 2014).

The OECD's recommendation on the digital government strategy sets out to promote data-driven culture among the government agencies. Data is valued as an asset. Key features of digital organizations and business models, such as the ability to collect the data, production output, and big data processing to understand the data insight and to identify the future trends by utilizing data and other sources in government administration to understand the needs of service recipients, have continuously improved the performance and expanded the network of external stakeholders to create the shared value-added together.

The focus on information is a key component of the transition to digital government and Open Government, strengthening policy and providing effective government services. Leading countries that tend to focus more on information policy, such as France, Korea, Japan, Mexico, the United Kingdom, and the United States, usually appoint a chief data officer or chief data scientist to assist in government administration and synthesize the highest value from the existing data. These countries often invest in government data development, increase the ability to analyze data, analyze the impact of the current data, improve data management, identify and fill out the government's requirements; for example, Denmark has established an agency responsible for developing data policy.

A typical implementation to opening government data is to collect relevant datasets and their respective metadata and publish them on a Open Government data portal. Another difference between Open Government implementations is the scope, where a portal or catalogue may publish data relevant to a specific administrative region, for example, a city or a country. A large number of countries have created local or national government data portals in order to provide access to Open Government datasets (Martin, Foulonneau & Turki, 2013). Four major sites to date are in the US (data.gov),

the UK (data.gov.uk), France (data.gouv.fr), and Singapore (data.gov.sg) (Hendler et al., 2012). Such portals act as one-stop-shops and facilitate consumers' access to government data, saving the trouble of collecting data from various authorities, offices, or websites. Thailand has also established data.go.th which was applied in this research for evaluating the degree of openness of published data. It is consisted of eight criterias, namely complete, primary, timely, accessible, machine processable, non-discriminatory, non-proprietary, and transaction.

Data has become the most valuable resource of the digital economy and is the essential basis for digital government (Bertot et al., 2014). Thailand has not yet developed a regulatory framework for government data or has a specific government data policy to seek capabilities in building the government database proactively.

Digital Government Development Agency (Public Organization) (DGA) has defined that open data can be used independently. It is reusable and distributed by anyone, but the source or owner must be identified, and it must apply the same contract or conditions set by the source or the owner. The disclosure must be as follows;

- Availability and Access - All data must be available, and the cost must not be greater than the cost of duplication, especially for downloading from the Internet. Data must be available in a convenient format and can be updated.
- Re-use and Redistribution - Data must be provided under conditions that allow re-use and redistribution, and integration with other datasets.
- Universal Participation - Everyone must be able to use, re-use, and redistribute the data. There is no discrimination against individuals or groups of people; for example, 'non-commercial' restrictions that prevent commercial use or usage restrictions for certain specific purposes (for example, in education only). Otherwise, such data will not be considered open data.

The benefits of disclosing information to the government sector are to know the needs of the public and to have the ability to provide services to meet the needs of the public successfully, to increase the administration effectiveness and efficiency, to know the problems and solving them before they are escalated, to reduce conflicts/oppositions from the public, to gain cooperation, support, and trust from the public, and to develop a transparent government administration system under the principles of good governance.

The benefits to the public sector are to understand methods, constraints, needs, benefits, and rationales of the government sector, to be able to monitor the local administration, to trust the decisions of the regional and local executives, to cooperate in activities, regulations, and policies set by the government, such as policies and rules in public administration of various projects that have broad impact and to help strengthen and develop the role of the public sector in a creative way, helping to lay down the basis of a Participative Democratic Society.

However, Thailand does not have a specific policy or explicit open data policy for the public sector (OECD, 2019), as well as other countries in the ASEAN, Jordan, Lebanon, and Tunisia (OECD, 2018). The lack of a policy support framework hinders the development of Open Government and ecosystem. Open data is a mechanism to promote transparency, network-based government administration, participation, and service improvement.

### **Governance Network (GN)**

GN can be defined in various ways (Tengratanaprasert, 2017). Marsh and Rhode's (1992) define GN as "a limited number of participants, frequent interaction, continuity, value consensus, resource dependence, positive-sum power games, and regulation of members" (p. 23) is widely accepted. Koppenjan and Klijn (2004, pp. 69–70) defined the formation and interaction of GN in a similar way: "more or less stable patterns of social relations between mutually dependent actors, which form around policy program and/or cluster of means and which are formed, maintained and changed through a series of games". Private, semi-public and public actors are involved in GN and are likely to be

dependent on each other's resources and capacities. However, independent operation is essential (Rhodes, 1985; Marin and Mayntz, 1991). GN is perceived as an effective way in interaction among the civil society, local, regional and national government (Newman, 2001).

Since the 1980s, government institutions have started working with various organisations. The authoritarian structure has shifted to social relations through quasi- and non-government entities. Citizens are likely to be empowered and engaged in the policy making process and how business activity is conducted. Engagement is likely to grow due to social networking (Daly, 2003). GNs can be distinguished from alternative hierarchical and market models in three main ways. First, the relationships between participants in partnerships are autonomous; they actively interact to achieve public preference rather than being authorised by a central authority such as those involved in competitive regulation seen in a business models (Stoker, 1995; Hodge and Greve, 2005; Osborne, 2010). Second, decision-making is collaborative effort and involves a negotiated process that allows a plurality of stakeholders to create joint decisions and mutual solutions. However, the negative impact is that divergence of interests may result in conflicts (Mayntz 1993; McLaverty, 2002; Edelenbos & Klijn, 2005). Finally, stakeholders are likely to acquiesce with negotiated decisions based on a desire to build trust and on political obligation, which can subsequently maintain networks by creating self-regulation and norms (Bovaird, 2005; Bouckaert & van der Walle, 2003). GN involve linkages and overlap between the political and economic arenas and to recognise different forms and outcomes of networks (Agranoff and McGuire, 2003; Torfing, 2007). The crucial challenge, according to Stoker (1995), is to connect local and non-local sources of policy change and to place any analysis within the context of wider processes of change.

### **Transparency**

Transparency is one of the most crucial ingredients of OG. Key indicators of government effectiveness are transparency, governance, and legitimacy. Transparency can be described as transparency of government operations, procedures and tasks and data

transparency. Data openness is still very much viewed as an important new tool that can be used to strengthen transparency of government. It also allows the public to access the internal government flows and investigate whether their representatives have met their expectations is an important step for achieving accountable government (Jaeger & Bertot, 2010). There are long-term considerations of data transparency that pertains to information usability by all. This concern further requires establishing tasks that are related to achieving information usability and accessibility, promoting government and information and technology literacy, making appropriate and accurate content and services available, meeting user expectations, promoting trust, and encouraging lifelong usage (Jaeger & Bertot, 2010).

### **Benchmarking Open Government**

Benchmarking is used as a tool for making comparisons between two or more entities based on a defined set of indicators (Rorissa, Demissi, & Pardo, 2011). E-government benchmarks developed prior to the Open Government are not applicable for this model because Open Government is more focused on data than on developing electronic services. Furthermore, there has been limited academic research in this area as a result of the ambiguity of Open Government (Sandoval, 2011). Ren and Glissmann (2012) propose an approach for open data assessment that is based on theory and practice in business architecture and information quality. Six criteria were examined, namely accessibility and availability, understandability, completeness, timeliness, error free and security. Transparency has often been viewed through the lens of government corruption. The Corruption perceptions index (CPI) from Transparency International (TI) measures the perceived levels of public sector corruption. It is based on expert assessments and survey data, covering issues such as access to information, bribery of public officials, kickbacks in public procurement, and the enforcement of anti-corruption laws (Lambsdorff, 2008). Socrata (2011) has performed an Open Government data benchmark study that addresses the open data as a strategic aspect in an Open Government model. They have studied the presence of open data in government portals, the availability of open data

portals and high-value datasets that are present on the portals. This study clearly addresses one aspect of the Open Government model, which is open data, but it is necessary that an Open Government benchmark also addresses other Open Government features, namely, transparency, collaboration and participation, and defines appropriate criteria and scales for measurement.

In the proposed benchmark model, open data are used as a data source for two indicators: a basic dataset and data openness (Socrata, 2011). Within the governance network indicator, user involvement addresses citizens' involvement in the government process and decision making. In the scope of the collaboration indicator, user involvement encompasses citizens', businesses' and government agencies' involvement in the process of collaborative decision making. Each of the four indicators (openness, transparency, accountability and governance network) has a set of rules that are applied to scoring open government.

## **Key finding and discussion**

This section presents findings regarding the current status of Open Government in improving the quality of public services, and analyze the relationship and data openness that affect the four dimensions of an Open Government: Transparency, Open Data, Accountability, and Governance Network in public health, economy, Transport, and Agriculture. The research frameworks from Veljković, Bogdanović-Dinić, and Stoimenov (2014) were employed to validate and assess the current status of open government.

**Step 1:** Current state analysis of the four-dimensional factors that result in the development of the Open Government, based on the correlation analysis of the four aspects of data from 14 agencies 27 databases such as transport and logistics, public health, agriculture, and economic, financial and industrial areas, from different development levels to Open Government (OG) according to Table 1.

**Table 1** Levels of Development to the Open Government

Percentage Values	Levels
0 - 5%	0 - Cradle
6 - 35%	1 - Basic
36 - 75%	2 - Average
76 - 90%	3 - Above Average
> 90%	4 - High

Source: Veljković, Bogdanović-Dinić, and Stoimenov (2014)

The levels of OG development in each dimension are as follows (as shown in Figure 2);

**1) Transparency** it is found that public health and economic, financial and industrial data, transportation and logistics data, and agricultural data are at level 3 - Transparency (84.97%, 86.29%, 81.51%, and 81.883%, respectively).

**2) Open Data** it is found that agricultural data is at the level of 3—Openness (76.83%). Economic, financial, and industrial data and transportation and logistics data are at level 2—average openness (68.533% and 63.93% respectively) and public health data are at level 1— Basic Openness (11.44 percent)

**3) Accountability** it is found that economic, financial, and industrial data (84.62%), public health data (83.21%), agricultural data (81.55%), and transportation and logistics data (80.18%) are at level 3 — Accountable.

**4) Governance Network** It is found that economic, financial, and industrial data (84.62%), public health data (83.21%), agricultural data (81.55%), and transportation and logistics data (79.72%) are at the level 3 -Governance Network

Figure 2 summarizes the level of OGP development in each dimension linked to all four aspects of data.

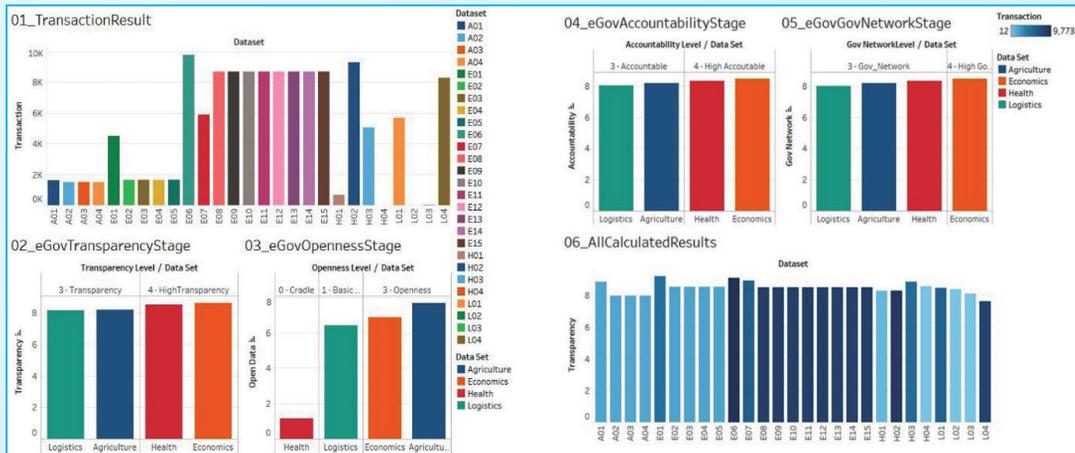


Figure 2: The results of the current state analysis of the four-dimensional factors that affect Open Government’s development

**Step 2:** Analysis of factors related to Open Government’s development by performing the statistical factor analysis, determining factors related to development which consists of four-dimensional factors: Transparency, Open Data, Accountability and Governance Network, linked with the analysis of the High-Value Data in four areas (Logistics, Health, Agriculture, Economics) and determining the weight associated with the factor in each dimension, can be calculated as follows:

$$DS = ((0.25 * F1) + (0.25*F2) + (0.25*F3) + (0.25*F4))$$

DS = Dataset Indicator

F1 = Transparency - 25%

F2 = Open Data - 25%

F3 = Accountability - 25%

F4 = Governance Network - 25%

The study found that the average percentage of dataset indicators are as follows; Transparency -76.33%, Open Data -65.71%. Accountability -80.44% and Governance network -81.02%, as shown in figure 3. It may be said that the government sector should urgently give priority to the development of open data as it leads to Open Government which is in line with the study results.

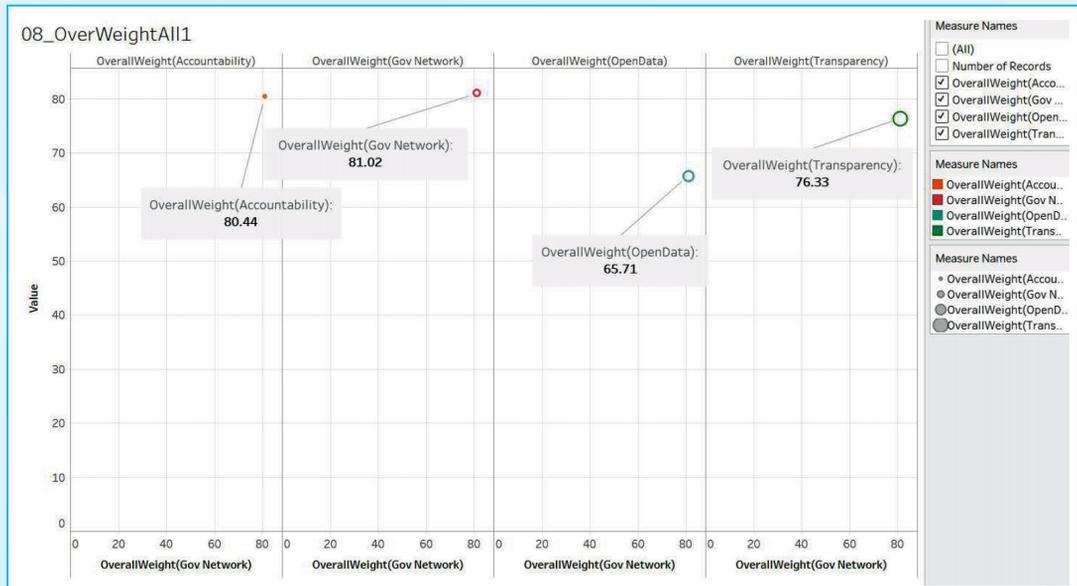


Figure 3: Average of Dataset Indicators related to Open Government

**Step 3:** Diagnostic model data analysis with four factors related to Open Government development is based on data linkage analysis obtained from High-Value data analysis by determining each dimensional factor's weight compared to the diagnostic results and the transaction data relating High-Value Data category and data browsing statistics to evaluate the impact of open data against the economy and to perform due diligence of the development into Open Government in each dimension as shown in Figure 4, 5, 6, and 7, as follows;

**1) Transportation and Logistics** it is found that the average transaction concerning the High-Value-Data category is 23.06%, and the average of data browsing is 17.28%, which is considered economically negligible. However, the government operations in transportation and logistics are highly transparent, and it is ready to develop into Open Government if there is the development of Open data per following details;

- Transparency is 81.51%, and the difference in development into the Open Government is 61.33%
- Open Data is 63.93 percent, and the difference in development into Open Government is 43.75 percent.
- Accountability is 80.18%, and the difference in development into Open Government is 60.01%
- Government Network is 79.72%, and the difference in development into Open Government is 59.55%.

**2) In public health**, it is found that the average transaction related to the High-Value-Data category is 24.70 percent, and the average of data browsing is 18.46 percent, which is considered to be economically negligible. The most effective aspect is Transparency, and It is ready to develop into Open Government if there is a development of open data per the following details;

- Transparency is 84.98%, and the difference in development into the Open Government is 63.39%.
- Open Data is 11.44%, and the difference in development into Open Government is 10.14%
- Accountability is 83.21%, and the difference in development into Open Government is 61.64%
- Government Network is 83.21%, and the difference in development into Open Government is 61.64%.

**3) Agriculture** it is found that the average transaction related to the High-Value-Data category is 9.99%, and the average of data browsing is 42.73%, which is considered

to have a moderate economic impact. The most effective aspect is Transparency, and it is ready to develop into Open Government if there is a development of open data per following details;

- Transparency is 81.83%, and the difference in development into the Open Government is 55.47%
- Open Data is 76.83%, and the difference in development into Open Government is 50.47%.
- Accountability is 81.55%, and the difference in development into the Open Government is 55.19%
- Government Network is 81.55 percent, and the difference in development into Open Government is 55.19%

**4) Economic, financial, and industrial,** it is found that the average transaction related to the High-Value-Data category is 42.25 percent, and the average of data browsing is 21.52 percent, which is considered to have a moderate economic impact. The most effective dimension is Transparency, which is higher than the others mentioned above, and it is ready to develop into Open Government if there is the development of open data per the following details;

- Transparency is 86.30%, and the difference in development into the Open Government is 54.41%.
- Open Data is 68.52%, and the difference in development into Open Government is 36.64%.
- Accountability is 81.55%, and the difference in development into the Open Government is 55.19%.
- Governance Network is 84.61%, and the difference in development into Open Government by 52.73%



Figure 4: Development into the Open Government in terms of Transparency

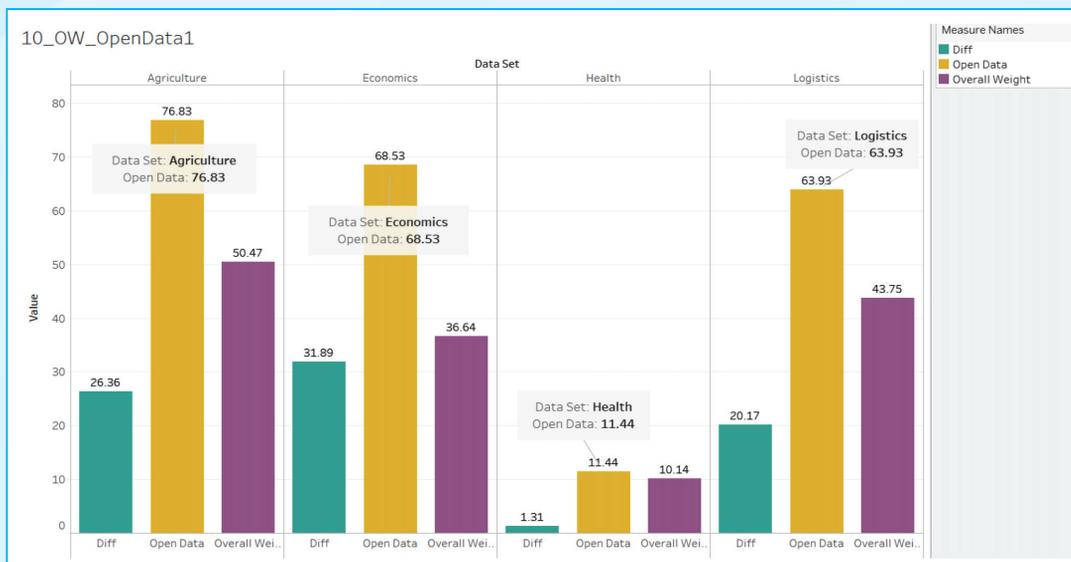


Figure 5: Development into Open Government in terms of Open Data

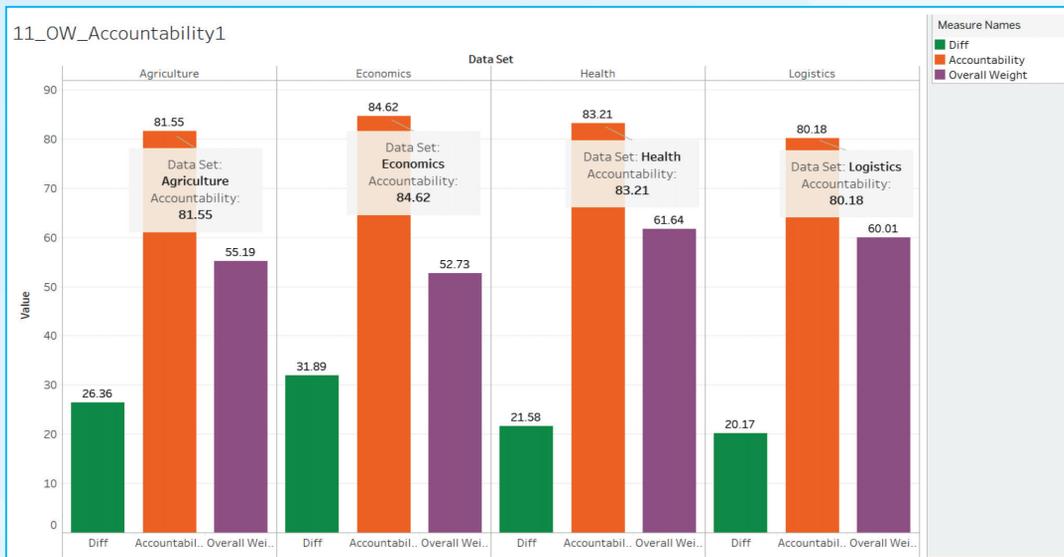


Figure 6: Development into the Open Government in terms of Accountability

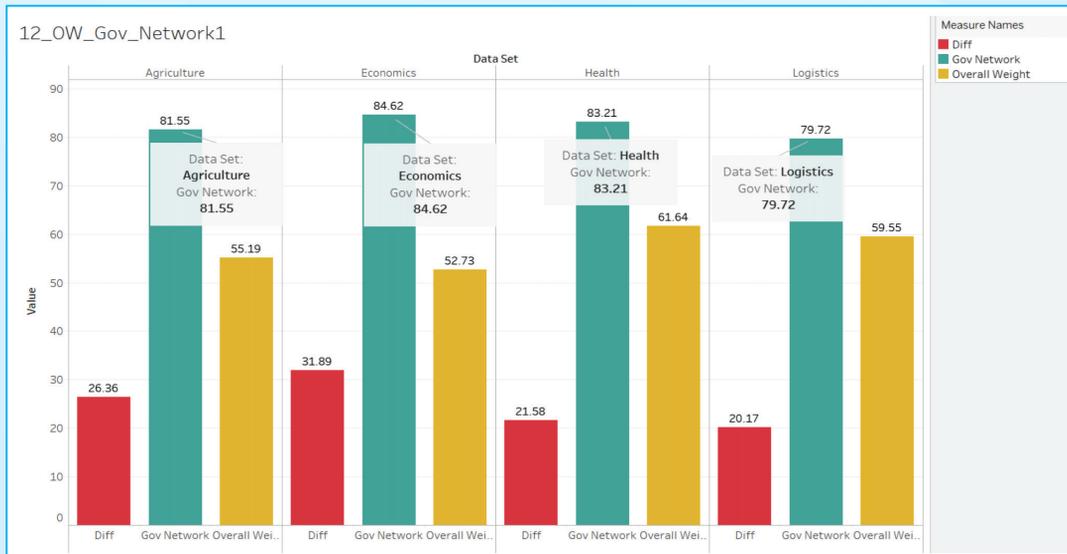
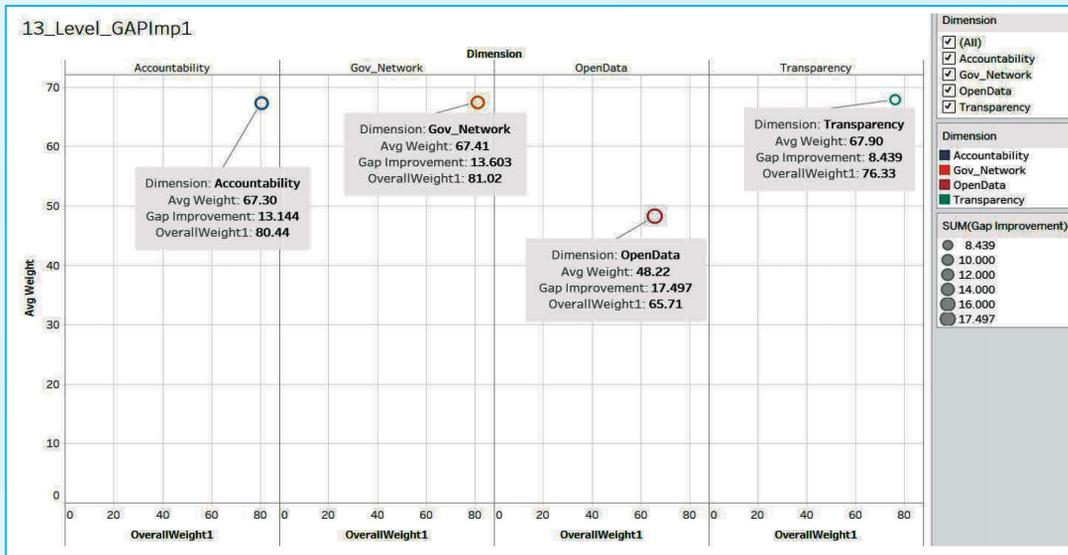


Figure 7: Development into the Open Government in terms of Governance Network

**Step Four:** Advisory analysis to analyze the strengths of Open Government development of all four-dimensional factors, it is found that the average percentage of development into Open Government in terms of Transparency is 8.44%, Open Data is 17.50%, Accountability is 13.14%, and Governance Network is 13.60% as shown in Figure 8.



**Figure 8:** Development into the Open Government in each dimension

Formulating and preparing the policy-based recommendations for promoting Open Government in each dimension based on the correlation and the data linkages, the government sector should prioritize the policy promoting and pushing the agencies to take open data as their first priority. As a result, the Open Government's development in terms of Open Data will be increased to 83.21 percent. The second is the Governance Network - by formulating the policy that promotes all network members' participation and integration among the government sector, private sector, civil society, and the people. As a result, Open Government's development in terms of Governance Network will be increased to 94.62 percent. The third is Accountability - by formulating the policy to adjust rules and regulations according to the Open Government's development and identifying

the primary host and the relevant agencies to operate to achieve the agencies' important missions and tasks. As a result, the Open Government's development in terms of Accountability will be increased to 93.58 percent. The fourth is Transparency - by formulating the policy to promote the agency's morality, ethics, and transparency. As a result, Open Government's development in terms of Transparency will be increased to 84.77 percent. Overall, the gap improvement will be 52.68 percent.

## **Discussion**

Based on the data linkage analysis of all four areas, including transportation and logistics, public health, agriculture and economic, financial, and industrial aspects and data linkage analysis of four-dimensional factors related to the development of the Open Government, namely Transparency, Open Data, Accountability, and Governance Network, reflect the prominent opportunity for government agencies to focus on policy formulation in accordance with the development of Open Government. According to Figure 5, it is also found the government should prioritize the promotion of Open Data, particularly the health sector which is likely to be the lowest level. The most obstacles of Open Data are personal data concern and cyber security, as a result the government faces some difficulties in disclosing data. To solve this problem, enterprise architecture is required to re-design business model of government agencies according to the good governance principle which can enhance transparency, and collaboration to strengthen democracy (Arcelus, 2012; Chan, 2013; Mutuku & Colaco, 2012). Additionally, data governance is needed to strengthen open and connected government. Through the long term interaction with an Open Government data platform, open data promotes not just transparency and accountability, but also democracy (Mutuku & Colaco, 2012). The government must realize the importance of digital technology adoption for public administration in accordance with the Digital Government Development Committee's notification on Data Governance for Government as of March 12, 2020. The Government's task is to establish the rights, duties, and responsibilities of stakeholders in data management and formulate the data policy used in the governance process to systematically control and monitor data operation, resulting

in data security and data quality, socio-economic value, and break-even in operation. In terms of Governance Network, the government promotes the participation which is consistent with the implementation of the country's reform plan, jointly implemented by many agencies, causing significant changes to the public, resulting in happy and good quality of life, in order and harmonious environment, participating in the development of the country and meeting the needs and expectations of the people. In terms of Accountability, the policy is set to adjust rules and regulations following the Open Government's development. It determines the primary hosts and the relevant agencies to achieve the mission and important tasks appropriately following the drive of the national strategic goals (2018 - 2022) within a specified time by elevating the country's potential in various dimensions along with expanding the country's opportunities on the global stage based on the concept of Government of the people, for the people and the public interests.

In terms of Transparency, the policy is set to assess government agencies' morality and transparency. It is a "proactive anti-corruption measure" that government agencies across the country will be required to implement, aiming for assessed government agencies to acknowledge the assessment results and the guidelines for development and raise the agencies' morality and transparency in their operation appropriately. It also promotes the development and raises Thailand's Corruption Perceptions Index (CPI), which is in accordance with the OECD's self-assessment framework, in the National Reform Plan for counter-corruption, and to improve the Integrity and Transparency Assessment (ITA) based on Good Governance in government administration, which focuses on performing duties with integrity, transparency, and verifiability, promoting the Open Government.

## **Conclusion**

The research findings can be concluded that to promote the Open Government; the government should realize the importance of implementing digital technology in the public administration process by urgently formulating a policy for the development and management of extensive databases which can help analyze and develop services

that respond to the public's needs and provide the government sector with the big data that can support proactive and preventive government policies effectively under the drive to integrate public databases and government services in a concrete way, as well as monitor and evaluate the data linkages of various agencies periodically. The responsible agencies are to be assigned and integrated into the operations, especially in the public service sector, in order to reduce the work process, the paper documents, and the resource utilization as well as to implement the information technology systems to create transparency in the operation of the government sector (Integrity and Transparency Assessment: ITA), according to the Good Governance principle.

What interesting about this article is that the government sector should consider formulating an accelerating policy to promote an Open Government focused on open data, network integration, accountability, and transparency to ensure the best benefit of the public.

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# Industry Analysis by PESTEL-AHP: A Case Study of Thailand Public Airports

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## Abstract

This article aims at applying the Analytical Hierarchy Process (AHP) with PESTEL Analysis to quantitatively conduct an industry analysis in order to provide policy implications. The public airports, under operations of the Department of Airports, located in the local and regional parts of Thailand is employed as a case study. By weighting the importance factors from airport expert panels under the PESTEL-AHP framework, the results reveal that Air Navigation Act BE (No.14) 2562, which is a legislation element of PESTEL, plays the most crucial component and has the biggest impacts on Thailand public airports with an estimated weighted at 28% when comparing to other PESTEL elements. While the National Strategy and trend toward airport digitalization approximately impact the overall industry with 22% and 21%, respectively. The policy implications for public airport development deriving from the airport industry analysis are presented at the end of the article.

**Keywords:** Analytical Hierarchy Process, Industry Analysis, PESTEL Analysis, Public Airports, Thailand

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## การวิเคราะห์อุตสาหกรรมด้วย PESTEL-AHP: กรณีศึกษาสนามบินของรัฐในประเทศไทย

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### บทคัดย่อ

บทความวิจัยนี้มีวัตถุประสงค์ในการประยุกต์ใช้ Analytical Hierarchy Process (AHP) ควบคู่กับการวิเคราะห์ด้วย PESTEL เพื่อวิเคราะห์อุตสาหกรรมในเชิงปริมาณและนำเสนอข้อเสนอแนะเชิงนโยบาย การศึกษาในครั้งนี้อาศัยสนามบินของรัฐซึ่งเป็นสนามบินท้องถิ่นและสนามบินภูมิภาคภายใต้การดูแลของกรมท่าอากาศยานเป็นกรณีศึกษา ผลการศึกษาพบว่า การถ่วงน้ำหนักค่าความสำคัญของตัวแปร PESTEL ด้วยค่าคะแนนที่เก็บจากกลุ่มผู้เชี่ยวชาญด้านสนามบินด้วยวิธี PESTEL-AHP ทำให้พระราชบัญญัติการเดินอากาศ (ฉบับที่ 14) พ.ศ. 2562 เป็นตัวแปรด้านกฎหมายที่มีอิทธิพลต่อการดำเนินงานของสนามบินของรัฐมากที่สุด หรือคิดเป็นร้อยละ 28 เมื่อเปรียบเทียบกับตัวแปร PESTEL อื่น ๆ ในขณะที่ตัวแปรนโยบายยุทธศาสตร์ชาติ และตัวแปรแนวโน้มด้านการเปลี่ยนแปลงทางดิจิทัลในสนามบินมีบทบาทในการส่งผลกระทบต่ออุตสาหกรรมคิดเป็นร้อยละ 22 และ 21 ตามลำดับ ข้อเสนอแนะเชิงนโยบายสำหรับการพัฒนาสนามบินของรัฐซึ่งได้มาจากการวิเคราะห์อุตสาหกรรมอยู่ในส่วนสุดท้ายของบทความ

**คำสำคัญ:** การวิเคราะห์อุตสาหกรรม การวิเคราะห์ด้วย PESTEL สนามบินของรัฐ ประเทศไทย

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## INTRODUCTION

Industry analysis has played an important role in business administration since it is a part of the strategic management and performance improvement process (Davis & Duhaime, 1992; Görener, Toker, & Uluçay, 2012; Kampanje, 2014). From past to present, several industry-analysis approaches have been introduced; for example, the PEST Model (Aguilar, 1967) and its extensions such as the PESTEL Analysis, the STEER Analysis, the Porter-five Forces Model (Porter, 2001), or even the OT Analysis (Helms & Nixon, 2010; Hill & Westbrook, 1997) have been a part in industry analysis literature. However, the general tool used by practitioners, scholars, and market researchers to investigate the situation and the overall factors affecting the industry is the PESTEL Analysis (Oey & Nitihardjo, 2016; Pan et al., 2019; Tsangas et al., 2019). Still, the PESTEL analysis lacks quantitative properties (Srdjevic et al., 2012) and does not systematically highlight and prioritize factors gathered from the analysis (Thakur, 2021; Yüksel, 2012). Therefore, the Analytical Hierarchy Process (AHP) is introduced to conduct an industry analysis hybrid model or the PESTEL-AHP.

This case study research makes an academic contribution and sheds light on airport industry analysis literature. Firstly, it illustrates external business environments affecting the situation of Thailand public airports located in local and regional areas, which is rarely found in the airport industry, especially in the small airport context (Adler et al., 2013; Button et al., 2010; Chutipongdech, 2020; Chutipongdech, 2021; Merkert et al., 2012). Secondly, it prioritizes those business environments under PESTEL elements by integrating AHP, which is the quantitative method that is scarcely available in relating literature. By collecting the estimation of factor importance from the airport expert panels, the PESTEL elements are ranked to summarize the overall industry analysis.

To address the research question on how to analyze the industry, this paper aims to apply the PESTEL-AHP Model to investigate Thailand airport industry. Operated by the Department of Airports (DOA), the public airports located in local and regional areas of Thailand are used as a case study. The information gathered from the PESTEL Analysis

is quantitatively weighted by AHP to discover the magnitude of each PESTEL element affecting the industry. To illustrate the results of the study, each part of the case study article is organized as follows. The second part reviews the theoretical framework used to analyze the public airport industry. The third part presents the PESTEL-AHP Model construction while the fourth part shows the findings and discussion on the issue. Lastly, the conclusion is presented together with policy implications for airport management are suggested.

## REVIEW OF LITERATURE

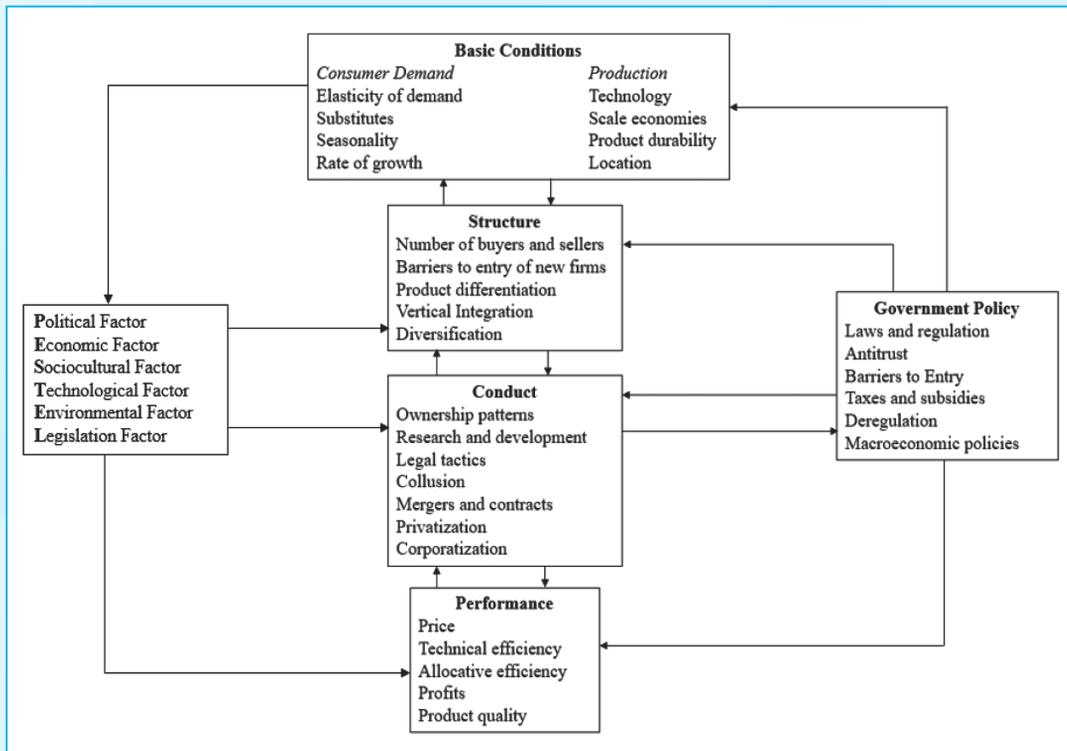
### Industry Analysis and PESTEL-AHP

To analyze the industry situation, the common theoretical framework in economic theory refers to the Industrial Organization (IO). The theoretical framework initiated by Mason (1939, 1949) was later developed by Bain (1959), intending to describe the real phenomenon of the overall market leading to policy recommendations. Although the theory has been utilized since 1939, the application of IO has various approaches such as empirical studies and Game Theory. By analyzing the relationships among the structure, conduct, and performance of an industry (the SCP Paradigm), which is the core analysis of Industrial Economics, researchers can understand the realistic settlements, compositions, interactions and ultimately the situation of the industry since interactions between market structure, conduct and performance, the structure, conduct, and performance provide the descriptive analysis framework on how an industry is organized. As it sheds light on the situation of the market (Carlton & Perloff, 2015; Nikomborirak, 2004).

### PESTEL Analysis

To analyze an industry under the SCP Paradigm (Figure 1), the PESTEL is used to frame the industry analysis. According to Song et al. (2017) and Bell and Rochford (2016), the PESTEL Analysis was developed from the PEST Model by Aguilar (1967). The acronym stands for Politics, Economic, Social, Technology, Environment, and Legal factors (Table 1). The purpose of the PESTEL Analysis is to retain the effectiveness and efficiency of the industry in responding to changes, analyze the business environments in

a systematic approach, and be a tool to support practitioners as an approach providing fundamental connections among macroeconomic factors (Kampanje, 2014; Thakur, 2021; Tsangas et al., 2019). Moreover, the PESTEL Analysis can deliver valuable information for strategy and policy formulation (Srdjevic et al., 2012).



**Figure 1** Situation analysis basing on PESTEL under Structure-conduct-performance Paradigm Source: Chutiphongdech (2020)

**Table 1** the PESTEL components

Components	Descriptions
<i>P</i> – Political factors	<i>P</i> relates to political policies affecting industry policies. Such variables include deregulation policy, inter-state community, tax policy, political environments, federal monetary system, fiscal budgeting, tariff-related policy, institutional strengths and so on.
<i>E</i> – Economic factors	<i>E</i> relates general economic condition, inflation rates, policy interest rate, exchange rate, GDP, income per capita, consumer confidence toward economic environments etc.
<i>S</i> – Sociocultural factors	<i>S</i> refers to values, attitudes, behaviors of people in society. Other societal factors involve population size, cultural factors, lifestyles, demographic changes, growth rate and so on.
<i>T</i> – Technological factors	<i>T</i> is inferred as changes in technological advancement or technical development such as digital disruption, nanotechnology, blockchain, big data, cashless society, Internet of Things (IoT), technological incubators, etc.
<i>E</i> – Environmental factors	<i>E</i> is relevant to environmental and ecological variables such as waste management, global warming, water shortage, weather, climate changes etc.
<i>L</i> – Legal and legislation factors	<i>L</i> relates to law and legislation issues. For instance, corporatization and privatization laws, laws on consumers, producers and labor protection, antitrust regulation, safety standard practice by international agencies.

**Source:** Thompson et al. (2014)

However, the PESTEL Analysis does not systematically prioritize PESTEL elements derived from the analysis (Srdjevic et al., 2012; Thakur, 2021). Moreover, it excludes a means of indicating the importance of each factor in relation to the affect among other factors and decision alternatives. Consequently, AHP is introduced to enhance the ability of PESTEL Analysis (Song et al., 2017; Yüksel, 2012).

### PESTEL-AHP Analysis

As mentioned, PESTEL Analysis can be incorporated with a multicriteria decision-making technique called AHP. According to Saaty (1990), the pioneer of this method, AHP is a multicriteria decision-making approach where factors are organized in an ordered structure. It can help represent general operational decisions by decomposing

and removing complex problems into a multilevel hierarchical objective, criteria, and choices (Görener, Toker, & Ulucay, 2012; Helms & Nixon, 2010). The advantages of AHP are to measure the importance of factors, reflect the logical considerations of factors relevant to decision making circumstances, and quantify those intangible factors into numerical values by weighing selected factors from expert opinions through a series of pairwise comparisons (Saaty, 1990, 2008). Consequently, AHP approach achieves pairwise comparisons among factors or criteria for prioritizing them by using the eigenvalue calculation.

To illustrate the pairwise comparison on n criteria and eigenvalue computation, the algebraic matrix of pairwise comparison are as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix}$$

where  $a_{ij}$  is the relative importance for  $i$  to  $j$ ,  $a_{ij} = 1/a_{ji}$  and  $a_{ij} = 1$  if  $i = j$  and the importance vector value,  $\hat{w}$  is calculated by this formula:

$$\hat{A} \cdot \hat{W} = \lambda_{max} \cdot \hat{W}$$

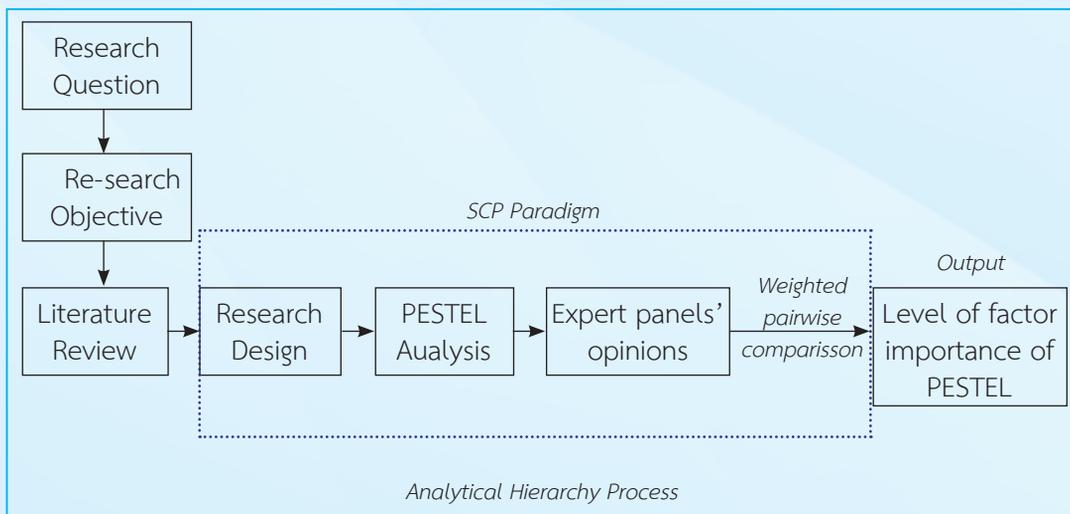
where  $\lambda_{max}$  is the largest eigenvalue of  $\hat{A}$ .

To the boundary of this approach, literature review using the PESTEL analysis together with AHP especially in the airport industry is highly scarce (Chutipongdech, 2020; Chutipongdech, 2021). Since the traditional industry analysis is conducted without quantifying; thus, the weightiness of the factor importance is not common. Therefore, to bridge the research gap in the literature, applying the PESTEL-AHP to analyze the public airport industry by converting the framework into a hierarchic structure together with the eigenvalue computing method would supplement the richness of the industry-level analytical tool.

## RESEARCH METHODOLOGY

### PESTEL-AHP Model Construction

To specify the PESTEL-AHP Model under the SCP Paradigm, the first stage PESTEL Analysis was conducted (Figure 2). The secondary data from the Office of the National Economic and Social Development Council, the Ministry of Transport (MOT) Strategic Plan BE 2560-2564, the Department of Airports (DOA) Strategic Plan BE 2560-2564, the information from the DOA Information Center and Library, Thailand Aviation Industry Report from the Civil Aviation Authority of Thailand (CAAT), some economic reports from Airport Council International (ACI) and academic journals relating to airport industry analysis were acquired to analyze the industry of public airports in Thailand.



**Figure 2** Research procedure

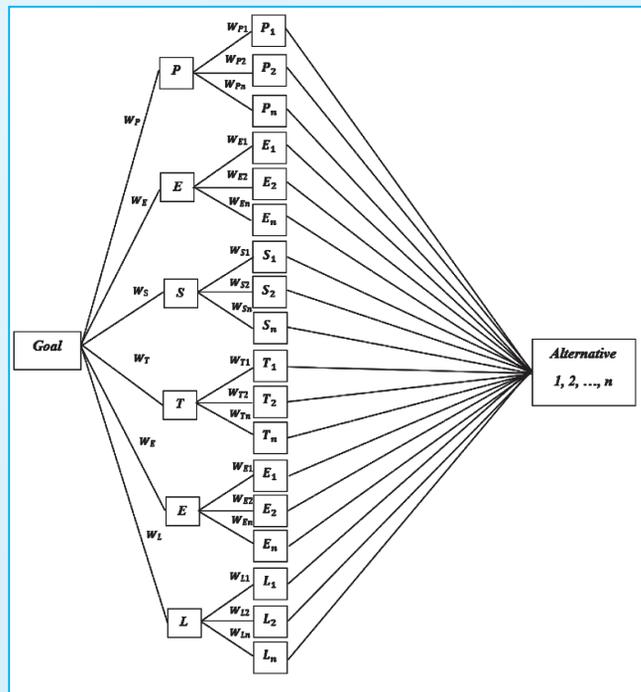
Further, the results from the first stage PESTEL Analysis were distributed to the expert panels. In order to select the airport expert panels, the inclusion criterions were set. Firstly, the panel must consist of airport management and aviation researchers. Secondly, the airport management must work in the top managerial position where they have experiences on formulating the public airport development strategic plan. Therefore, an expert was chosen from the central unit of Department of Airport (DOA) while 4 experts were selected from the directors of DOA public airports located in the local and regional areas. Thirdly, 2 airport scholars having experiences at least one aviation national project were invited to give opinions on weighting scale regarding Saaty (1990) (Table 2).

**Table 2** Level of factor importance for weighting PESTEL elements

Intensity of importance	Definition
1	Equal importance
3	Somewhat more importance
5	Much more importance
7	Very much more importance
9	Absolutely more importance
2,4,6,8	Intermediate values

Source: Saaty (1990)

To construct the PESTEL-AHP Model (Figure 3), the pairwise comparison was performed. The PESTEL elements were decomposed, and the hierarchy was conducted. The prioritization procedure was started to determine the relative importance of each element.



**Figure 3** PESTEL-AHP construction

Source: Chutiphongdech (2020)

## RESULTS AND DISCUSSION

By framing the PESTEL-AHP with the SCP Paradigm, the situation of public airports located in the local and regional areas of Thailand could be illustrated. Each element of PESTEL is drawn to describe the interactions among the structure, conduct, and performance of the DOA public airports to reflect the situation of the industry. The National Strategy (2018-2037) initiated by Thailand Prime Minister, General Prayut Chan-o-cha, is regarded as a political factor (P) affecting the structure of the industry. The New S-Curve Policy drawn from Thailand 4.0 Industry Development Strategy Plan (2017-2036) is an economic factor (E) while the Second-tier City Tourism Policy is chosen to present a sociocultural factor (S). The trend toward airport digitalization is considered as a technological factor (T) and climate change according to the study from the International Civil Aviation Organization (ICAO) is viewed as an environmental factor (E). Lastly, the revision of the Air Navigation Act (No.14) BE 2562 is selected to reflect the legal and legislation factor (L). The results of PESTEL Analysis are as follows:

### Political Factor (P)

As mentioned, the National Strategy (2018-2037) is a political factor influencing the public airport performance since the National Strategy's vision - Thailand is to become a developed country with security, prosperity, and sustainability under Sufficient Economy Philosophy – not only shapes the government policies (Figure 4), but frames every aspect of national developments, planning and air transport infrastructure (Office of the National Economic and Social Development Council, 2018). Under the National Strategy (2018-2037), its purposes are to achieve 6 strategic goals which are

1. well-being of Thai society
2. national competitiveness, economic growth, and income distribution
3. human capital development
4. social equality and equity
5. sustainability of national biodiversity, environmental quality and natural resources
6. government efficiency and better access to public services



Figure 4 The National Strategy (2018-2037)

Source: Office of the National Economic and Social Development Council (2018)

To achieve the goals regarding the competitiveness of the nation, 2 of the 23 master plans that are most relevant to the airport industry are the 4<sup>th</sup> Master Plan for Future Industry and Services and the 7<sup>th</sup> Master Plan for Basic Infrastructure, Logistic and Digital System. Due to the global growth of technology and innovation advancements, the 4<sup>th</sup> Master Plan for Future Industry and Services and the 7<sup>th</sup> Master Plan for Basic Infrastructure, Logistic and Digital System have been prepared to serve the national development. The engagement of these two master plans with the 12<sup>th</sup> National Economic and Social Development Plan (2017-2021) further develops the aviation industry, which includes airlines, airports, MRO (Maintenance Repair and Overhaul) sector, and other basic infrastructures that supporting the logistic system in the country.

Moreover, the plan intentions are to increase and fully utilize the capacity of airport systems and improve the management and technical efficiency of the system to ensure the service quality of passenger and transportation product under international

standards. Also, the plans focus on preparing the basic infrastructure to support the potential demand for air transport to avoid traffic delays and facilitate all stakeholders in the industry. Ultimately, the competitiveness of the nation, according to the National Strategy, will be increased.

In summary, the National Strategy (2018-2037) has an impact on the public airports since the National Strategy influences the government transport policies which affect the overall performance of Thailand DOA airports as explained by the SCP Paradigm.

### **Economic Factors (E)**

The New S-curve Policy, according to the Thailand 4.0 Industry Development Strategy Plan (2017-2036), has an impact on the structure of the airport industry since the plan shapes the guidelines for the industry development and plays an important role as a new engine of growth and economic development mechanism in the country. The new S-curve industry refers to the industry that uses intensive technology and innovation and potentially has high growth rates in the future. It includes the robotics industry, biofuels and biochemicals industry, digital industry, medical industry, aviation, and logistics industry.

Aviation and logistics that follow the New S-curve Policy are readily preparing the infrastructure for servicing transportation, aircraft maintenance, repair and overhaul (MRO), time-sensitive products, drones, software, and aviation-relating institutions. The new S-curve policy framework allows plenty of integrations among various sectors in the industry. Consequently, the integration of the framework affects the market structure and performance of Thailand public airport system.

In summary, this macroeconomic policy impacts the structure of the industry as it integrates in various dimensions such as vertical, horizontal or even the helix collaboration among various sectors in the aviation industry, which finally have an impact on the performance of the public airports.

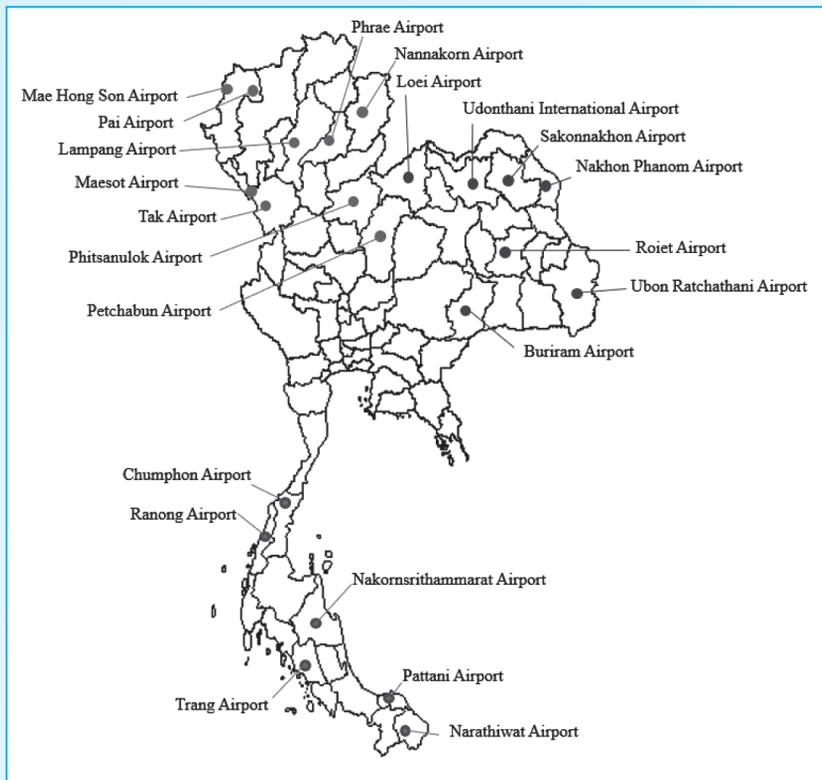
## Sociocultural Factors (S)

With the intentions of equal income distribution in the suburban areas, local economy stimulation and, congestion decrement in main tourism cities, the Second-tier City Tourism Policy has been implemented since 2016. In reference of the TAT Interlligence Center (2018), the second-tier city is defined as a province that has less than 4 million visiting tourists per year. From the aforementioned criteria, 55 provinces are considered as the second-tier tourism city (Table 3). The largest areas of second-tier cities are located in the northeastern and northern part of Thailand (18 and 16 provinces respectively) while the smallest areas are assigned to the eastern cities.

**Table 3** Second-tier cities according to Tourism Authority of Thailand criterion

Regions	Second-tier provinces	Total
Northern part	Lampang, Chiang Rai, Lamphun, Mae Hong Son, Nan, Phayao, Uttrradit, Phrae, Kamphaeng Phet, Phichit, Nakhon Sawan, Tak, Phitsanulok, Phetchabun, Uthai Thani, Sukhothai	16
Central part	Chai Nat, Lopburi, Samut Songkhram, Sing Buri, Supphan Buri, Ang Thong, Ratchaburi	7
Northeastern part	Kalasin, Chaiyaphum, Nakhon Phanom, Bueng Kan, Buriram, Maha Sarakham, Mukdahan, Yasothon, Roiet, Loei, Ubon Ratchathani, Sakon Nakhon, Sisaket, Surin, Nong Khai, Nong Bua Lamphu, Amnat Charoen	18
Eastern part	Sa Kaeo, Chanthaburi, Trat, Prachinburi, Nakhon Nayok	5
Southern part	Chumphon, Trang, Nakhon Si Thammarat, Narathiwat, Pattani, Phatthalung, Yala, Ranong, Satun	9
<b>Total</b>		<b>55</b>

**Source:** TAT Interlligence Center (2018)



**Figure 1** Public airports serving secondary-tier provinces in Thailand

**Source:** Chutipongdech (2020)

This formulated tourism policy attempts to transfer tourists from the main tourism cities to second-tier tourism provinces by providing attractive tax deduction packages. Furthermore, megaprojects linking those destinations are invested in to facilitate tourist accessibility. Therefore, the Second-tier City Tourism Policy has an effect on demand for travel while simultaneously impacting the demand for air transport. As Thailand’s public airports are the part of tourism supply chain (Figure 5), the Second-tier City Tourism Policy clearly has an impact on their performance since it is possible the policy would stimulate the demand for air transport and tourism in the mentioned provinces.

### Technological Factors (T)

Technological adaptation in an airport can be classified in two ways. Firstly, technology can help airport operators reduces the cost of production; for example,

technology could replace some job functions such as using lesser manpower in the security process. Not only improving the processing time of safety and security, but the use of technology can also develop the overall operational efficiency of an airport. Hence, it effects on passengers' satisfaction.

Airport technology plays an important part in creating passengers' experiences as many passengers tend to spend more time in airports and regard them as a destination (Bogicevic et al., 2017; Chutipongdech & Vongsaroj, 2022b; Wattanacharoensil et al., 2016). Since the digital transformation is about using technologies in the process of automation, customer comfort facilitation and airport client experience enhancement (Airport Council International, 2017; Zaharia & Pietreanu, 2018), this technological factor inevitably has an impact on demand for air transport and tourism as it influences passenger and airline satisfaction. According to Bogicevic et al. (2017), the technologies used in an airport can be clustered into self-service technology and the supporting technologies.

The self-service technology includes check-in kiosks, touch screen information kiosks and self-service baggage dropping while the supporting technologies in an airport consist of a business center, a tour guide application, and USB chargers. Additionally, Airport Council International (2017) presented the airport technological features and current trend toward becoming a digital airport beyond Bogicevic et al. (2017) classification. It is suggested that airport operators provide basic technology infrastructure starting from IT security and WIFI to the advanced components like digitalized touchpoints or biometric screening, as the integration of technology and streamlined facilities would enhance the customer experience.

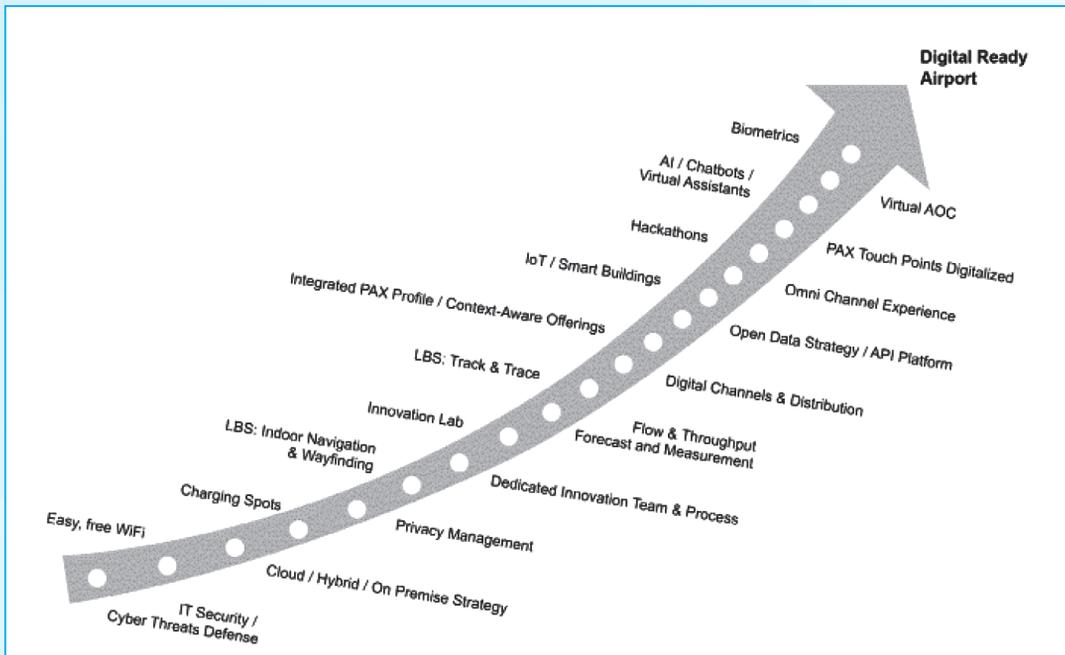


Figure 2 Pathways for digital airport transformation

Source: Airport Council International (2017)

In conclusion, the technological factor affects the basic conditions according to the SCP Paradigm, as the demand for tourism, air transport and production are impacted by technologies given at the airport. Hence, this factor shows the relationship among structure, conduct, and performance of Thailand public airports.

### Environmental Factors (E)

While there is a scientific sound connection between the impacts of environmental factors like climate change on airport performance, it is also clear these impacts simultaneously affect airport operations. As suggested and explained by research from international airport-relating organizations, Baglin (2012), Puempel and Williams (2016), and International Air Transport Association (2019), the possible risks that happen from climate changes on airports cause additional risks in operations. Their works indicated that airports are facing risks from physical risks, business risks, security risks, and financial risks. The physical risks refer to the damage from natural devastations such as storm surges,

runway and taxiway flooding, wind pattern shifting, and sea level rising (Figure 7). The business risks mean flight disruption and delays, route network changes, legal compliance, supply of utilities, loss of airport capacity, and airport closures while the security risks are regarded as threatening to life and safety. Lastly, climate change can cause unplanned expenditure and decrease demand for air transport and tourism.

In summary, the environmental factor plays a part in airport performance. Referring to Structure-conduct and Performance Approach, the climate change factor influences the consumer demand for tourism and air transportation; thus, it affects the numbers of sellers (market structure) and public airport operations (conduct) eventually.

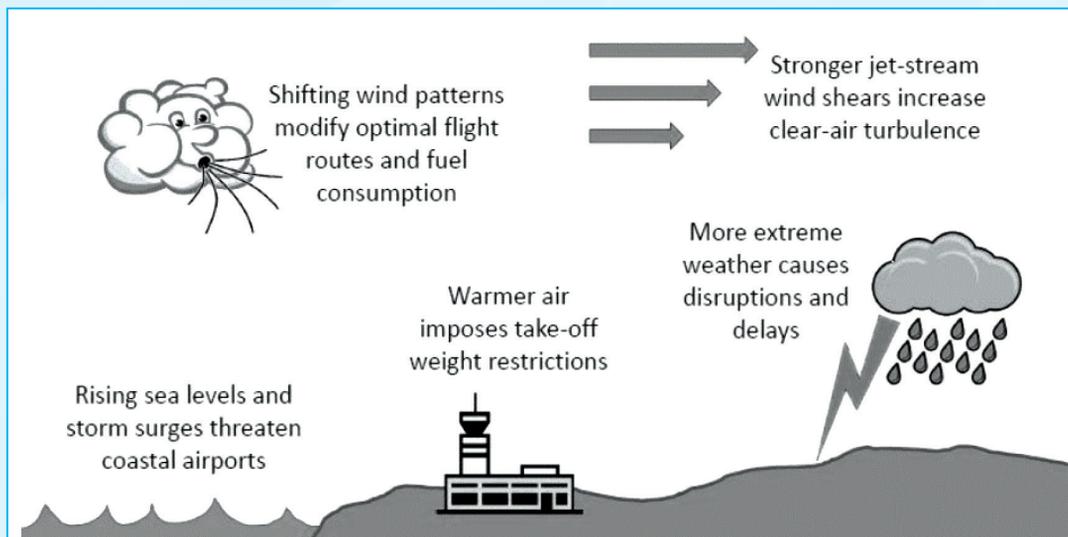


Figure 3 Impact of climate change on airport performance

Source: Puempel and Williams (2016)

## Legal and Legislation Factors (L)

The revision of Air Navigation Act (No.14) BE 2562 and Ministerial Regulation on the Department of Airports Division BE 2558 issued by the Ministry of Transport seems to be the most crucial factor for Thailand public airport operations since it legally indicated the Department of Airports' mission. Samples of such obligations include how operations

are financed, sources of working capital, department spending on airport investment, Thailand public airport network development, airport business administration, and so on.

In essence to the SCP Paradigm, the legal and legislation factor has an impact on aviation-relating laws and regulations, and macroeconomics policies. Consequently, any policies launched from the department must comply with the Air Navigation Act BE (No.14) 2562, which ultimately affects public airport industry.

### Results from Pairwise Comparison

To illustrate the industry situation of public airports in quantitative analysis, the AHP construct reconfirms the factors and prioritizes the virtual effects. By collecting the primary data using the scoring approach from the 7 expert panels (Table 4), the weightings of factor importance according to Saaty (1990) scale can be applied to the pairwise comparison among PESTEL elements. Table 5 reflects the level of importance toward the public airport industry.

**Table 4** Level of factor importance scoring from 7 airport expert panels

Expert no.	Scorer groups	Level of factor importance					
		P	E	S	T	E	L
1	Aviation Scholars	9	4	5	7	4	9
2		7	1	5	8	5	5
3		7	5	4	9	5	8
4		8	2	4	2	5	9
5	DOA Managements	8	5	7	9	6	9
6		9	9	9	6	7	8
7		9	5	5	8	8	9

**Table 5** Level of factor importance weighted and scored by airport expert panels

PESTEL Analysis	Expert panel weighting estimations							SUM	Weighted	Ranking
	P	E	S	T	E	L				
P	0.07850	0.14866	0.19616	0.26740	0.22681	0.40749	1.32502	0.22084	2	
E	0.12728	0.03357	0.10779	0.15820	0.09465	0.00906	0.53055	0.08842	6	
S	0.16869	0.16904	0.04015	0.07378	0.12772	0.13742	0.71681	0.11947	4	
T	0.21374	0.21648	0.23899	0.05995	0.18793	0.31747	1.23455	0.20576	3	
E	0.01440	0.15893	0.13513	0.13717	0.03969	0.05767	0.54300	0.09050	5	
L	0.39739	0.27333	0.28177	0.30349	0.32320	0.07089	1.65008	0.27501	1	
Summation	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	6.00000	1.00000		

The ideas formulated by the expert panels (Table 4 and 5) show that the revision of the Air Navigation Act (No.14) BE 2562 plays the most crucial part in Thailand public airport environments. Normalizing each PESTEL element by AHP prioritization illustrates how the revision of the Air Navigation Act (No.14) BE 2562 affects the public airport performance 27.5%; while the National Strategy (2018-2037) and the trend toward airport digitalization is estimated to have an impact on public airport industry of 22.08% and 20.58%, respectively. The logic behind these numbers is based on the orientation law of DOA. Since the Department of Airports (DOA) is a government agency, the missions are governed and directed by national legislations. The Air Navigation Act (No.14) BE 2562 indicates the airport business obligations and implies the managerial limitations for DOA. The revision of the Air Navigation Act (No.14) BE 2562 provides financial flexibility to the department since it allows the establishment of the DOA Working Capital Fund (DOA-WCF), which encourages and facilitates administrations among 28 public airports located in local and regional areas of Thailand. Moreover, the DOA Working Capital Fund provides options for the department to generate revenues, as the DOA is not legally authorized to deliver partial incomes incurred from 28 public airports to the Ministry of Finance and the Treasury Department.

The National Strategy (2018-2037) is the second element of PESTEL analysis that plays an incremental part in public airport situations. In regard to the expert team's opinions, this element has 22.8% effects on the public airports under the control of DOA. The reason behind these considerations is they share the common themes as the revision of the Air Navigation Act (No.14) BE 2562. In other words, as DOA is one of the government agencies, it is required to follow the policy directly derived from the present prime minister and the cabinet. Since some parts of the National Strategy (2018-2037) focus on the competitiveness of the country, they strongly impact the public airport environments.

The trends toward airport digitalization are considered influential for the public airport industry. Based on the opinions of the experts, this PESTEL element can affect both the demand and supply side of the industry. Digitalization in an airport can decrease the cost of operations, improve comfortability among staff, and enhance the accuracy of safety and security, which all considering as the supply side. When creating passengers' experiences, the conveniences and airline facilities are viewed as the demand side derived from digitalized airports.

The effects of the Second-tier City Tourism Policy on public airport industry are approximately weighted as 11.95%. There are some contradictions of the rationale given by expert opinions; some experts said that statistics on some public airports recorded an insignificant increment of passenger traffic after the policy implementation while other airports have significant passenger traffic. This was explained because the main groups of passengers using some DOA airports are business travelers; the tourism policy then does not have an impact on these groups of passengers. Consequently, the scores computed for this PESTEL element are ranked 4th.

The climate changes are another factor influencing the public airport industry. However, as the patterns of climate change in the country are quite common and not extreme, the rating scale for this element is ranked as 5th. Most of the circumstances relating to climate changes are in the forms of airport flooding, PM 2.5, forest fires, and

weather conditions which can cause flight delays and cancellations. This factor may affect tourism demand, which ultimately influences the public airport revenue.

The New S-curve Policy and Eastern Economic Corridor Development Project seem to have had the least effect on the overall airport situation. To quantify this economic policy for public airports under DOA, only 8.84% is scored from the expert panels. There are two main reasons for this value. Firstly, the content in Thailand 4.0 Industry Development Strategy Plan (BE 2560-2579) by the Ministry of Industry (2017) lacks of policy directions for DOA officials. Although it focuses on aviation and aeronautic development, there is not ample information to guide the DOA. Secondly, the location of the 28 public airports is not in the area of the Eastern Economic Corridor Development Project oversight; hence, it may have caused an indirect impact on the public airport industry instead.

## CONCLUSIONS

To analyze the public airport industry in Thailand, PESTEL Analysis under Structure-conduct-performance Approach provides the overall pictures of the industry. The National Strategy (2018-2037), the New S-curve Policy, the Second-tier City Tourism Policy, the trends toward airport digitalization, climate change and the revision of Air Navigation Act (No.14) BE 2562 are carefully considered and selected to represent the factors interacting among structure, conduct and performance of Thailand public airport system.

The PESTEL-AHP is quantitatively constructed to estimate and prioritize each PESTEL element that plays a large part in the public airport industry. The scoring approach from expert panels reveals that the revision of the Air Navigation Act (No.14) BE 2562 has the strongest force on the public airports under the control of the Department of Airports (DOA). While the other top 2 PESTEL elements are given to the National Strategy (2018-2037) and the trend toward airport digitalization, with the weighted score estimation of 28%, 22%, and 21% respectively. The industry analysis from PESTEL-AHP provides policy implications.

To formulate the public airport strategic planning, this study suggests that DOA management is required to carefully look at the revision of the Air Navigation Act (No.14) BE 2562 and the National Strategy (BE 2560-2579) since it frames the budget system and directions of airport development. Flexible legislations in terms of airport financing, and area commercialization would allow each airport to rapidly adapt to changes in business environment regarding its contexts and locations. Moreover, the trend toward airport digitalization allows DOA management to focus on improving technological infrastructure and the digital ecosystem in public airports in Thailand. Not only to offer better passengers' experiences and tourist comfortability, but also to seek more efficient airport business administration. To surmise the importance of a public airport industry analysis for future research, all 28 public airport management across the country should be surveyed in order to gain well-rounded information and in-depth details on how they administer the airport business. Insight data collection from airport users should be observed and articulated in order to perform a proper airport development for all.

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# RDF Waste Power plant in Rayong Province : A Model for Community Sustainable Environmental Friendly RDF Waste Power Plant

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## Abstract

The research aimed to study on social and environmental success of RDF waste power plant project in Rayong province and to analyze mechanisms and factors affecting social and environmental success of RDF waste power plant. Qualitative data analysis was conducted by documentary research, relating to the comprehensive solid waste management of the RDF Waste Power Plant in Rayong Province, Code of Practice (CoP), implementation of pre-construction to date in social and environmental aspects and interviews from representatives of RDF waste power plant, The data were analyzed in accordance to the issues of the assessment in Social and Environmental to identify important issues that affected the success of acceptance of people. The lesson learned from the gathered information concerning the waste management leading to the improvement and solution of community waste problems that enabled effectively of the environmentally friendly process.

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The results of the study was found that mechanisms and factors affecting the success of social and environmental operations of RDF waste power plant, 1) Cooperation with the sector in Thailand was possible for the management of specialized knowledge of the private sector; it was feasible to drive the project in efficient manner, as well as verifiable, 2) It was in accordance with the principles of good governance by having a waste learning center based on transparency and public participation, 3) Clear communication and consistency including employing local people would enhance and create opportunities for people in the neighboring area around the RDF waste power plant.,and 4) Consistent environmental impact assessments.

**Keywords:** RDF waste-to-energy power plant, Environmental Management, Public participation, Rayong Province

# โรงไฟฟ้าขยะ RDF จังหวัดระยอง : ต้นแบบของโรงไฟฟ้าพลังงาน ขยะที่เป็นมิตรต่อสิ่งแวดล้อมที่ยั่งยืนในชุมชน

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## บทคัดย่อ

การศึกษามีวัตถุประสงค์เพื่อ ศึกษาความสำเร็จของการดำเนินโครงการโรงไฟฟ้าขยะ RDF จังหวัดระยองและวิเคราะห์กลไกและปัจจัยที่มีผลต่อความสำเร็จของการดำเนินงานด้านสังคมและสิ่งแวดล้อมของโรงไฟฟ้าขยะ RDF จังหวัดระยอง ผ่านการวิเคราะห์ข้อมูลเชิงคุณภาพโดยศึกษาเอกสาร (Documentary Research) ที่เกี่ยวข้องกับการจัดการขยะมูลฝอยครบวงจรของโรงไฟฟ้าขยะ RDF จังหวัดระยอง ประมวลหลักการปฏิบัติ (Code of Practice: CoP) การดำเนินการโครงการก่อนการก่อสร้างจนถึงปัจจุบันในด้านสังคมและสิ่งแวดล้อมผ่านการสัมภาษณ์จากผู้แทนจากโครงการศูนย์กำจัดขยะมูลฝอยรวมแบบครบวงจรจังหวัดระยอง โรงไฟฟ้าขยะ RDF และนำข้อมูลที่รวบรวมได้ถอดบทเรียนในการบริหารจัดการขยะครบวงจรแห่งแรกในระยอง ที่นำมาสู่การต่อยอดและแก้ไขปัญหาขยะของชุมชนได้อย่างมีประสิทธิภาพ และเป็นมิตรกับสิ่งแวดล้อม 1) การร่วมมือกับภาคเอกชนในประเทศไทยมีความเป็นไปได้ในการบริหารจัดการองค์ความรู้เฉพาะด้านของภาคเอกชนสามารถขับเคลื่อนโครงการได้อย่างเป็นปกติและมีประสิทธิภาพสามารถตรวจสอบได้ 2) ตามหลักธรรมาภิบาลโดยการมีศูนย์การเรียนรู้สร้างความโปร่งใสและการมีส่วนร่วมของประชาชน 3) การสื่อสารที่ชัดเจนถึงความสม่ำเสมอและเกิดการจ้างงานคนในพื้นที่

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เป็นการเสริมสร้างด้านสร้างโอกาสแก่ประชาชนในพื้นที่รอบโรงไฟฟ้าขยะ RDF 4) การตรวจสอบ  
ประเมินผลกระทบด้านสิ่งแวดล้อมที่มีความสม่ำเสมอ

**คำสำคัญ:** โรงไฟฟ้าพลังงานขยะ RDF การจัดการสิ่งแวดล้อม การมีส่วนร่วมของประชาชน  
จังหวัดระยอง

## Introduction

With the increase of population, production and consumption, the arisen problem is urban garbage overflowing. In addition, dumping or ineffective waste management leads to many environmental problems. Water, soil and air pollution have been caused by non-gathered or non-disposal of waste that were left in the community areas (Pollution Control Department, 2019). The government has been aware of the problem of solid waste management, especially plastic waste management and sea waste issue. There was a campaign for solid waste management policies, such as plastic waste management Road Map. Building of collaborative networks between the public and private sectors, including community solid waste management plans "Clean Province" is an option to focus on solid waste management comprehensively from upper, middle and lower stream. The alternative ways of waste disposal were using fuel waste or Refuse Derived Fuel (RDF). The presentation of idea for effective community waste disposal allowed reduction of environmental problems and pollutions. One option was to convert community waste into fuel through variety of processes under the government policies; Alternative Energy Development Plan 2018-2037 (AEDP 2018) to generate power by community waste for 800 MW in 2037. Operating a waste power plant becomes an interesting choice today by transform waste into energy for power generation, including alternative power as well as solving the issue of urban waste overflowing. However, amid the objection for building waste power plant that caused the concern of people on the production process such as waste odor, waste water that might enter natural water sources, including objection of RDF waste power plant construction in many areas. However, there was no objection to the standards of social and environmental management, due to efficient e Environmental management; before the operation, there was the survey for opinions and evaluation of environmental quality. According to the study on social and environmental aspects of the integrated waste disposal center in Rayong Province under the RDF power plant project, they could accommodate in communities and manage waste effectively by treating 500 tons a day. In the process of energy production, RDF could be converted into waste fuel and sustainable environmentally friendly. Therefore, researchers are interested

in studying and have the lesson learning for operation of RDF waste power plant, in terms of society and environment, that enabled the community acceptability and accommodation with the local community as well as using as the guideline for waste disposal development and production of RDF waste power in other areas.

## Purpose of study

- 1) To study the social and environmental success of the RDF waste power plant project in Rayong province.
- 2) To analyze the mechanism and factors affecting the social and environmental success of the RDF waste power plant in Rayong province.

## Literature Review

**Code of Practice (CoP);** for the project Waste-to-fire thermal power plants with an installed capacity of less than 10 MW for measures to prevent, rectify and monitor environmental impacts, safety, as well as potential impacts on nearby communities of the power plant, covering from the preparation phase, the construction phase, the operation phase and the demolition process of buildings, machines, or equipment. Participation and opinions expression on the project implementation from the beginning of the project and the CoP report is opened and used as a supporting document for obtaining a license to operate the electricity business. (Energy Regulatory Commission, 2016)

**Public Participation;** there are a variety of techniques used to create public participation by categorizing the techniques of public participation into 2 types, with details as follows; (Jutarat Chomphan, 2017) 1) Techniques for providing information on good public participation must consist of planning for good information dissemination to the public, in order that people can be fully aware of information and important issues, 2) Participation Techniques when people receive complete and appropriate information, the next step is to set up a platform so people can express their feelings, or opinions to decision-makers appropriately, such as in group discussions, opening a hotline, interviews, hearing meetings.

**Good Governance** is the main idea base for management and operations to build stability for the organization and treat stakeholders fairly, good management supervision management which can be used for both the public and private sectors. The Good governance, proposed by the Office of the Prime Minister, consists of 6 principles: 1) Principles of Integrity 2) Principles of Rule of Law 3) Principles of Transparency 4) Principles of Participation 5) Principles of Responsibility 6) Principles of Efficiency and Effectiveness. (Office of the Civil Service Commission, 2009)

**Social impact assessment (SIA)** is the basis for the process of assessing educational social impacts and forecasting the social impact of a project on people, communities and people's way of life through the process of analyzing, forecasting, assessing the impact and management of both direct and indirect impacts on humans and the environment of the planned intervention. All processes of social change that arise from those interventions which leads to sustainability and equality in bio and environment including the culture, traditions and beliefs of the people in the community as well as presenting measures to reduce the impact, prevent and reduce negative impacts on communities and livelihoods. (Dej Wattanachaiyingcharoen, 2010)

**Waste fuel or Refuse Derived Fuel**, commonly known as RDF, refers to solid waste that has undergone various management processes such as separating combustible materials, tearing or cutting the solid waste into small pieces in order to improve and convert the waste into solid fuel with properties in terms of heating value, humidity, size and density suitable for use as fuel for generating electricity in solid form.

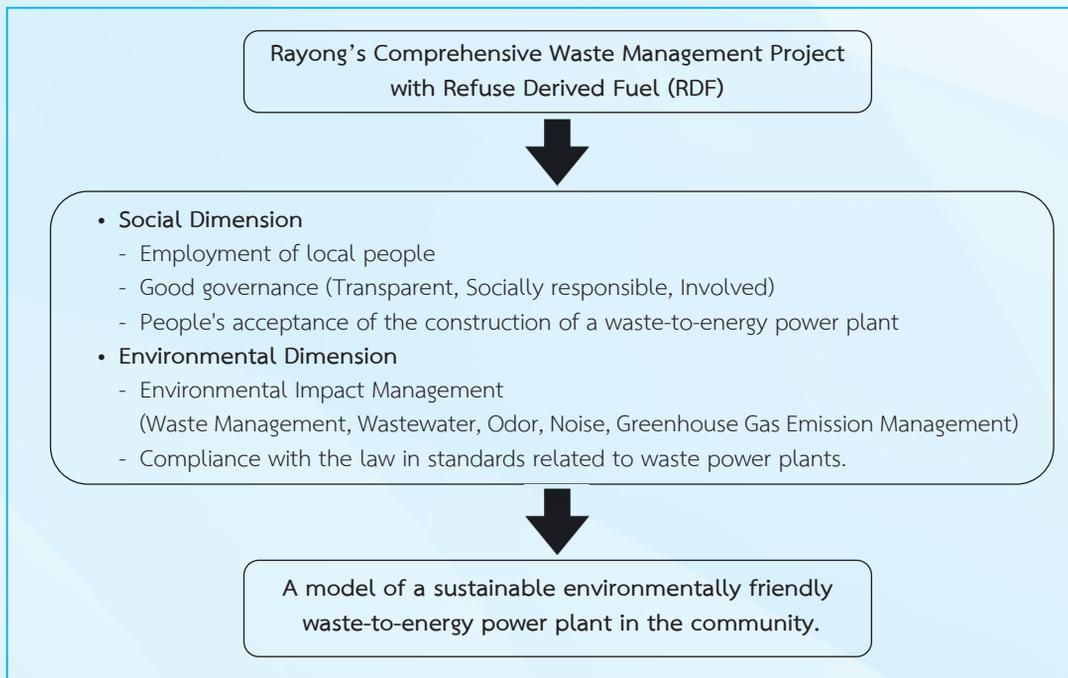
**Table 1** Showing the type of fuel waste ( Refuse Derived Fuel)

Type	Characteristics and production methods of fuel waste	combustion system
RDF-1 MSW	Separating the combustible waste with its original size of the garbage.	Stoker
RDF-2 Coarse RDF	Separating burned waste and crushed or coarsely cut the garbage.	Fluidized Bed Combustor, Multi-Fuel Combustor
RDF-3 Fluff RDF	Separating burned waste and crushed or cut until 95 percent of the waste is smaller than 2 inches.	Stoker
RDF-4 Dust RDF	Segregating the burned waste through the process to be in the form of dust	Fluidized Bed Combustor, Pulverized fuel Combustion
RDF-5 Densified RDF	Separating burned waste through the compaction process, forming into bars, cubes, or, pellets, etc.	Fluidized Bed Combustor, Multi-Fuel Combustor
RDF-6 RDF Slurry	Segregating the combustible waste through the process of being in a slurry form	Swirl Burner
RDF-7 RDF Syngas	Segregating the combustible waste through the Gasification process to produce syngas useable gas fuel	Burner, Integrated Gasification Combined Cycle (IGCC)

**Source:** Bureau of Waste and Hazardous Substance Management, Department of Pollution Control, 2018

## Method

This study was qualitative research by studying related documentary research on the integrated solid waste management of the RDF waste power plant in Rayong Province, the Code of Practice: CoP, the pre-construction project implementation until the present, and the interviews with representatives from the provincial Integrated Solid Waste Disposal Center in Rayong Province and the nearby communities of the Integrated Solid Waste Disposal Center in Rayong Province, community leaders and people in the area of Nam Kok Subdistrict, Thap Ma Subdistrict, Map Kha Subdistrict and Nong Tapan Subdistrict. The collected data was analyzed according to the assessment aspects on Social and Environmental issues in the Integrated Waste Management Project of the RDF Waste Power Plant, Rayong Province, were analyzed through PDCA method in order to identify the important issues affecting the success of building public acceptance.



**Figure 1** Research concept diagram of the RDF Waste Power Plant Project, the Integrated Solid Waste Disposal Center, Rayong Province Source: author

The research concept of the RDF Waste Power Plant Project of the Integrated Waste Disposal Center in terms of social dimensions was conducted by using the social dimension analysis topic, employment of people in the nearby area of the community waste power plant, Good governance of the project with the communities that builds a reputation for trust, social responsibility and participation through providing opportunities for people in the area. The environmental dimension is an important dimension as it is the one that is in concern of many parties about the impact that may occur in the management of environmental impacts on waste, waste water, odors, noise and greenhouse gas emissions, due to the incineration of waste fuel that occurs in the production process and compliance with the law in measures related to waste-to-energy power plants. In this regard, the Integrated Waste Disposal Center, RDF Waste Power Plant, took the lessons from management in terms of social and environmental dimensions, to create a model of environmentally friendly waste power plants that are sustainable in the community.

## Summary of research results

Company information of Refuse Derived Fuel (RDF) Powerplant project

Rayong Provincial Administrative Organization has collaborated with Global Power Synergy Public Company Limited to operate a comprehensive solid waste disposal center project in Rayong, located in the areas overlapping 4 sub-districts, comprising Nam Kok Subdistrict, Thap Ma Subdistrict, Map Kha Subdistrict and Nong Ta phan Subdistrict. For a comprehensive waste disposal center consists of a waste sorting plant and converting into Refuse Derived Fuel (RDF) and a waste incineration plant that generates electricity with a capacity of 9.80 megawatts, with the capability to dispose 500 tons of waste per day, covering an area of approximately 429 rai. The investments for the construction of the incinerator system entirely derived by GPSC investment. This allows Rayong Province to be able to dispose all waste and to support the amount of non-hazardous industrial waste in Rayong that is about 50 tons per day, which will make Rayong Province free from waste problems from both the community and the industrial sector for at least 20 years, promising for safely and sustainably solving the waste problem in Thailand. This project was an investment in the form of public-private partnership (PPP) which helps the government to save budget and speed the project progression, which will lead to capability in completely and sustainably solving the waste problem, and also operation in accordance to international standards, with no more smell, pollution nor environmental impact, resulting in the acceptance from the surrounding community which will be a model for other provinces to be applied across the country. (Rayong Provincial Administrative Organization, 2019)

The area of the Integrated Waste Disposal Center, Rayong, consists of a waste separation project, Waste-to-energy power plant; Rotary Kiln incinerator system that works continuously for 24 hours. Under the environment principles, air pollution is monitored, from the process of collecting to the transmission of infectious waste into the incinerator system. There is a follow-up operation in every step to prevent the spread of germs. For the big problem of organic waste mixed with community waste, since it was wet waste,

weighing more than other elements, which the landfill option would cause odor problems, so it was instead solved by putting sorted organic waste into biogas fermentation system which was a closed system, so there was no disturbing smell and could be used to generate 1 megawatt of electricity as a renewable energy to be used within the integrated solid waste disposal center as well as having a by-product Sludge from fermentation that could be used as a soil improvement material returning to the surrounding communities. Moreover, there is a waste management learning center within the center that is equipped with modern technology in providing knowledge on waste to electricity for those who are interested, including staff from the center from student personnel from the community around Rayong Integrated Waste Disposal Center.

## **Power production and operation, environmental management measures and living together with the community.**

### **social**

In terms of society, the analysis of RDF waste power plant project and the comprehensive waste treatment center was conducted before construction. It was required to make good understanding in the four zones through communication for the purpose of construction, analysis and evaluation of the impact of housing and community life to open for community participation in accordance to the theory of community participation. Employment of people to work in the power plant waste sorting plant, and coffee shops. It is considered as a kind of social dimension that can build the trust of the community and society around the RDF power plant. This leads to social transparency and responsible social activities through continuous social campaigns, exchanging views and support as well as needs of people and the creation of new career through projects operation. For the people acceptance and participation on RDF power plant construction, the process of understanding and communication was conducted in 4 Sub Districts in 5 forums in the understanding stage of RDF power plant project through explanation of the village head, then there was the stage of opening for public opinions and informing the Cop guidelines for biomass, and solids, not exceeding 10 MW., as well

as continuously identifying solutions to social problems through online 24 hours. In addition, the solution to the theoretical problem was conducted through the PDCA method. As the power plant is not a short-term project, it is need for the vision for communities to sustainably go along with the power plant. Planning to provide good information to the community so that the community can fully understand the information and problems on health and safety around the plant and the use of hazardous chemicals, as well as to ensure the work efficiency of plant by focusing on communication with people in the areas.



Figure 2 Zero Waste Village , Rayong Province Source: Rayong Provincial Administrative Organization,2021

### Environment

On the course of environmental impact management, in the construction process, environmental impact assessment was done by inspecting the quality index before construction at the nearby communities in the aspects of garbage, waste water, smell, noise and greenhouse prose which probably caused by RDF power plant construction. The possible management and solving guideline are as follows;



**Figure 3** Overview RDF Waste Power Plant Project, the Integrated Solid Waste Disposal Center, Rayong Province Source: Rayong Provincial Administrative Organization,2021

1) Waste Management: under the clear management practice or guidelines, if we can manage waste to create value by transforming it into energy; with our long-term vision of how to manage waste that is increasing every day, how to accommodate the power plants and environment to go along with the communities. One solution is to have an efficient waste management center for waste management and care, from the source to the destination. The by-products obtained through waste sorting is that each type of waste derived by municipal waste can be converted into RDF solid fuel, while organic municipal waste or waste that can be recycled and sold. This will increase efficiency. However, there may still have environmental impact. The possible solution is to design a closed room for garbage disposal with a door blocking between the waste pick-up pits garbage and the yard that the car runs into to dump the garbage into the pond. The areas must open only for the garbage trucks Garbage to run back and forth to pour the garbage into the garbage pit inside the room. There should also be the fan installation to ventilate the air inside the garbage room, the area above the waste pit and above the garbage feeding funnel into the oven in order to have some air for combustion in incinerators.

Such measures cause the air pressure in and above the area to be less than atmospheric pressure and as a result, odors and dust will not spread to outside, this thus reduces foul odor problems in the solid waste receiving room and that otherwise will diffuse from the solid waste receiving room to outside. Another solution is to use only the community solid waste as fuel, not to accept hazardous waste, infectious waste, radioactive substances or other objects (eg. construction waste, demolition, bricks, stone, concrete and those are oversized the waste inlet to be fed into the furnace) for the use of the project's fuel. The solid waste fuel characteristics should be prepared to be suitable to the selected combustion technology such as size and humidity, etc., in order to control combustion conditions to achieve complete combustion and reduce emissions of pollutants, arising from the project.



**Figure 4** Sign of the RDF Waste Power Plant Project, the Integrated Solid Waste Disposal Center, Rayong Province Source: Rayong Provincial Administrative Organization,2021

2) Wastewater Management: the integrated waste disposal center of the RDF Power Plant has the efficient waste and water management through the water management method used in the industry by adding new water to the process without discharging around the power plant. It is considered as a good circulation system with efficiency considering the reuse of water from the sewerage ponds, such as watering plants and green areas within the project area, which is the internal use of the projects or Zero Discharge Water Balance.

3) Odor management: the problem of odor is managed a sorting plant that is a closed plant inside. At the negative pressure, there is no ventilation of odors from outside and inside. Furthermore, 500 tons of waste are sorted per day through hot air blowing to get 200 tons of RDF waste per day for fuel. Other garbage will be sold while organic waste such as durian scraps, fruit scraps will be fermented in biogas . Solving the problem of odor of RDF waste power plants is mainly about the sorting process. After the sorting is done, the segregated waste will be converted into RDF fuel through conveyor belts and conveyed to the incinerator to reduce air pollution from the RDF. The incineration is controlled to a temperature of 850-1,100 degrees Celsius for 2-3 seconds to achieve complete combustion. Pulse Jet Bag Filter in the air pollution Bag filter treatment system, is designed to be placed behind the air pollution treatment system to trap light ash dust derived by combustion and activated carbon is used to remove dioxin compounds and heavy metals and reduce the potential for cancer-causing dioxin compounds. As Thailand does not yet have a law on the protection of dioxin compounds, environmental concerns arise.

4) Noise Management: before construction, there was the prevention of noise during the construction from the use of various machinery , drilling and temporary fencing around the construction area to reduce the noise level from construction bothering neighboring communities. Moreover, personal protective equipment were provided for working workers who exposed to loud noise as well as inspected maintenance of machinery and equipment for various installations to be ready for use at all times. The building's area was planned to be in the middle zone of the project area in order to have the most distance from the community and to have perennial planting around the boundary of the project area, enabling to noise control and reduction to prevent impact against nearby communities.

5) Greenhouse and Air pollution conditions: the measure concerning greenhouse conditions to prevent global warming are planned using the method of T-VER-METH-WM-04 Version 03 CoP legal standards, namely the standard values displayed through the

display screen in front of the RDF waste power plant. The CO and NO<sub>x</sub> emissions of RDF combustion show ; however RDF combustion can significantly decrease the CO emission due to its distinct pellet structure and burning pattern. The major of acidifying air pollutants are SO<sub>2</sub>, NO<sub>x</sub> CFs that RDF samples due to emissions released during the incineration of Municipal Solid Waste (MSW). Incineration had a greater impact on the environment due to air emissions, such as carbon dioxide, sulfur dioxide and nitrogen dioxides. a pilot scale vertexing fluidized bed to help If it exceeds the standard, it will be notified to the plant for inspection and can be promptly prevented in the affected condition areas.

There are also measures to monitor environmental impacts, statistical record of complaints in various problems against the communities including methods and timeframes for corrective action with a summary and result report every 6 months pursuant to the legal Code of Practice (CoP) conducted for the project of waste-to-fire thermal power plants with an installed capacity of less than 10 megawatts to prevent repeat complaints concerning the environment.

### **Success and Factors Affecting Success**

According to the interview about the power plant from RDF fuel, it was the first integrated waste management model in Rayong, leading to further improvements and solutions to community waste problems. It could effectively reduce the landfill area and was environmentally friendly, reflecting the comprehensive waste management within the communities as well as upgrading community products to generate income for the community, increase employment of local people. In this regard, the clear communication, good governance, social accountability, and participation were mechanisms that enable communities and power plants to go along. “Investment in the RDF Waste Power Plant Project, the Integrated Waste Disposal Center Rayong Province has a low return in comparison to other energy investments. However, the important thing is the company's mission to support the management of the government through cooperation with local agencies in order to be the model of truly integrating cooperation between government,

private and public sectors.” said the RDF waste power plant representative. Success in the acceptance dimension from people maybe because; 1) Cooperation with the private sector in Thailand has the possibility to manage the private sector's body of knowledge, enabling the project to be driven in a normal and effective manner that can be traced; and 2) According to the principles of good governance , having a learning center within the plant is considered transparent and with public participation in order that everyone will be able to learn and understand waste management through the form of recycling waste into electric fuel 3) The clear and continuous communication and employment of local people are the effective ways of enhancing opportunities for people in the nearby areas of the RDF waste power plant 4) Consistent environmental impact assessment. As a result, the Project will be recognized as the prototype of waste management and create value-added to the MSW at the same time. Thus, the collaboration between Rayong Provincial Organization and GPSC shall provide benefit of waste management to Rayong Province and their people as well as be the learning center for other local administrative organizations in the future.

## Research Discussion

Today's waste management has a greater impact on the environment than normal disposal. As waste collection in other areas have been conducted through unsanitary dumping and incineration, with no technology, causing many pollution problems, and without generating any benefit Management of waste is a main concern and one of the most crucial issues in modern society. Effective waste management considers prevention, recycling, and handling of waste in such a way that most effectively protects human health and the environment and Environmental Effects focused on Municipal Solid Waste (MSW) to energy technologies and monitor other issues. Although odor issue, Factors affecting MSW composition include season of the year, geographic location, population characteristics, and degree of urbanization (Zabaniotou, A., Giannoulidis, N., (2002), Rayong Province is a fruit farmer. Sometimes organic waste such as fruit rinds, durians, mangosteens are present in large numbers during fruit festivals. There may be

a problem of smelling garbage during the fruit season. which is still a problem sometimes solved. is to enhance understanding consistent with the research of residents' perceptions, concerns and attitudes towards waste management facilities. According to the characteristics and environmental impact of RDF management and the good practice of Policy analysis for sustainable refuse-derived fuel production in Espírito Santo, Brazil to sustainable RDF project, (Giselede Lorena Diniz Chaves., (2021), the proposed solid waste management policy, it is envisioned that there will be sufficient waste streams for RDF production under dynamic uncertainties, given the limited cost-benefit-risk trade-off assessment. In addition to the direct benefits of sustainable RDF production as a substitute for fossil fuels, the indirect environmental benefits are salient as the regulations for circular economy can be functional in the future.

Good governance of the project with the communities that builds a reputation for trust, social responsibility and participation through providing opportunities for people in the area. The environmental dimension is an important dimension as it is the one that is in concern of many parties. As the future requirement is to wisely promote environmental sustainability management of other problem not only waste management, but also planning to manage future waste, as well as the issue of public health and the environment in the long run, which required for long-term following up. The performed to select the most viable waste management alternative based on technical, economic, environmental, and stakeholder preferences (Lionel P. Joseph Ramendra Prasad, 2020). The law relating to waste power plants affecting public health should be undertaken in the form of an additional social impact assessment (SIA) project to forecast the social impact of the project against people, communities and the way of life of people in the communities (Det Wattanachaiyingcharoen, 2010) and other impacts like Local community organization process to inform development guidelines, to acknowledge the problems and needs of local people older residents reported most concern about the potentially adverse health impacts of long-term exposure to odours from MSW facilities. However, although awareness of MSW facilities and concern about potentially

adverse health impacts varied according to the characteristics of residents., the necessity for a waste power plant to transport waste through trucks roaming across the community road, the affect to land prices and village construction, businesses, shops of villagers, Medium-term and long-term agricultural areas of power plants with 20-year power supply contracts, including the proposed mitigation measures, prevention and reduction of negative impacts against communities and sustainable livelihood.

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## APPENDIX

### Interview questions

#### Social dimension

##### Questions

- 1) Do you promote the employment of local people to work in the project and create new jobs?
- 2) How do you promote exhibition to disseminate the knowledge of RDF or not and how?
- 3) How do you think the relationship with the communities surrounding the RDF Waste Power Plant Project?
- 4) The RDF Power Plant has built confidence in waste management.  
including how to anticipate future problems that will occur in the landfill site; emergency action plan?

#### Environment dimension

##### Questions

- 1) How do you plan to manage environmental problems within the RDF Waste Power Plant Project in terms of waste management, wastewater (leachate), odor, noise, and greenhouse gas emissions?
- 2) Environment from the operation of the RDF waste power plant, especially the smell and how do you deal with complaints?
- 3) Have you fully complied with the standards related to RDF waste power plants
- 4) Code of Practice (CoP)
  - Plan 4.1 Water Resources Management Action
  - Plan 4.2 Waste and Waste Management Action
  - Plan 4.3 Occupational Health, Safety and Health Action Plan
- 5) Have you action plan to create an understanding of the operation of the RDF waste power plant during the construction phase, the construction phase and the current operation.

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  - 6.2 The synopsis of the focal situation or a brief summary of the main point;
  - 6.3 The outline of the case includes
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- main body of case,
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