Investigating Sustainable Consumption Practices: a case of Single-Use Plastics in Online Food Delivery Market, Thailand

Miss Boonchanit Wongprapinkul

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Thesis Advisor	SUJITRA VASSANADUMRONGDEE, Ph.D.

Accepted by the GRADUATE SCHOOL, Chulalongkorn University in Partial Fulfillment of the Requirement for the Doctor of Philosophy

..... Dean of the GRADUATE SCHOOL
(Associate Professor YOOTTHANA CHUPPUNNARAT, Ph.D.)

DISSERTATION COMMITTEE

..... Chairman
(Associate Professor Thumrongrut Mungcharoen, Ph.D.)
..... Thesis Advisor
(SUJITRA VASSANADUMRONGDEE, Ph.D.)
..... Examiner
(Assistant Professor Suthirat Kittipongvises, Ph.D.)
..... Examiner
(Associate Professor NUTA SUPAKATA, Ph.D.)
..... External Examiner
(Associate Professor Witsanu Attavanich, Ph.D.)

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ในช่วงปีที่ผ่านมา ธุรกิจจัดส่งอาหารออนไลน์ประสบความสำเร็จในตลาดประเทศไทยโดยมีอัตราการเติบโตทางธุรกิจในระดับสูง การเติบโตของธุรกิจนี้ก่อให้เกิดขยะแบบใช้ครั้งเดียวราว 560 - 2,856 ชิ้นต่อปี นอกจากนี้ การแพร่ระบาดของโรคติดเชื้อไวรัสโคโรนา 2019 (โควิด-19) ส่งผลให้ผู้บริโภคเกิดความลังเลในการเลือกบริโภคผลิตภัณฑ์พลาสติกแบบใช้ครั้งเดียวด้วยเหตุผลด้านการป้องกันเชื้อโรค ผู้บริโภคเผชิญเหตุการณ์ที่ต้องตัดสินใจระหว่างการบริโภคที่ส่งผลต่อสุขภาพของตนเองซึ่งเป็นเรื่องเร่งด่วน และการบริโภคที่ส่งผลต่อสิ่งแวดล้อมโดยรวมซึ่งยังไม่มีความแน่นอน ดังนั้น การบริโภคผลิตภัณฑ์พลาสติกแบบใช้ครั้งเดียวในช่วงการแพร่ระบาดจึงกลายเป็นเรื่องปกติที่ยอมรับได้ ขณะที่คนไทยเริ่มปรับเปลี่ยนพฤติกรรมการบริโภคอย่างยั่งยืนตามมาตรการงดแจกถุงพลาสติก การแพร่ระบาดของโควิด-19 นำไปสู่ข้อกังวลในเรื่องผลกระทบต่อการปรับเปลี่ยนพฤติกรรมการบริโภคในระยะยาว โดยในเชิงทฤษฎี การบริโภคบรรจุภัณฑ์และช้อนส้อมพลาสติกแบบใช้ครั้งเดียวเป็นการบริโภคบนพื้นฐานของความเคยชินซึ่งมีปัจจัยหลากหลายที่ส่งผลให้การตัดสินใจบริโภคไม่ได้เป็นไปอย่างมีเหตุผล นอกจากนี้ การตัดสินใจบริโภคยังเกิดขึ้นในตลาดที่มีความล้มเหลว กล่าวคือ ผลิตภัณฑ์ที่เป็นมิตรต่อสิ่งแวดล้อมมีราคาสูงกว่าผลิตภัณฑ์ทั่วไป การเข้าถึงข้อมูลด้านสิ่งแวดล้อมเป็นไปอย่างจำกัด และระบบการจัดการขยะยังขาดประสิทธิภาพ ปัจจัยเหล่านี้ส่งผลให้การตัดสินใจบริโภคไม่ได้ก่อให้เกิดประโยชน์สูงสุดในทางเศรษฐศาสตร์ เมื่อพิจารณาถึงความท้าทายในระดับจุลภาคและมหภาค งานวิจัยชิ้นนี้จึงเสนอแนะมาตรการในการลดการใช้บรรจุภัณฑ์พลาสติกแบบใช้ครั้งเดียวในธุรกิจจัดส่งอาหารผ่านเครื่องมือเชิงพฤติกรรม เครื่องมือทางการตลาด การพัฒนาระบบและโครงสร้างพื้นฐาน และการตลาดสีเขียว

งานวิจัยชิ้นนี้จึงมีวัตถุประสงค์เพื่อศึกษาคุณลักษณะด้านสิ่งแวดล้อมของผู้บริโภคแต่ละกลุ่มบนเงื่อนไขของความลังเลในการบริโภคอย่างยั่งยืน รวมถึงศึกษาพลวัตของระบบที่ประกอบด้วยผู้มีส่วนเกี่ยวข้องที่หลากหลายเพื่อระบุจุดคานงัด (leverage points) ในระบบ โดยได้นำมาตรการในการลดการใช้บรรจุภัณฑ์พลาสติกแบบใช้ครั้งเดียวในธุรกิจจัดส่งอาหารที่ได้เสนอมาวิเคราะห์ถึงประสิทธิภาพและความเป็นไปได้ในทางปฏิบัติ โดยข้อมูลเหล่านี้นำไปสู่ข้อเสนอแนะเชิงการจัดการซึ่งรวมถึงมาตรการเฉพาะกลุ่มและข้อเสนอแนะเชิงนโยบายซึ่งจะเป็นประโยชน์ต่อผู้ให้บริการจัดส่งอาหาร ร้านอาหาร ภาคประชาสังคม และผู้ออกนโยบายในการลดการใช้บรรจุภัณฑ์พลาสติกแบบใช้ครั้งเดียวในธุรกิจจัดส่งอาหาร งานวิจัยชิ้นนี้เก็บข้อมูลผ่านช่องทางออนไลน์เป็นหลัก โดยการวิเคราะห์เชิงคุณภาพและเชิงปริมาณซึ่งใช้วิธีการวิเคราะห์กลุ่ม (cluster analysis) การวิเคราะห์พลวัตระบบ (system dynamic analysis) และการวิเคราะห์แก่นสาระ (thematic analysis)

ผลวิจัยพบว่ากลุ่มผู้ใช้บริการจัดส่งอาหารสามารถแบ่งได้เป็น 3 กลุ่มตามคุณลักษณะด้านสิ่งแวดล้อม ซึ่งทั้ง 3 กลุ่มมีความแตกต่างกันในเชิงพฤติกรรม จิตวิทยา และประชากรศาสตร์ โดยในเชิงการจัดการ งานวิจัยเสนอให้เน้นกลุ่มเป้าหมายที่เป็นกลุ่มผู้บริโภคสีเขียว (กลุ่ม 3) และกลุ่มผู้บริโภคทั่วไป (กลุ่ม 1) ผ่านการให้สิ่งจูงใจในรูปแบบที่แตกต่างกัน นอกจากนี้ การวิเคราะห์ระบบชี้ให้เห็นว่าจุดคานงัดที่สำคัญได้แก่ ระบบการจัดการขยะหลังการบริโภค เครื่องมือทางเศรษฐศาสตร์ กฎหมายและระเบียบ การได้ประโยชน์ร่วมกันของทุกภาคส่วน และต้นทุนและกำไร งานวิจัยชิ้นนี้เสนอมาตรการการลดการใช้บรรจุภัณฑ์พลาสติกแบบใช้ครั้งเดียวในธุรกิจจัดส่งอาหารในระยะสั้น ได้แก่ การตั้งค่า ‘ไม่รับช้อนส้อม’ เป็นค่าเริ่มต้นในระบบ และการเพิ่ม ‘ฉลากเขียว’ สำหรับร้านค้าสีเขียว และระยะยาว ได้แก่ การอุดหนุนบรรจุภัณฑ์สีเขียว (subsidy) และการพัฒนาระบบมัดจำ-คืนสินค้า (deposit-return scheme)

สาขาวิชา	สิ่งแวดล้อม การพัฒนา และความยั่งยืน	ลายมือชื่อนิสิต .....
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Boonchanit Wongprapinkul : Investigating Sustainable Consumption Practices: a case of Single-Use Plastics in Online Food Delivery Market, Thailand. Advisor: SUJITRA VASSANADUMRONGDEE, Ph.D.

Online food delivery platforms have demonstrated their financial success in the Thai market during the past few years. As a result, 560 - 2,856 million pieces of Single-use Plastics (SUPs) are expected each year. Furthermore, the Coronavirus Disease 2019 (COVID-19) caused a dilemma in sustainable consumption and intensified the plastic waste situation. The social dilemma poses difficult short-term choices between health and the environment. The concern is that while Thais have started to adopt new sustainable lifestyles with the no-plastic-bag policy, environmentalists worry that this COVID disruption will have a long-term behavioural impact on SUPs consumption habits. Consuming single-use packaging and cutlery is regarded as habitual consumption, where anomalies deviate decisions from rational (sustainable) consumption choices. Moreover, individual consumption decisions occur in the market with failures, where the decisions are not optimized. Green products are more expensive, green information is insufficient, and the waste management system is not efficient. Taking into consideration the micro and macro-limitations of achieving sustainable consumption, this study proposes initiatives to reduce and redirect the current set of consumption practices. These initiatives are based on behavioral instruments, market-based instruments, infrastructure and system provision, and green marketing approaches.

Based on these rationales, this research aims to understand the green profiles of each consumer group through cluster analysis based on a dilemma in sustainable consumption. It also aims to understand the dynamics in the multi-stakeholder system and identify leverage points in the system. The proposed initiatives were tested for their practicality and potential to reduce SUPs in the food delivery business. Ultimately, this study proposes strategic recommendations to reduce SUP in the food delivery business. The recommendations cover segment-specific managerial implications as well as system-wide measures with policy implications that would benefit the food delivery platforms, merchant partners, civil society, and policy makers. The survey questionnaire was mainly conducted online using both quantitative and qualitative methods, including cluster analysis, system dynamic analysis, and thematic analysis.

The findings suggested a three-cluster solution. Each cluster was found to be distinct in behavioral, environmental psychological, and demographic profiles. The managerial implication suggested that the initiatives should target the green cluster (cluster 3) and the general consumers (cluster 1) with different incentive schemes. System analysis revealed that ‘post-consumption system’, ‘economic instruments, law and regulations’, ‘benefit alignment’ and ‘cost and profit’ were high leverage points in the system that need to be improved. The study proposed setting ‘no cutlery’ as a default option, and adding ‘eco-label’ as short-term initiatives, while long-term strategies involve ‘eco-packaging subsidies’ and ‘deposit-return scheme’.

Field of Study:	Environment, Development and Sustainability	Student's Signature .....
Academic Year:	2021	Advisor's Signature .....

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INTRODUCTION

1. Background and situations

The current development paradigm of our world is centered around the concept of growth-led development. In this industrialization era, the debatable relationship between economic growth and environment is often referred to as weak sustainability. Such development schools believe that the trade-off between economic prosperity and environmental degradation is unnecessary since the environmental conditions will be improved as the economy thrives. It also supports the idea that natural resources and other capitals, such as financial capitals, are substitutable in terms of development competency; therefore, the world does not need natural capital (Bansal, 2012; Ferguson, 2015). However, this development paradigm is proven to be unjustified. The opponents of this approach argue that the increasing population creates more demand and consumption while the supply side keeps stimulating demands and consumerism in an exponential manner (Jackson, 2005; Seyfang, 2009). Globalization creates businesses that serve a convenience lifestyle; also, mass production and consumption have been intensified by cheap labour and materials. It is clear that the limitation to sustainable consumption pertains to the economic structure that aims solely for perpetual growth with a little consideration on the 'Limit to Growth' (Stiglitz, 2007). In the market system, economic externalities are the product of imperfect market structure that prevent the market economy from functioning efficiently. The establishment of the market economy is grounded on economic interest where demand and supply are determined by the pricing system that does not reflect the true cost. As a result of unsustainable consumption and production, negative externalities in forms of waste and pollution almost exceed the carrying capacity of the planet. The current ecological modernization paradigm[1] is the development concept as a product of globalization and industrialization (Ferguson, 2015; Stiglitz, 2007). The paradigm has brought about social transformation that is driven mainly by technologies and industrial innovation. Rapid digital disruption in Asia produces new products and services that satisfy ever-growing needs of consumers. The disruptions have introduced us to a wider range of consumption choices that offer a novel lifestyle which is becoming normalized as innovation adoption grows.

Online food delivery service is one of the emerging businesses in the platform economy which creates a new consumption pattern. It relies on the system embedded in the mobile application that enables seamless user experience. Online food delivery platforms have exhibited their financial success in the Thai market during the past few

[1] **The ecological modernization paradigm** is endorsed in 'Our Common Future report' by World Commission on Environment and Development (WCED) (1987) as a key strategy towards sustainable development

years of launching and consumers promptly respond to the new consumption lifestyle. Kasikorn Research Center reported that, in Thailand, food delivery business is estimated to have the market value of 46,000 million baht in 2022 without calculating COVID-19 factor (Kasikorn Research Center, 2019) while the report from Statista (2019) revealed 36% growth from 2018. However, Coronavirus Disease 2019 (COVID-19) during late 2019 - 2021 has multiplied the transaction amount by 50 - 400% (Tanakasempipat, 2020). Despite the impressive financial figures, the triple bottom line of this business is yet to be reached. This business model feeds the growing lazy economy and throw-away culture which accelerates a number of environmental impacts, one among them is issues related to Single-use Plastic (SUP) waste. Plastic pollution is known to be one of the life-threatening phenomenons to every lifes on earth that needs urgent mitigation action. 'Beat Plastic Pollution' was presented as the theme of World Environment Day 2018 to highlight the fact that cheap and convenient SUPs, after a few minutes use, could last in landfills for centuries.

Unfortunately, the source identification of waste generated in Bangkok is difficult to trace and record; only estimated numbers calculated from the market value were available. Kasikorn Research Center (2020a) estimated that, in 2020, the amount of packaging from food delivery was more than 250 million pieces. Food Passion, a food retail group, estimated from the market value of 35,000 million baht that 560 million pieces of SUPs are generated each year from this business. The assumption was that each order values 250 baht and generates four pieces of SUPs (Jitpleecheep, 2019). Research from Prince of Songkla University (PSU), Phuket campus, found that food delivery service in Phuket generates 37 million pieces of plastics each year; given three service providers in Phuket with 2,850 drivers and 1,000 restaurant partners. The calculation was made under the assumption that each driver makes 36 order transactions each day and each order generates one piece of SUP (Prince of Songkla University, 2019). Thampanishvong et al. (2020), from Thailand Development Research Institute (TDRI), argued that 140 million pieces of SUPs were generated, taking into account seven pieces of SUPs per order. However, the number has doubled during COVID-19 crisis, contributing to 280 pieces of SUP packaging and cutlery. Moreover, the Pollution Control Department (2021) found from its survey that 11 pieces of SUPs are generated from each food delivery order. Thailand Environment Institute (2021) estimated that food delivery plastic waste has reached 550 million pieces per year. From available research data, Wongprapinkul and Vassanadumrondee (2021) estimated plastic waste from food delivery services to reach 2,325 – 6,395 billion pieces in 2025. The assumption was based on the research conducted by Food Passion and the Pollution Control Department that 4 - 11 pieces of plastic were generated in each food delivery order (Jitpleecheep, 2019; Pollution Control Department, 2021). However, Thailand Greenpeace director pointed out that in Thailand, there is still no official statistical information on how much waste is generated from the food delivery sector (Thai PBS, 2019).

The world's devastating events like the COVID-19 pandemic intensified the situation of SUPs waste from food delivery service. During the COVID-19 event, almost all economic activities were paused. Yet, the food delivery business thrived according to the government measures that prohibited restaurant dine-in; only takeaway and delivery orders were allowed. This event contributed to a huge effect on food consumption patterns. Moreover, for hygiene reasons, some cafes and restaurants stop accepting personal food and drink containers that consumers brought to purchase. The Pollution Control Department (2021) estimated that, as people were asked to stay at home, this event would accelerate the amount of waste from food delivery service by 15%. (Kasikorn Research Center, 2020c) estimated that the closure of restaurants during this period could contribute to 35-40% growth in market value.

Likewise, this waste problem can be discussed from the development perspective. As a result of globalization and technological advancement in the neo-classical economy, Foreign Direct Investment, especially the foot-loose industries, is looking to settle in developing countries like Thailand due to the more relaxed standards and regulation. This situation is referred to as the 'pollution haven hypothesis' where the financial benefits flow back to the parent companies, leaving social and environmental consequences the burden of the host countries (Millimet & Roy, 2016). All four main food delivery platforms in Thailand are foreign companies that seize profit from little investment and externalize plastic pollution as a price of a lazy economy.

2. Problem Statement

In this research, the analysis of SUPs problems were conducted from the sustainable consumption practice perspective. Although consumers are not the sole key actor of sustainable transition in the food delivery business, sustainability in for-profit organization is usually driven by demands of consumption since consumers hold the power to *vote* for choices that are brought into the market (Dolan, 2002; Hanss, 2012; Kotler & Lee, 2005; Seyfang, 2009). As a result, the service sector relies heavily on consumer research in contemporary societies since consumers hold enough power to drive changes in business models. Moreover, sustainable transition involves multi-stakeholder coordination in the supportive market system. Therefore, this research explored the problems of SUPs in food delivery service from the consumption end which incorporates both demand and supply side of consumption, as well as the larger market system that this service resides in. The problems can be identified as, first, price in the market does not reflect the true cost of the product, making the price of green packaging higher than its plastic alternatives. Consumers do not have enough information to make optimal decisions. But even though consumers have full information, they are predictably irrational when making decisions. Lastly, the current systems and infrastructure are unsupportive of sustainable consumption models. As a result of these limitations, the actual consumption practices are unsustainable. For example, when ordering food delivery, despite the consumers choosing not to receive

cutlery, they still receive it anyhow. This research then proposed corporate initiatives and tested them for their effectiveness in reducing SUPs.

Taking these multi-layer challenges into consideration, the main theme of this research is 'sustainable consumption' which involved cross-disciplinary concepts and theories in areas such as social psychology, economics, business, and marketing. This research based its analysis on the explanation of consumption as a social practice which holds that sustainable consumption practices are reproduced by the collection of individual lifestyles within the larger systems of provision. A specific set of consumption practices in the society is the product of the interplay between everyday consumption of individuals and the systems of provision that enables such individual actors to act (Spaargaren & Van Vliet, 2000). Therefore, the problem lies at the micro-consumption scale cannot be solved without the adjustment of the existing systems of provision. The barriers need to be addressed, measures for effective collaboration need to be proposed.

3. Research Objectives

The objectives of this research are, first, to identify platform food delivery consumer clusters based on their environmental psychology characteristics, as well as to investigate the behavioral, psychological, and demographic differences among clusters. The improved consumer understanding would enable the platforms, their partners, and the regulators to design measures to support sustainable consumption. In addition, this research aims to identify potential changes in behavior and perception regarding SUP packaging consumption during COVID-19 event. Second, to identify leverage points in the system in order to pinpoint business opportunities and structural limitations. Ultimately, to provide managerial and policy implications and propose strategic recommendations that could lead to SUPs consumption reduction in the online food delivery market. This research also examined the interplay among actors that play roles in consumption and provision so as to understand the dynamic of demand and supply. The understanding of factors and motives will contribute to the improved recommendation of SUPs reduction measures in food delivery services that is suitable for Thai context.

4. Research Questions

1. What are the environmental profiles of platform food delivery customers?
    1.1 What are the consumer perceptions towards SUPs generated from the food delivery business?

    1.2 How can food delivery customers be clustered? What are the profile of each cluster?

2. What are the high leverage points in the system that can be adjusted to reduce SUPs in the food delivery business?

5. Conceptual Framework

In order to answer research questions, a conceptual framework was proposed.

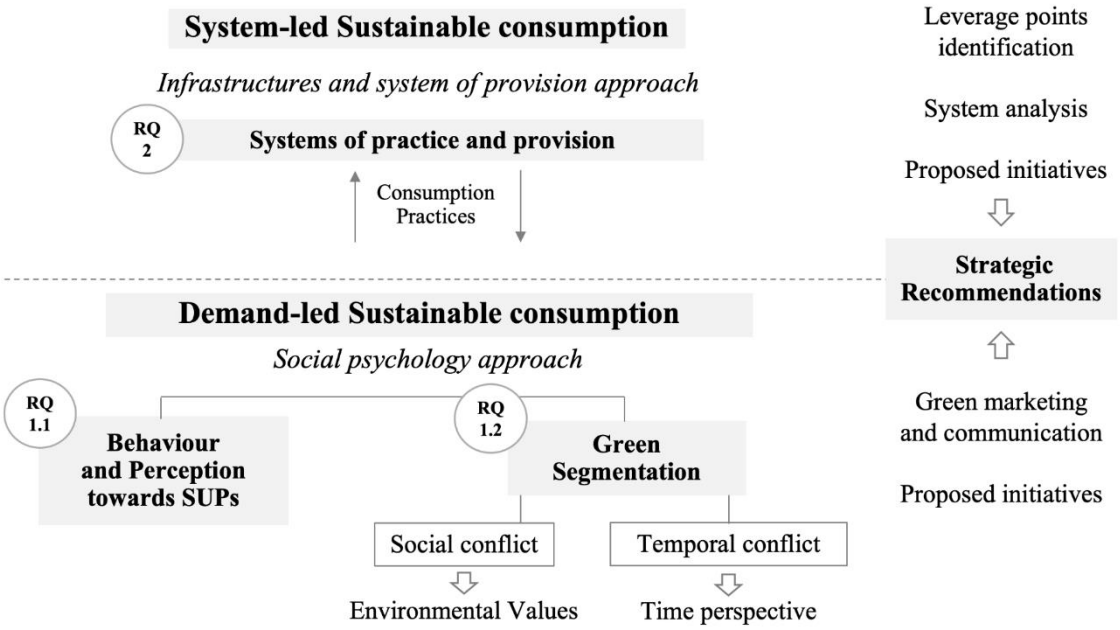

Figure 1.1: Conceptual Framework

6. Research Scope and Limitation

This research investigated behavior and perception of food ordering transactions occurring under four major platform-to-consumer food delivery businesses in Bangkok which are Grab Food, LINE MAN, Gojek and Foodpanda. It did not include direct orders with the restaurant (such as the Pizza Company 1112, McDelivery, or S&P), phone orders, orders placed via the restaurant's website and other offline orders. In this research, SUPs from food delivery service includes plastics in forms of cutlery and its sleeve, food box and containers, food bags, carrier bags, condiment sachets, cups and lids, straws, cup holders and trays. This research was conducted solely for the academic contribution, not for commercial purposes. Therefore, the research results could contribute to the business implications and improve the existing development concepts. However, this research did not include the actual implementation of intervention commercially but rather provided profound understanding on how each actor in the system responded to each theory-based initiative. The research focused around the activities occurring between consumers, platforms, niches and the regulators along the chain. It did not specifically touch upon the packaging production stages since it involves another level of which is business-to-business supplier. It also excluded technical research at post-consumption waste management as it involves particular scientific knowledge and expertise.

By referring to COVID-19, the time frame of such an event was set according to the Bangkok Metropolitan Administration's order in relation to the restaurants' operation restriction. The period of restaurant closure was between 22 March 2020 to 17 May 2020 or 57 days. However, this research examined the changes in consumption patterns that were influenced by the COVID-19 but resulted in long-term behavioral impact beyond the pandemic period.

The limitations in this research involved some dimensions involving research scope. Due to the highly competitive characteristic of this business, the targeted food delivery platforms did not cover new platforms emerged during the research period. In addition, Gojek, one of the targeted platforms, has been overtaken by the airline company's extension unit, Airasia Food. So, the research results were not based on particular brand, but rather on the foundation of overall experience, attitudes and perception towards food delivery services in general.

7. Expected Outcome and Contribution

This research aims to identify the possible set of initiatives that foster the reduction of SUPs consumption in online food delivery business through the holistic analysis of different actors throughout the value chain. Previous studies examined the different groups of green consumers through segmentation and clustering (e.g., Albayrak et al., 2010; Gilg et al., 2005; Oliver & Rosen, 2010; Park & Lee, 2014). Some researchers investigated consumers' responses to sustainable initiatives or a particular green product attributes such as product labels (e.g., Isa & Yao, 2013; Podnar & Golob, 2007; Rokka & Uusitalo, 2008; van Dam & van Trijp, 2016). This research not only analysed individual consumption, but also investigated the collective consumption practices and the provision side of consumption. Specifically, it identified consumer segments based on attributes related to sustainable consumption concepts. The proposed strategic recommendations can be adapted to fit different market settings in different industries. Furthermore, this research contributed to the novel understanding of concepts within the sustainable consumption framework which can be applied to other consumption studies such as energy consumption and tourism industry. Also, this study contributed to the understanding of changing consumption practices during the unusual event and how it might lead to long-term behavioral consequences. Further study could be conducted on other cause-related consumption such as the consumption of organic, fair-trade and local produce. Future research can investigate the long-term attitudinal change towards the use of SUPs over the COVID-19 period. This study also addressed the opportunities for future research in examining constructs relating to dilemmas in other aspects of socio-temporal conflict in sustainable consumption, especially under the COVID-19 situation.

CHAPTER 2
LITERATURE REVIEW

1. Overview of Online Food Delivery in Thailand

Platform food delivery market in Thailand has four major players; Grab Food, LINE MAN, Gojek, and Foodpanda. In its Industry Outlook Analysis, Kasikorn Research Center (2019) revealed that the market value in 2019 was expected to reach 35,000 million Baht. Despite this large market value, platform food delivery merely accounts for 8% of Thailand's restaurant market value, leaving a large pie of untapped opportunities for the business to expand. Statista (2019), in its Online Food Delivery - Thailand report, revealed that the penetration rate of platform-to-consumer delivery grows 22.5% a year. In the same report, the number of users was expected to grow from 1.9 million in 2019 to 2.4 million in 2020. The revenue incurred from this business is divided among the platform, food messenger and the restaurant. The revenue model differs across platforms. 78% of the market value goes to the partnered restaurants (chain and local) while 12% and 10% are shared between the food messengers and the platforms consecutively (Kasikorn Research Center, 2019; Marketingoops, 2019). Each company has presented financial success as follows. **Grab Food** reached 120 million transactions in 2019 while only 20 million is expected. The transactions contribute to 900% Year-over-Year (YoY) growth since only three million transactions are made in 2018. LINE marketing and communication director reveals that **LINE MAN** Food has grown 250% in 2019 (Bangkok Bank SME, 2019). **Gojek** platform operation director revealed that Gojek (under the name 'GET' at that time) reached 10 million transactions within less than a year of operation. The area with the highest transaction is Pathumwan (Marketingoops, 2019). **Foodpanda** experienced the highest order rate in Sukhumvit area (Bangkok Bank SME, 2019).

From a business and marketing perspective, online food delivery is a data-driven business that brings customers from offline to online platforms. It acquires business opportunities from the digitalisation of the consumer market; the strategy is so called Online-to-Offline (O2O) or Business to business to consumer (B2B2C). Food delivery business is often considered as an on-demand fulfilment player in the e-commerce ecosystem. It can also be regarded as a multidimensional platform business that needs network effect from a number of stakeholders. The key success factors of this business are the variety of restaurant partners, fast delivering at low cost, and the supportive digital system. At the early stage of market entering, the platform uses a 'Loss Leader' strategy where the companies invest in promotional activities and discounts trying to draw as many customers into using their platforms, to build lively market environments, and to *sell* new consumption behavior until such behavior becomes common. They would accept initial financial loss in order to forcefully penetrate the market. The goal is to make consumers decide to place delivery orders even when they are surrounded by plenty of physical restaurants and food vendors. This strategy is becoming widely adopted by e-commerce platforms and startup companies

with high market competition. LINE MAN, Grab and Foodpanda are among the first players in the market while Gojek enjoys the market that has already been built. To this date, the platform keeps expanding its business operation to best answer the ever-growing consumer needs. The Cloud kitchen is the space where many restaurants can share. It is usually located in a prime area so as to lessen the delivery distance and time. This model seems to be the solution in the era of social-distances and economic downturn. Platforms introduced a physical kitchen in Bangkok Central Business District (CBD) where the popular partnered merchants are gathered physically so as to eliminate limitations on delivering distance. Foodpanda launched the 'Krua by foodpanda' project that partners with seven merchants. The shared kitchen is located at 'The Curve'. LINE MAN introduced combined order service among more than 16 partner restaurants (both chain and local) at Samyan Mitrtown and adjacent areas. Grab partnered with Central Group and introduced 'cloud kitchen' which acts as a central kitchen of 12 restaurants (local heros) located at Samyan market and Vibhavadi 36. In 2021, Grab owned 10 kitchens in total. Consequently, the extension of the convenience-based business model poses a threat to the planet's carrying capacity.

However, COVID-19 accelerated the growth of this business at a very rapid rate. As a result of the country's lockdown measure from March 2020, Kasikorn Research Center revealed that the food delivery sector is estimated to have grown 33% in just over a month to about 45,000 million Baht. This business experienced a 150% growth rate during the first half of 2020. The order reached 66-68 million transactions with 78-84% growth rate in 2020 (Kasikorn Research Center, 2020b). LINE MAN experienced 300% order growth from the beginning of the lockdown in March through the end of April. Grab reported 400% growth in its food delivery business in the week after the lockdown. Foodpanda's order grew 50% from February to March, and another 10% in April. The transaction reached its peak in the first week of May (Suwannatat, 2020; Tanakasempipat, 2020; The World Bank Group, 2020). During the second wave of COVID-19 in Thailand (late December 2020 - February 2021), LINE MAN revealed that its orders tripled in COVID-19-controlled areas where the restaurants had limited capacity for dine-in customers and people were asked to stay home (Thairath, 2021). The World Bank Group (2020) pointed out that the consumption of food delivery changed significantly due to COVID-19 disruption. In the Thai market, a number of newcomers entered the market during 2020-2021. Most of them were introduced as a subsidiary under the existing big brands. Firms in the banking industry, telecommunication industry, and airline industry have extended their service line to capture this lucrative market.

Other countries have also experienced rising food delivery orders as well as the amount of waste. China, for example, reports that plastic waste from home deliveries increased by 25% during the pandemic (Song et al., 2018). The Standard Wealth (2021) reported the substantial change in online food ordering habits in a global landscape. Mobile marketing data research unit in Tokyo found that in July 2020, 46.4% of the survey sample ordered food via mobile application at least once, while only 29.9% was

recorded in September 2019. The 'cloud kitchen' model finds its lucrative opportunity to thrive in the midst of the COVID-19. Taiwan, Hongkong, Japan, China, Singapore, Indonesia, Malaysia, Philippines and India all witness the post-COVID-19 growth and are all pushing investment and innovation into this delivery business model (The Standard Wealth, 2021). Senior research analyst at Euromonitor International also affirmed that this trend will become the new normal of the restaurant sector and that we can expect more delivery innovations (Chandrasekar, 2020).

As a result of the COVID-19 event in early 2020, Bangkok governor ordered the closures of retails, malls and restaurants on 22 March 2020; only takeaway food is allowed. Other provinces later followed the same measure. On 26 March 2020, the Emergency Decree on Public Administration in Emergency Situation, B.E. 2548 came into force. Although the majority of economic activities have been paused, food delivery service became more needed than ever. The situation has increased the negotiation power of food delivery platforms. At the same time, food retailers, large and small, rely on food delivery service as the main sales channel leading to weaker negotiation power. The consumers also faced limited choice in daily food consumption. Kasikorn Research Center (2020c) estimated that, while the food industry is expected to shrink by 9.7-10.6%, the closure of restaurants could contribute to 35-40% growth in market value of food delivery during this golden period. The Pollution Control Department (2021) suggested that, as people were asked to stay at home during the lockdown, this incident accelerated the amount of waste from food delivery service by two to three fold.

The effort in campaigning against SUP was delayed or even ceased and the governments in many countries have eased their SUPs restriction measures. Massachusetts, for example, suspended a ban on polystyrene foam containers, as well as imposed a temporary ban on reusable shopping bags and allowed the retailers to give out free plastic bags. Many other states such as New Hampshire and San Francisco have gone through the same measure. The Plastics Industry Association demanded the United States government to endorse SUPs as the most hygienic and the safest option to be used in daily life during the pandemic. Scotland postponed its packaging deposit-return scheme (DRS) to July 2022. India suspended the ban of SUP bags and bottles. The United Kingdom suspended SUP bag charges in delivery services (Peszko, 2020). Thailand should have been phasing out SUPs in 2020 according to the roadmap. Unfortunately, the ‘Bring-Your-Own’ campaign in Thailand was also paused during the pandemic; the majority of coffee shops had stopped accepting private reusable cups (Praiwan et al., 2020).

2. The pandemic and changing consumption behavior

For the customer profile, Wongnai and LINE MAN conducted a research and found that food delivery customers are aged between 25-34 years old (37%) males (50.2%) and females (49.8%) with high income (39.2%) (Wongnai, 2020) while Gojek found that the majority of its customers are female (67%). The wider age range of food

delivery customers would be the millennials (generation y-z) which are 17-38 years old (Marketingoops, 2019; Witoorut, 2019). Gojek also found that customers order one to two menus per order on average in the evening between 4pm-9pm. On Gojek, bubble tea was the most ordered menu (300,000 cups each month) (Marketingoops, 2019). LINE MAN revealed that the active users tend to place weekly orders (Brandage, 2019). However, during the 2020 country lock down, the order frequency increased at least three times. One of the main customer groups is the 'routine lover' who orders from the same restaurant. Additionally, 63% of customers believe that the introduction of food delivery platforms has changed their consumption behavior (Kasikorn Research Center, 2019). In general, a number of research found that the main reason to purchase through platforms is the convenience and time-saving characteristic of delivery service[2] (Chantapoon, 2016; Electronic Transactions Development Agency (ETDA), 2020). In 2020, the pandemic allowed food delivery platforms to reach the untapped customer segments. Chulalongkorn University Transportation Institute (2020) found that new users of food delivery platforms increased by 8%. As illustrated in Figure 2.1, the transaction amount shifted from 'one to three times per week' to 'four to six times per week' and 'more than seven times per week'. Among the respondents, 69% plan to continue using the service. A survey from Electronic Transactions Development Agency (ETDA) (2020) revealed that 34% of consumers ordered food delivery because of COVID-19-related reasons. Institute of Public Policy and Development (2020), in their survey, found that the average transaction per week doubled from 3.36 to 6.54 times per week during the lockdown in Bangkok. Moreover, regardless of environmental behavior, more than half of the respondents (62.43%) believed that SUPs are necessary in the time of the pandemic (Institute of Public Policy and Development, 2020). COVID-19 has largely contributed to gigantic SUP waste as humans developed health concerns and believe that single-use is the answer for hygiene issues. As a result, when dine-in service is allowed, tableware is wrapped in plastic, foods are sometimes served in single-use containers, and customers are required to wear SUP gloves in self-service restaurants. However, recent research by (Chin et al., 2020), (University of California - Los Angeles, 2020) and (Van Doremalen et al., 2020) affirmed that the virus can stay on plastic surfaces from one to six days, longer than other materials such as cardboard or in aerosols.

[2] **Electronic Transactions Development Agency (ETDA)** (2020) reveals that 80.37% of the respondents order food delivery because of convenience, 50.63% order food delivery because of time-saving.

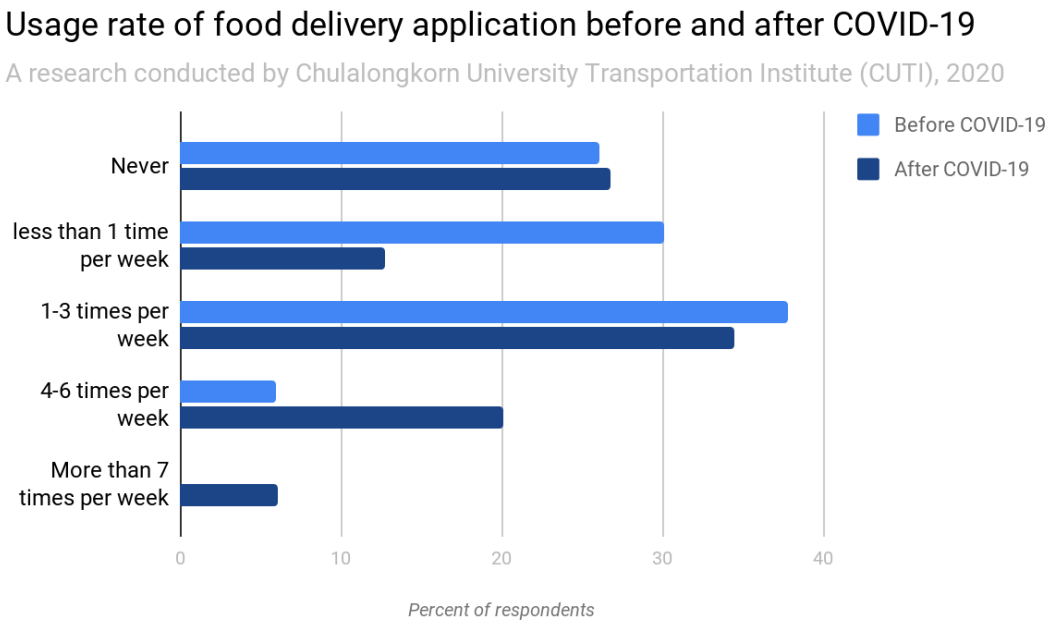

Figure 2.1: Usage rate of food delivery application before and after COVID-19 (Chulalongkorn University Transportation Institute, 2020)

To capture the trends, a social listening research from Wisesight revealed that ‘plastic waste’ was mentioned on social media five times higher during COVID-19 than it was before. When analysing the conversation, food delivery is the major activity that was mentioned as the cause of increasing plastic waste. Many of them stated that they feel bad and want to be a part of the solution by opting-out for plastic cutlery or even stop using the service. The report also revealed that Thais, on social media, ordered food delivery the most in April (the middle of the three-month lockdown), 98% higher than in February (before the lockdown) and then, in June, shrank to the level above the pre-lockdown period as shown in Figure 2.2. The report also found that 'online food delivery' is the seventh most mentioned keyword under the ‘work from home’ context during the lockdown period. The most popular dishes included the Thai cooked-to-order dishes, noodles, papaya salad, grilled shrimp and pickled eggs; western food such as pastries, salad, and steak; Japanese menus such as sushi, ramen, and Gyudon (Thai Health Promotion Foundation, 2020).

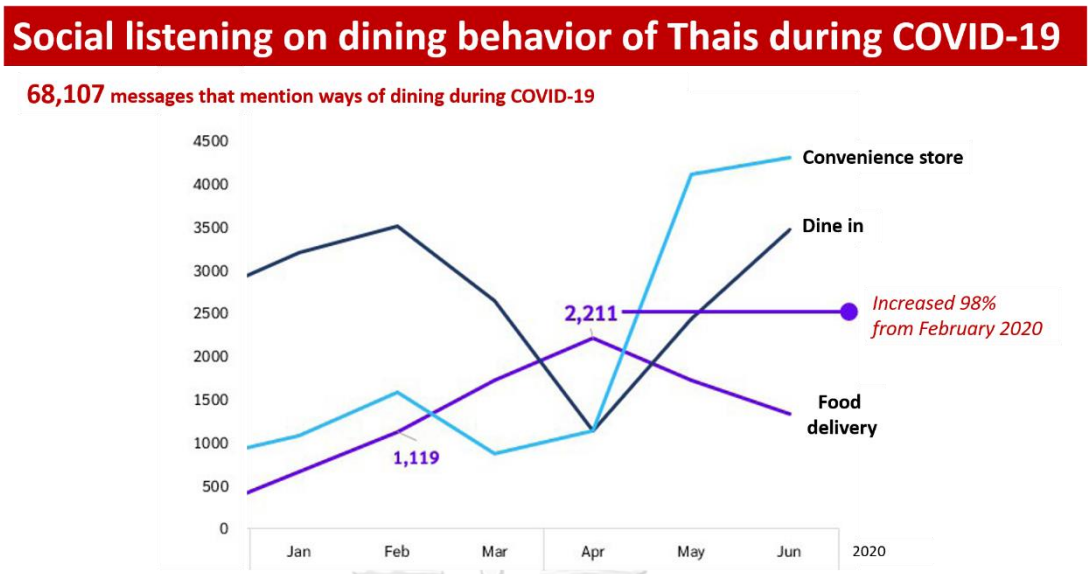

Figure 2.2: Social listening result on Thais' eating behavior during COVID-19 (Thai Health Promotion Foundation, 2020)

3. Environmental Impacts of Food Containers and Cutlery

Pollution Control Department (2018) revealed that in Thailand, the majority of plastics consumption belongs to the packaging industry which accounts for 2.33 million tons or 41% of all plastic products. Most of the packages are SUP hot and cold food bags, High-density polyethylene (HDPE) and Polypropylene (PP), plastic carrier bags, boxes, trays, cups and straws. Around 1.93 million tons of plastics become post-consumer waste. 20% of the waste enters the recycling system while the rest 80% contaminates the environment. Plastic food containers and cutlery are commonly found in forms of PP and Polystyrene (PS). Food containers and cutlery, by their nature, have low recyclability rates due to food contamination (food residue), low economic value and stringent recycling regulations. Moreover, some of the packaging were made from more than one type of plastics and some of them were screenprinted. Individual consumption practices also pose limitations to the circular economy of plastic packaging. Consumers rarely rinse or separate the leftover food from its container before littering which causes these types of SUPs ending up in the same bin as mixed waste or general waste. The problem could become more intense in the food delivery industry which operates under the lazy economy in which the consumers would not want to take any additional effort at the post-consumption stage. Moreover, only 11% reported that they always make requests not to receive SUPs cutlery in food delivery service. During the COVID-19 event, the Pollution Control Department (2021) and Bangkok Metropolitan Administration (2020) reported that, despite overall improvement in amount of waste, recyclable and non-recyclable plastic take larger proportions of overall municipality waste compared to the same period in the previous year. Country-wise, Thailand Environment Institute (2021) estimated that plastic waste increased by 15% during the time of pandemic. In Bangkok, where food delivery

service is clustered, plastic waste increased 62.28% in April 2020 compared to the same period in 2019. During this period, only 20% of all plastic waste was recyclable. 80% of Bangkok's plastics waste were contaminated items, from takeaway bags to containers, bottles and cups (Tanakasempipat, 2020), which increased 71% from 2019 (Table 2.1). As a result of the new lifestyle, household plastic waste during the pandemic mainly consisted of food containers, food bags, cups, bottles, cutlery, straw and other packaging (Bangkok Metropolitan Administration, 2020).

While the overall level of consumption may remain the same, consumption has shifted from organisations to households where the waste segregation rate is lower. Pollution Control Department (2021) conducted a survey in April 2020 and found that the majority of consumers did not separate contaminated SUP waste from general waste (45%). The World Bank Group (2020) also revealed that the challenge to the recycling of food packaging is due to high food waste volumes. The regulator, therefore, encourages consumers to properly separate household waste and send it back to the recycling scheme. In Thailand, the public bin facility is still unsupportive of waste sorting especially at the office buildings and households where the consumption of food delivery orders take place. Specifically in Thailand, low economic return from recycling discourages household waste separation and recycling (Pullman et al., 2010). These problems raise the cost of recycling and makes it uneconomical to recycle. Moreover, many countries such as Singapore, Indonesia, Malaysia, Vietnam as well as Thailand have imposed a 'recycled content policy' regarding food safety that prohibits the use of recycled material in food containers (United Nations Environment Programme, 2019). For these reasons, the majority of SUPs food containers and cutlery were made from virgin plastics. Moreover, for food safety reasons, food packages are usually designed to maintain food quality with minimum chance of chemical reactions in particular storage conditions. Therefore, most of the food packages are not easily degradable in normal conditions, especially the packages of dry food with long shelf-life (Robertson, 2010).

Table 2.1: Bangkok's plastic waste during COVID-19 situation

	Normal situation January-April 2019 (Ton/day)	**COVID-19 situation January-April 2020 (Ton/day)**	**Amount increased from 2019**	**Percent increased from 2019**
Overall	2,115	3,432.3	1,317.3	62.3
Recyclable	495 (23%)	659.8 (20%)	164.8	33.3
Contaminated	1,620 (77%)	**2,772.5 (80%)***	1,152.5	**71.1**

* BMA reveals that 80% of Bangkok's plastic waste during COVID-19 is contaminated items, from takeaway bags to containers, bottles and cups (Tanakasempipat, 2020).

In addition, the majority of the studies related to Life Cycle Assessment (LCA) of plastic packaging and cutlery examined raw materials acquisition, manufacturing, distribution, use, recycling and waste management. Unfortunately, by looking at the life cycle of takeaway food containers as well as other SUP products, the use stage could be as short as ten minutes. However, the disposal of it could take centuries to degrade just to remain circulated in the environment and the nutrient cycle. Song et al. (2018) studied packaging waste from food delivery in China's megacities with statistics on waste generated and proposed policy suggestions. It reported that the highest volume of packaging waste were plastic containers, wood chopsticks, plastic bags, plastic spoons and paper order slips correspondingly. Accorsi et al. (2014) conducted LCA of reusable containers, as opposed to SUP containers, throughout the food catering supply chain. The analysis concluded that the impact of SUP containers is relatively high at the manufacturing stage while the system of reusable containers contributes to the highest impact at the transportation stage. The National Environment Agency (2018) and Gallego-Schmid et al. (2019) studied the environmental impacts of takeaway food containers and found that single-use PP containers have the highest carbon footprint and energy consumption when compared to styrofoam and aluminum containers, resulting in highest global warming potential. Still, styrofoam has a lower recyclability rate. The study also revealed that, in order to have an equal impact to styrofoam containers, reusable tupperware containers have to be reused 18 times; and disposable PP containers have to be reused five times. Therefore, the more the containers are reused, the lower the environmental impact they would have created. The National Environment Agency (2018) also found that the production of paper containers are equally energy intensive when compared PP containers. It also affirmed that, although reusable PP containers consume large amounts of water along the life cycle, they consume less energy and emit relatively less carbon footprint and Green House Gases (GHG). Alternatively, single-use kraft paper boxes were found to have less global warming potential and energy consumption but higher water consumption and land usage. Mujushi et al. (2018) assessed the life cycle of plastic cutlery and affirmed that the raw material acquisition and manufacturing process are the most energy intensive stages where every stage causes waste in forms of GHG emission, plastic residue and chemical substances. The most problematic stage would be the post-consumption management since plastic packaging, especially cutlery, mostly ends up in landfill, incinerators or the ocean depending on the waste management system, market mechanism and regulatory framework of each country (Accorsi et al., 2014). Due to the challenges in SUPs waste management in many countries, International Union for Conservation of Nature and Natural Resources (IUCN) (2020) proposed that SUPs and over-packaging should be reduced when possible. However, most LCA studies failed to analyse further into the composability, the impact of microplastics contamination in the environment and the littering potential; resulted in the underassessment of plastic packaging environmental impact when being compared to the greener alternatives. Still, there are ongoing efforts to improve the accuracy in the LCA of plastic products. A project called The MARILCA (Marine Impacts in LCA) attempted to integrate marine impact assessment into the LCA of plastic litter since a large portion of plastic waste

leaks into the ocean (International Union for Conservation of Nature and Natural Resources (IUCN), 2020).

4. Sustainability effort to reduce SUPs in food delivery business

4.1 Existing sustainability initiatives in the global food delivery market

Sustainability efforts were analysed from the viewpoints of service providers, consumers and the regulator so as to understand the complete sustainability framework in the food delivery market. By reviewing relevant literature, a wide range of studies about business-led sustainability initiatives looked into areas such as emission reduction in the production system, sustainably sourced material, energy and resource consumption reduction, and SUPs and green packaging for non-food items. This presented a gap to an understanding of how a fast-moving platform business responds to the problem caused by convenience and seamless lifestyle experience that this service offers.

After plastic pollution has been raised as a global concern in 2018, the world attention on plastic pollution has surged again due to the pandemic-influenced changing lifestyle. Food delivery is one of the few businesses that has been affected positively by COVID-19. From the business viewpoint, sustainability is becoming more of a concern in online food delivery business. Apart from the plastic waste situation, food delivery service also drives other environmental issues such as food waste and energy consumption. This section discusses sustainable programs that aim to reduce or replace the consumption of SUP packaging and cutlery among food delivery transactions.

Globally, **Deliveroo**, a UK-based food delivery platform facilitates and encourages its merchant partners to use eco-friendly packaging through the procurement of green packaging ranging from sushi platter to pizza tray. The platform then sells the packaging set to its partner at an affordable rate. This strategy reflects that the additional cost incurred from changing to eco-packing is absorbed by both the platform and the partner restaurants. In Melbourne, Deliveroo partners with Returnr and BioPak, packaging startups, for a mutual goal to bring reusable packaging into Deliveroo's delivery model. A $6 USD deposit can be added to Deliveroo's order which will be reimbursed when the container is returned. **Foodpanda** Singapore also partners with Proterra, Dillic Packaging, and Ecou, the suppliers of eco-friendly foodware to provide safe and sustainable food containers, cutlery, and coffee cups, to the restaurant at a low price. Ideally, it aims to replace SUP packaging in all partner restaurants at no cost. Moreover, customers who opted out of plastic several times were given a $10 voucher as a token of appreciation. As a result, 250,000 pieces of cutlery were saved. Foodpanda Singapore delivers sustainability with the belief that the platform has the responsibility to create an eco-friendly environment in the market and to communicate sustainability with its partners and customers. The blue mountain project by **Meituan Waimai**, who leads chinese food delivery market, has a mission to drive sustainability in the food delivery business through promotion of environmental awareness, research,

exploration of reuse and recycling, and charitable activities. Within its mobile application, Meituan Waimai develops restaurant packaging guidelines. It also develops a point system for consumer's source reduction (no cutlery) which incorporates behavioral marketing techniques based on social norms by showing the number of people participating in the program; with points, the number of cutlery opt-out has doubled. Moreover, it provides information on types and the separation of waste generated in each meal. It also works with China Packaging Federation on the provision of alternative packaging (Guan, 2020). **UberEATS**, however, believes that the packaging choice is made by the restaurants, tailored to the type of food they provide and that the platform acts as a supporter of any initiative proposed. Other popular sustainable moves include the in-app function for the customers to choose not to receive SUP cutlery (both opt-in and opt-out[3]). This initiative can be widely seen in the delivery services throughout the world from Asia to the Middle East. Some of the platforms in some countries (such as Foodpanda in Singapore and Hong Kong) offer rewards in forms of e-voucher or discount codes for no-cutlery orders. Besides, in some platforms, a fee is applicable for additional bags or container requests. Other service providers are looking for sustainable solutions through business partnerships and government support in terms of eco innovation. These firms are the traditional profit-led food delivery platforms who shift their business operation towards the more sustainable path.

However, apart from the sustainable moves made by the existing platforms in the market, there are newcomers whose business models are purposefully developed on a sustainable basis. These companies are either established in forms of the delivery platform itself or the supporting services of the platform. **Go Box** is a supportive service platform in the United States that aims to reduce packaging waste for offline orders. It partners with more than 100 local vendors in Portland and San Francisco Bay and distributes returnable food containers and coffee cups for takeaway orders. It launches a mobile application that customers can subscribe for membership and make a request for returnable boxes at the physical restaurants by scanning QR code. The customers then return the boxes and scan the code at Go Box drop sites located at more than 30 spots. The membership cost $21.95 USD per year or $3.95 USD per month. Go Box also introduced a corporate program that encourages office buildings to have their own drop sites to facilitate sustainable consumption in their buildings, save waste management cost, and reach corporate sustainability goals. Go Box will be responsible for the logistics and cleaning of the boxes. Since 2011, the project has saved more than 194,000 pieces of single-use food containers. **DeliverZero** is a zero-waste delivery service platform that uses returnable and reusable food containers based in New York City. As a newly-launched platform, only eight restaurant partners were formed. The program only requires a $2 USD deposit for each container. The deposit will be reimbursed once the box is returned. To return, customers

[3] **Opt-out** is an option that, when being activated, users choose *not* to receive something that is being offered ('yes' is a default) while **Opt-in** is an option that, when being activated, users choose to receive something that is being offered ('no' is a default).

can arrange pickup or return the box next time they order. Customers are responsible for the cleaning. DeliverZero's co-founder revealed that the sustainable business model itself acts as the unique selling point that lifts the competitiveness of the company. He also stated that the restaurants partner with DeliverZero because they see it as a business opportunity rather than solely for environmental reasons (Hirsh, 2020). **ReCIRCLE** is a Switzerland-based initiative that establishes a reuse system among takeaway restaurants. It gives value to the packaging with a deposit in a subscription system. Once the tupperwares is worn out, reCIRCLE purchases them back from their restaurant partners at the same price and sends them to recycling to ensure that the products come back into the loop. For four years, it saved 50,000 containers. Other food delivery start-ups that adopt deposit-return models include DabbaDrop and Dabbawala, Deliveround, Sharepack, Vanilla bean, Ozarka, Ozzi, reBOX, Yumiie, and Returnr located in the UK, India, Belgium, Netherlands, Germany, US, Switzerland, and Australia. 90% of them establish deposit and rewards systems (Ellen MacArthur Foundation, 2019). Moreover, in India, the platforms, Zomato and UberEats, responded positively to the introduction of SUPs ban by Maharashtra government. However, the problem of actual practice at the point of purchase and the lack of alternative containers still persist. In South Korea, the government by the ministry of environment has signed an agreement with Korea Plastic Packaging Container Association, Baedal Minjok, Korea Franchise Association, and the Korea Zero Waste Movement Network encourages the manufacture of SUP packagings that are easier to recycle (i.e. single-material, non-printed) and promoting restaurants that use reusable containers (Jun-tae, 2020).

4.2 Existing sustainability initiatives in Thailand's food delivery market

In Thailand, the industry is at its starting stage to tackle SUP issues. At a platform level, LINE MAN, Grab Food, and Foodpanda took initial steps in a sustainable transition towards zero-waste food delivery model. **Grab Food** occasionally offers paper bags for some orders in a certain period. It also offers a 'no cutlery' function embedded in the order page and the check-out page in opt-in format on its mobile application. The in-app charge for the extra bag can also be seen in some restaurants. Also, after the order is completed, Grab allows customers to give feedback of their order in various aspects including 'unwanted cutlery' and 'packaging'. Grab also introduces the 'green merchants' category where consumers can browse all the shops that use alternative packaging from Fest, the partnered packaging supplier. Through such partnership, Grab offers 25% promotional discounts on all Fest products to their merchant partners who are the first-time buyers. In addition, Grab also offers discounts for customers who order from retailers participating in the 'Fest x Grab' campaign. **LINE MAN** also offers the same 'no cutlery' function in opt-in and opt-out formats which has started as a pilot campaign with 6 restaurant partners in Pathumwan and Silom areas which contribute the highest transaction and is expanding to some other chain restaurants. LINE MAN partners with Bio-Eco Co., Ltd on a campaign to distribute bio-packaging to 200 restaurants who were financially affected from COVID-19 outbreak. **Foodpanda** began with a partnership with more than 100 merchants for

plastic cutlery opt-in function. Despite being a market follower, Foodpanda was able to extend the cutlery opt-in function to every order within its platform. The success factor of this initiative would be the fact that the business operates on an international standard with a strong commitment; the company policies were carried out on the same basis in every country. It is more of a global platform compared to Grab Food who operates as a separate entity from its Singapore headquarters on a more context-specific basis. For orders from **Gojek** and non-participating restaurants, customers are encouraged to add 'no cutlery' as a special request in the note. Gojek believes that changing to green packaging is the responsibility of the restaurants, while the platform acts as a supporter (Marketingoops, 2019). Yet, Gojek partners with Bio-Eco Co., Ltd and offers 15% discount on Bio-Eco's compostable packaging for Gojek's partnered food retailers as part of the #GoGreener campaign. To build engagement, the platforms constantly launched activities on their social media accounts, mostly Facebook pages, and gave out metal cutlery sets or cloth bags as a reward. However, the campaigns barely mention sustainability issues or the reusability of the giveaways.

Apart from four market leaders, sustainable niches[4] are often originated from the cooperation among public, civil society and academic sectors. The current niches in Thailands' food delivery sector include **Lookie Waste**, an innovative application that tracks and assesses the environmental impact of food waste and packaging. The project is developed by National Science and Technology Development Agency (NSTDA) as part of the UN Resource Efficiency through Application of Life Cycle Thinking (REAL) project. **Wasteless Delivery,** a project initiated by Food Passion, a restaurant group that aims to replace SUP packaging used by its restaurant members with plant-based packaging for every delivery order. It partners with Grab Food, Duni (green packaging supplier), and TPBI company (the founder of 'Won' project that develops reusable bags made from recycled plastics). The Wasteless Delivery project targets to save 1.2 million pieces of SUPs in 2020. However, the project implementation is still limited to brands under Food Passion group, which are Bar B Q Plaza, Joom Zap Hut, Chana, Space Q, and Red Sun. **Paleo Robbie** is a platform that provides healthy ingredients and meals, that adopts deposit-return programs in its delivery service and offers free pick up service for the returned containers that circulate within its ecosystem. Other small niches are being initiated as the waste problem becomes more vivid. **GreenIm** and **Indy Dish** are Thai startups that adopt zero-waste models by incorporating deposit-return schemes within their own platforms. Indy dish develops its own ecosystem and even partners with a container company, Lock&Lock. However, the startups partner with only less than ten restaurants so the impact is still limited. Other local restaurants such as Kenji's lab and bo.lan are also adopting return systems within their neighboring ecosystem.

[4] **Sustainable niches** or green niches refer to the innovative seeds that lead to long-term transitions to sustainable systems by offering solutions that overcome existing structural tensions (Kemp & Rotmans, 2005).

During COVID-19, **Locall.bkk** was another startup that emerged from the closures of hotels due to the pandemic. The hotels' restaurants transform into delivery hubs that gather local food in nearby areas delivered in tiffins or lotus leaf. From this case, it is obvious that there are rooms for sustainable niches and partnership to play a role in the market to deliver new business models or to support existing models for commercial purposes while not trashing the planet. **'Send plastic back home'** project was also initiated to serve the increasing SUPs waste during COVID-19 with an aim to help manage the rise in household waste generated during the stay-at-home period. The project began with an information campaign on household waste separation. Later in May 2020, a plastic take-back system was developed as part of the circular economy through the provision of necessary infrastructure. To facilitate the take-back system, stores and supermarkets along Sukhumvit Road would provide drop-off sites for plastic waste that will later be transported to a waste hub for recycling and upcycling (Wipatayotin, 2020). This project is the effort from collaboration among the public and private sector, as well as the social enterprise and social group. During the environment day in June 2020, a few take-back systems were developed to mitigate the rocketed amount of waste. The projects were initiated from private-public cooperation as an effort to set up drop-points so as to facilitate the societal transition to a circular economy. Moreover, retail malls, such as Central group, initiate the **'Rethink'** project that accepts used (clean) SUP food containers in exchange for discounts in various stores. These projects incorporate 'Cause-Related Social Marketing[5]' technique through the donations with every kilogram of plastics returned.

5. Green Segmentation

Similar to traditional marketing, green marketing aims to deliver satisfaction to the consumers by knowing who the customer is (segmentation), choosing the target group from the segments (targeting), and developing products or services to capture that target customer accordingly (positioning). Green segmentation is one of the first and most important steps for businesses that want to promote products, services or business activities that contain sustainability attributes. Green segmentation has been extensively studied in a wide range of consumption and behavioral domain from general action such as Pro-Environmental Behavior (PEB) and past behavior, the consumption of household energy, sustainable food, and environmentally friendly products to specific types of consumption such as electric vehicles, ecotourism, sport equipment, fairtrade products. Previous research explored the possibility to group consumers according to factors such as sociodemographics, PEB, self-efficacy or Perceived Consumer Effectiveness (PCE), Perceived Behavioral Control (PBC),

[5] **Cause-Related Marketing (CRM)** is a marketing technique that links commercial transactions with development causes. The most common form of it is transaction-based donation. On the other hand, the marketing of non-commercial activities such as waste management practice is considered as social marketing. So, in this case, the project's strategy can be viewed as 'Cause-Related Social Marketing'.

Environmental Locus of Control (ELOC), ecological worldview, lifestyle, social and environmental values, time perspective (construal level), price sensitivity, Willingness to Pay (WTP), personal importance of Corporate Social Responsibility (CSR), and environmental attitudes, concerns, awareness, knowledge and belief (e.g., Albayrak et al., 2010; Cleveland et al., 2005; Dietz et al., 2005; Ibrahim & Al-Ajlouni, 2018; Park & Lee, 2014). From a macromarketing point of view, green segmentation not only benefits the company in addressing consumer environmental profiles, but also the government, NGOs, civil society, and other stakeholders in utilizing such information to encourage them to use their power to drive sustainability in the business. Regulating and monitoring authorities such as the federation can reorganize the market structure towards sustainability through interventions (Dolan, 2002; E. Maibach, 1993).

Department for Environment Food and Rural Affairs (2008) proposed an environmental segmentation model that divides consumers into seven clusters based on their willingness and ability to act. The segment ranges from 'positive green' who has highest willingness and potential to act, to 'honestly disengaged' who has lowest willingness and potential to act. Jeevan (2014) attempted to understand the difference among consumer groups that establish high and low value-action gaps in their consumption. The four suggested segments range from 'behavioral green consumers' who are green to the core, to 'true brown consumers' who generally ignore environmental issues. Kotler et al. (2019) identified four customer segments in the green market as the trendsetter, value-seeker, standard matcher, and conscious buyer and proposed the positioning strategies to capture each targeted segment. (Institute of Public Policy and Development (IPPD), 2019) identified four segments of Thai consumers based on their attitudes and perception towards plastic waste. The convenience-based segment practices sustainable behavior only if the effort and change in lifestyle is minimized. The trend-follower behaves according to the norms; personal attitudes remain unchanged. The Lifestyle of Health and Sustainability (LOHAS) values good health and realizes the casual relationship between health and environment. The green consumers are informed and always aware about the environmental impact that could be caused from their action. Apart from the descriptive analysis of green segments, other studies conducted cluster analysis to identify consumer segments based on environmental values, sociodemographic, and psychological constructs and proposed policies and marketing recommendation accordingly (Albayrak et al., 2010; Annunziata & Vecchio, 2013; Do Paco et al., 2009; Gilg et al., 2005; Oliver & Rosen, 2010; Park & Lee, 2014; Trivedi et al., 2015).

Kotler et al. (2019) and Van Dam (2016) highlighted the importance of segmentation in the era of value-driven marketing. Both literatures described the consumers according to their level of greenness. The analysis concluded that the dark green segment represents consumer groups who already have high environmental concern and already practice sustainable consumption or even anti-consumption. The light green segment does not believe in green products. Therefore, for commercial purposes, the business may not favor these two segments since it is relatively difficult

to influence their consumption pattern. Yet, the less-concerned group possesses more complex consumption motives as the reason not to buy involves a larger number of factors than those of the dark green segment (van Dam & van Trijp, 2016). As a result, the businesses often target the segments that settled along the middle of the bell curve, which constitutes the mainstream market. The most common goal of green marketing research is, therefore, to study consumer characteristics, consumption motives, and decision making process.

Past research suggested that psychological construct is more effective than demographic variables as a measurement to segment the lay consumer. Roberts (1996) and Straughan and Roberts (1999) affirmed that demographic criteria can explain very little about green consumers and thus is not a practical method, when compared to psychological criteria, to identify differences across green segments. Rokka and Uusitalo (2008) pointed out that demographic variables and environmental attitudes are weakly associated. Jeevan (2014), in their proposed conceptual framework on marketing and segmentation, stated that it is hard to define green consumers based on their demographic characteristics. Annunziata and Vecchio (2013) also made clear that, in the study of sustainable food consumption, psychological variables are more predictive of behavioral intention when compared to demographic variables. Jeevan (2014) highlighted that it is hard to identify green consumers demographically. Trivedi et al. (2015) added to this finding that consumer segmentation based on environmental factors is more stable than segmentation based solely on demographic parameters. Albayrak et al. (2010) also found that demographics are not the accurate and sole determinant of environmental psychological attributes and that psychological variables are more stressed in green segmentation. Concerning consumer's ethical profile; Jaeger et al. (2021) asserted that environmental commitments derive from social psychological values and can not be demographically segmented. However, demographic attributes possess concreteness. Demographic attributes can influence one's environmental attitude, for example, LOHAS consumers. Schwartz and Miller (1991) and Chan (2001) made the point that the majority of green consumers possess higher income and education levels than non-green consumers.

6. Sustainable Consumption Theory

Sustainability itself is an abstract and loosely defined construct. The meaning of sustainability is dynamic and context specific. Due to its flexibility and complexity, multiple routes can be taken to improve SUP consumption in food delivery service. This research analysed sustainable consumption from two perspectives: the demand-led sustainable consumption focusing on individual consumption behavior (study 1) and the system-led sustainable consumption focusing on the system of consumption provision which constitutes corporate and non-corporate agencies as macro actors (study 2). The review of concepts and literature are presented accordingly.

The researches on sustainable consumption behavior have come to the ground understanding that humans consume for many reasons; and sometimes for no reason.

Sustainable consumption is not about what a rational individual in the utopia decides to consume. Rather, it aims to understand the action of individuals in society with limited consumption choice in the market with failures. Sustainable consumption urges people to be more conscious of the possible impacts from their consumption since every type of consumption creates externalities. Because of the differences in consumption motives, the study of sustainable consumption integrates knowledge from fields such as economics, psychology, anthropology, and consumer behavior in an attempt to understand why a particular choice is made. Greener demand needs to be answered by greener supply. Spaargaren and Van Vliet (2000), Dolan (2002), and Jackson (2005) highlighted that consumption practices emerge from mutual relationships between micro and macro actors. Individual consumers alone can not practice sustainable behavior if the greener option is unaffordable. Therefore, apart from the demand side of consumption, sustainable consumption theory also emphasizes the process of making consumption choices available in the market. This approach aims to improve the system of consumption through the provision of facilities and infrastructure. The approach also explores the institutions that influence consumption practices and the relationship among them.

In the light of COVID-19 pandemic, situational factors underlie the sustainable consumption dilemma in many ways. First, consumers prefer single-use products for hygiene reasons, despite the fact that this belief is still debatable (Chin et al., 2020; University of California - Los Angeles, 2020; Van Doremalen et al., 2020). Second, business is expected to respond to its customers' voice. Internal psychological consumption factors, together with the new standards of restaurant services are the situational factors that catalyse SUPs consumption during the spread of COVID-19. Therefore, in addition to the general perception and consumption practices, this research also examined changes caused by situational factors which involve both sides of consumption: the demand and supply.

6.1 Demand-led Sustainability: Rational and Irrational Consumption

The common theories and concepts to study PEB can be generally classified as rational and irrational models (Department for Environment Food and Rural Affairs, 2008; Pavalache-Ilie, 2017). In this research, the author focused on irrational consumption decisions due to the debatable practicality of the rational model. The logic behind the focus of this research can be explained through 1) the failures in Rational Choice Theory (RCT) and 2) the unique characteristics of SUP consumption in the food delivery business.

First, while RCT presumes that individuals are self-interested and act on rational calculations to maximize pleasure or profit and minimize pain or loss, the market is imperfect. Unfortunately, the existing market is not designed for rational consumption decisions. The pitfalls of rational choice theory can be explained through the concepts of market failures. 'Pricing failure' stems from the imperfection of the free market system. It conveys that the market price does not reflect the true cost of the

product because it does not include externalities created along the product life cycle. Such costs are transformed to environmental costs borne by the government, the society, and the earth in forms of degraded environment. Consequently, the price of environmentally-friendly packaging is higher than single-use packaging; so, when cost and benefit are calculated, the benefit of SUP outweighs the cost. Environmental costs and benefits are not visibly reflected in the market. Thus, the internalisation of externalities should be practiced so that the right price signals are communicated to both ends (Seyfang, 2009; Stiglitz, 2007). Another market failure involved with rational choice theory is 'information failure'. With information deficit, the decision-making process can not function properly. Information provision is claimed to have influence on behavior under imperfect information circumstances (Alpizar et al., 2020). However, the provision of information and corrected price alone can not lead to improved behavior due to the fact that consumers are not always rational. In behavioral study, biases, cues, anomalies, shortcuts and heuristics limit cognitive processing and draw consumers away from deliberate behavioral consideration. Therefore, in RCT, the possibility of consuming greener options tends to be higher only with an assumption that people are rational thinkers and the market is perfect; a full set of information is provided and the price is right (Seyfang, 2009). Research also affirmed that RCT received extensive criticism and that emotional, rather than rational deliberation, is a key driver for PEB (Department for Environment Food and Rural Affairs, 2008; Jackson, 2005; Koenig-Lewis et al., 2014; Nordin & Selke, 2010). Notably, correcting the failures would rely on structural adjustment. Therefore, change in individual practice needs behavioral reshaping, not RCT. However, there is evidence that individual cognitive deliberation through information and knowledge can, to a certain degree, influence behavior (Jackson, 2005; Van Dam, 2016). Individuals hold a different set of information, comprehension and past experience; as a result, they develop different sets of relationships and values towards nature.

Second, the consumption of packaging possesses different characteristics from the common green products. As discussed in the next section about the consumption of food packaging and cutlery in food delivery services, consumers possess low relevancy towards packaging products and thus contribute to low level of information input and information processing, resulting in limited processing capacity (Nordin & Selke, 2010). Hanss (2012) also described habitual consumption as a non-deliberate decision which is automatically stimulated by external factors rather than personal calculation of cost and benefits. Dawnay (2005), the behavioral economists, added that habits require little or no cognitive effort and hence are not subject to cost and benefit evaluation. Moreover, packaging can contribute to psychological values such as brand perception (Chen et al., 2017). Koenig-Lewis et al. (2014) highlighted that packaging can evoke negative emotion and that emotional, rather than rational evaluations, is a key driver for greener consumption. Therefore, cost and benefit analysis might not be an appropriate research concept for this study. However, WTP was examined as a variable that reflects personal values to things.

According to the fact that RCT does not reflect actual decision making in everyday consumption, the first part of this research examined consumer characteristics in accordance with psychological constructs. The irrationality in consumption decisions is commonly discussed under environmental psychology theory which makes clear that psychological factors play key roles in influencing consumption decisions of environmental products. Behavioral economists and social psychologists explore the drivers behind irrational decisions and agree upon the ground concept that everyday decisions of individuals are largely based on the distinct perception of individuals towards the organization of consumption choices. Some scholars argued that irrationalities occur with the consumptions that serve beyond basic needs (Dolan, 2002). Psychological traits can also be seen as a product of the dynamic between individuals and their contextual surroundings, as well as how the environmental issues are framed and communicated. In order to promote sustainable consumption by tackling behavioral change, behavioral mechanisms including psychological factors, behavioral nudging, and macromarketing are needed. Hence, behavioral economics and green marketing were studied as the supportive approaches.

6.1.1 The consumption of food packaging and cutlery in food delivery services

The consumption in the food delivery sector is different from the traditional consumption of food where we consume what is available. The emergence of online food delivery platforms reinforces 'hyperconsumption[6]' through the introduction of convenience-based consumption service. Consumption choices are no longer limited to food nearby but rather extended to another level of consumption that satisfies *wants* rather than *need*. From a consumption perspective, a number of researches investigated food packaging in relation to food waste. Others studied consumer attitude and preference towards food packaging in terms of its function and design.

As food has long been interwoven in Thai culture with very context-specific consumption practices, Thais are relatively more serious about the fineness in every detail of their meal. Therefore, takeaway food in Thailand is usually served with plenty of spice, sugar, sauce, pickled chilli, and other condiment sachets, in addition to plastic food containers, bags and cutlery that is wrapped in plastic. Moreover, Thai food, as well as many other asian foods, is oily in nature; thus adding a challenge to post-consumption waste sorting since people do not want to wash pieces of greasy plastic. Consequently, this type of consumption creates externalities within a throw-away culture where everything is single-used. Having a short use period, packaging of Fast-Moving Consumer Goods is often seen as a 'necessary evil' since its disposal stage could take decades. Institute of Public Policy and Development (IPPD)

[6] **Hyperconsumption** refers to the consumption of fast, cheap, and non-functional consumption. It also includes new types of goods and services in the modern society that sell 'convenience'.

(2019) revealed that Thai consumers are aware of the problem of plastic waste caused by food delivery services but still not take action. This information conveys that there is room for behavioral improvement in this market.

Despite the fact that single-use packaging often ends up in the landfill or incinerator, it is worth discussing the role of packaging from different stances. When examining the meaning of food delivery packaging in Thai context, a well-packed meal is valued as a good service. For a meal, the staple food, its side dishes and other ingredients that are packed separately implies the cleanliness and the restaurants' attentiveness and caring for the best consumer experience. The functional role of food packaging is, most importantly, to maintain the food taste and quality during transportation since taste and quality are the core values of the food delivery business. The non-functional roles of food packaging can be viewed from branding and marketing perspectives. First, packaging acts as the augmented product that represents brand values and identity. Moreover, packaging is one of the communication channels (touchpoint) of the brand. In marketing studies of product attributes, packaging is seen as 'tangible' or 'actual product' which is a non-core product as shown in Figure 2.3 (Jayachandran, 2004). While food acts as a core product (expected product), packaging and cutlery supports the logistics and the use of the core product. However, consumers make decisions on what they want to consume (core product), but not on which types of packaging they want to have (non-core product). Consumers may order the menu that maximizes their satisfaction knowingly that SUPs waste would be generated from such an order. However, since consumers intend to purchase a meal, not the containers or the cutlery, this indirect consumption can be considered as one of the externalities created from economic activity. Thus, when being compared to the food itself, packaging, as the non-core product, receives less attention (Nordin & Selke, 2010). Pullman et al. (2010) revealed in their research on food delivery chains that consumers concern less about packaging waste reduction when compared to other sustainable attributes due to the 'uneconomic reusing of packaging'.

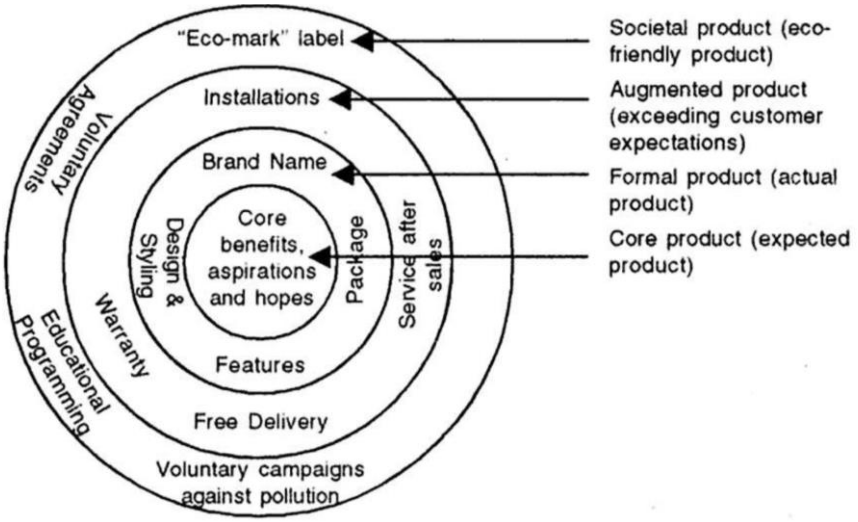

Figure 2.3: Four levels of product attributes
(Source: Jayachandran, 2004:197)

Although consumers exhibit lower relevancy to packaging and cutlery, a number of research confirms that green packaging can deliver marketing implication such as value added to the product, enhanced consumer perception towards the brand, and improved consumption decision (e.g., Arnaud, 2017; Chen et al., 2017; Isa & Yao, 2013; Magnier et al., 2016; Orzan et al., 2018; Rokka & Uusitalo, 2008; Van Birgelen et al., 2009). On the other hand, excessive packaging and non-green packaging can lead to negative perception and attitude towards the product and the brand (Chen et al., 2017; Koenig-Lewis et al., 2014; Monnot et al., 2015; Seo et al., 2016). The research on a specific attribute of packaging revealed that consumers tend to feel guilty for excessive use of packaging and develop negative brand attitudes (Chen et al., 2017). Therefore, the use of green packaging can be considered as one of the tools that contributes to marketing benefits, brand equity and competitive advantage.

In Thailand, the marketing communication of sustainable packaging has been constantly delivered to the consumers. Paper packaging is promoted to be ‘better’ than plastic packaging. Various types of bags have been used to replace the banned plastic bags in the supermarkets since January 2020. Awareness of the campaigning against plastic pollution was well established, however, there is a knowledge gap among the Thai population. The lay public relates plastic products with ‘global warming’. The perception towards a SUPs reduction effort is to help cool down the earth while in fact, plastic production emits less carbon footprint and GHG than its substitutes. Many consumers product brands, such as liquid shampoo and detergent, claim their refill packaging is ‘eco packaging’, as opposed to the normal retail bottle packaging. Most of the refill bags contain green labels stating how the brand contributes to the environment. Nevertheless, refill packaging composes multi-layered material such as polyamide (PA) and Linear low-density polyethylene (LLDPE) which is barely recyclable while the traditional retail bottle is single-material; mostly HDPE. When considering all aspects, the actual environmental impact can not be concluded. Each

material has its own environmental drawbacks. The lack of consumer knowledge could enhance the potential of greenwashing (Collins et al., 2007; Nordin & Selke, 2010). Therefore, the solution may be to limit the excessive use of single-used packaging.

6.1.2 The dilemma in sustainable consumption

During the unusual situation of the pandemic, people's consumption pattern no longer follows the traditional behavioral model as they are constrained by the changing market condition. Although overall household spending slows down, the consumption of necessities, such as grocery and food, remains largely unchanged. McKinsey & Company conducted a survey in 45 countries and found that the post-COVID online consumption in the takeout and delivery category in most countries except China, is expected to grow up to 29% compared to the reported pre-COVID consumption[7] as illustrated in Figure 2.4. They also stressed that digital services including delivery will experience higher adoption rates in the long-term. The report further affirmed that 60% of consumers have changed their shopping habits towards convenience and values since the COVID-19 outbreak. Moreover, hygienic packaging becomes one of the concerns in purchase decisions (Arora et al., 2020). As a result, the amount of SUPs have been multiplied due to its single-use attribute. In Indonesia, food takeout and delivery is the category that exhibits the largest shift from offline to online channels during COVID-19 (Potia & Dahiya, 2020).

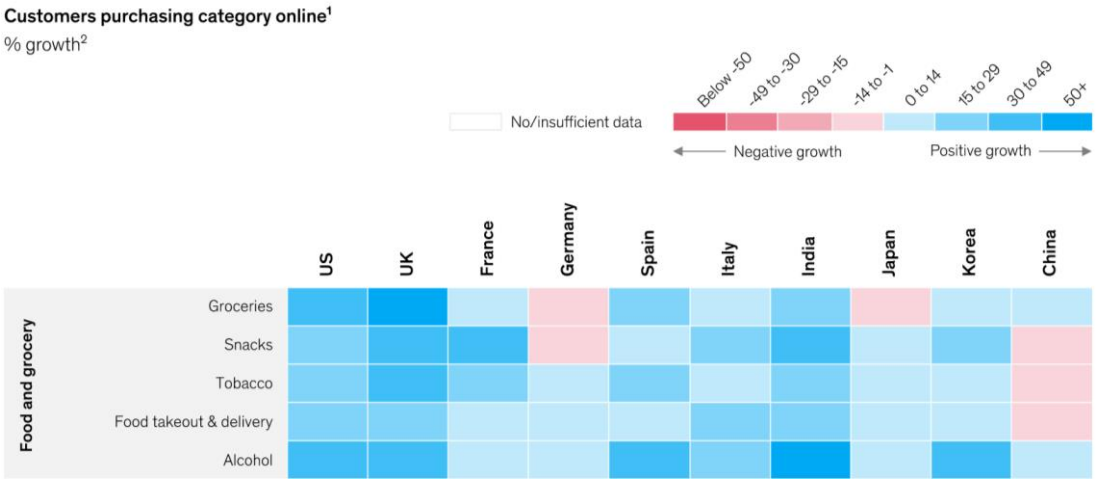

Figure 2.4: Customers purchasing category online post-COVID-19 (Arora et al., 2020)

[7] The survey questions are 'Before the COVID-19 situation started, what proportion of your purchases in this category were online vs from a physical store/in person?' and 'Once the COVID-19 situation has subsided, tell us what proportion of your purchases in this category you think will be online vs from a physical store/in person?'

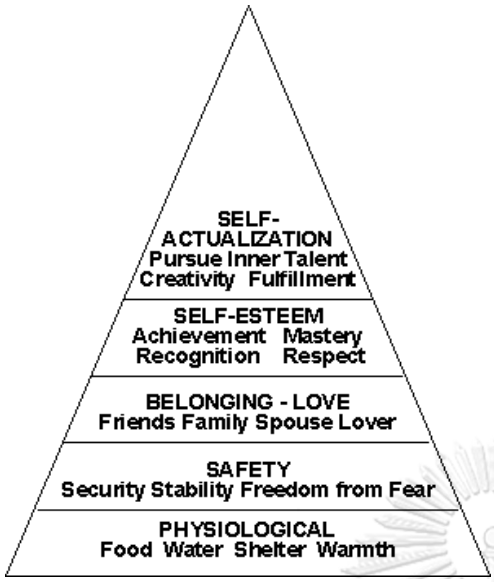

Figure 2.5: Maslow's hierarchy of need

Even people in the richest, most developed countries got affected by the devastating virus which shifts their concern in daily consumption. According to Maslow's hierarchy of need (Figure 2.5) pro-environmental concern is believed to lie at the self-actualization stage. Basic needs must be achieved before people can act further to reflect their values towards external things in life such as social or environmental issues because they have more capacity and resources to do so (Dietz et al., 2005; Trivedi et al., 2015). Maslow's concept has been studied as an input in various frameworks such as locus of control, environmental concern and environmental awareness. In the situation where the whole world struggles with the virus; the social dilemma of sustainable consumption may become more challenging.

A statistical support to this dilemma assumption is shown in the survey result from McKinsey & Company that since COVID-19 started, consumers in most countries place higher concern on healthy and hygienic packaging than on sustainable and eco-friendly products and the promotion of sustainable solutions (as shown in Figure 2.6) (Arora et al., 2020). As a result, SUP consumption during this crisis period is acceptable and even encouraged. The concern is, while people are starting to learn to adopt new sustainable lifestyles, environmentalists worry that this COVID disruption will have a long term behavioral impact on SUPs consumption habits as it is fear-driven under stressful circumstances.

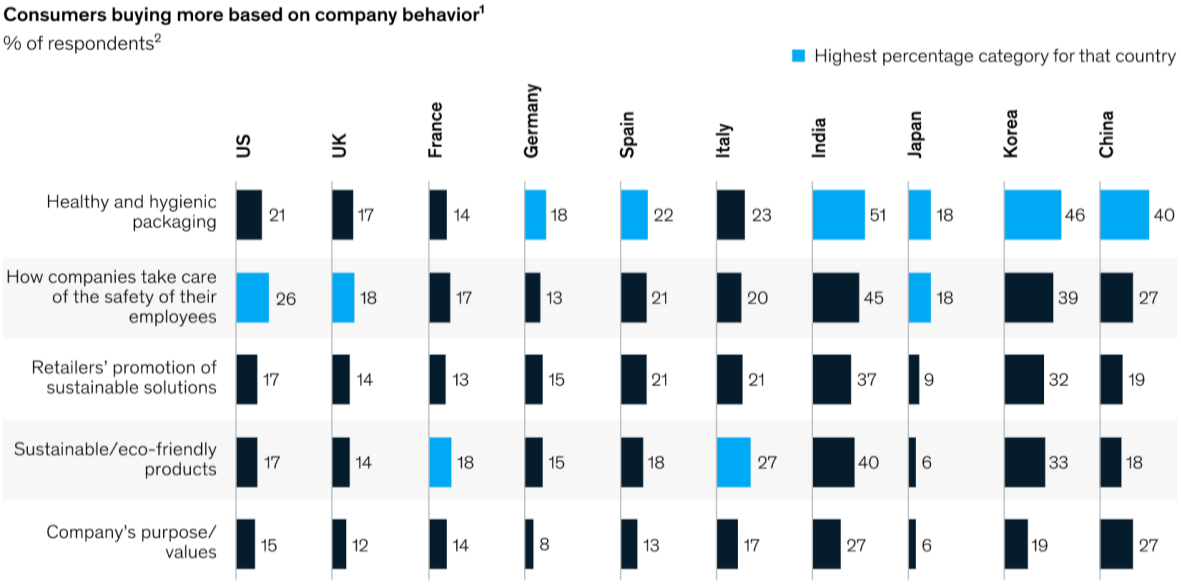

Figure 2.6: Change in purchasing concerns since COVID-19
(Arora et al., 2020)

6.1.3 Social psychology theory and the dilemma in sustainable consumption

Social psychology school aims to understand consumption motivations and shape behavior to promote sustainable consumption patterns. Factors that influence the behavioral outcome cover aspects such as socio-cultural factors, values, norms perception towards the environment. The history of environmental psychology aims to study human relationship with nature. As discussed in green segmentation, psychological determinants are often used to identify characteristics of individual consumers due to its comprehensive interpretation. Consumers, as members of society, tend to follow normal practices or what they think others expect them to do. However, this research examined consumption action occurring on digital platforms, therefore, it only analysed the personal dimension of factors in order to group consumers according to their psychological attributes.

Social dilemma or socio-temporal dilemma is a key barrier that hinders sustainable consumption decisions (Bechtel & Churchman, 2003; Hanss, 2012; Van Dam, 2016). Social psychology is often being studied with a social dilemma approach as it investigates how consumers deal with dilemmas between individual and collective interests (social conflicts) and short-term and long-term interests (temporal conflicts). Meadows and Wright (2008) affirmed that individuals make decisions based on short-term personal interest which may not contribute to the good of the whole. This research, therefore, chose to analyse two distinct psychological constructs: environmental values and time perspective to reflect both conflicts. Environmental value measures social conflict by identifying the degree in which the value is placed towards oneself and the environment (eg. shared resources, carrying capacity, and

biodiversity). Time perspective measures psychological distance (temporal) based on the degree of perceived urgency of environmental problems (Joireman et al., 2001; Milfont & Gouveia, 2006). Psychologically, regarding the time perspective, the pandemic is more concrete and urgent while environmental degradation exhibits higher psychological distance. The pandemic poses difficult short-term choices between health and the environment. Hence, the dilemma between self-interest and collective benefit may be hard to compromise when the priority of the citizens are their health and basic protective equipment.

1) Time perspective is a psychological construct that was used in this research to reflect temporal conflict in social dilemmas as it predicts temporal distance (short-term and long-term future consequence) (Hanss, 2012; Maglio et al., 2015). Time perspective is drawn from the Construal Level Theory (CLT) that comprises temporal distance, spatial distance, social distance, and hypothetical distance. CLT explains a perceived distance between individuals and the issue, object, event or person. Consideration of Future Consequence (CFC) is a construct that measures temporal distance. CLT and CFC are often discussed under the theme of marketing and sustainability as they aim to analyse consumers' insights towards green consumption decisions. The theory holds that when individuals can not visualize the likelihood of their consequence in the future, they develop mental construal to replace such pictures so that the event becomes more concrete and proximal. Past research found a strong relationship between psychological distance and construal level (Soderberg et al., 2015; Trope & Liberman, 2010; van Dam & van Trijp, 2016). As psychological distance increases, construal level becomes higher and vice versa; as construal level becomes more abstract, higher psychological distance is perceived. In their research, Wang et al. (2019) found that psychological closeness to climate change predicted more engagement in PEB. Research on sustainability perspective found that people tend to give priority to issues with lower psychological distance (closer to self) such as health and well-being, sustainable cities and communities, responsible consumption and production, and climate action. However, issues with higher distance (further to self) such as biodiversity receive fewer attention. In the sustainable consumption context, Do Paco et al. (2009)concluded that the closer the consumers are involved with the environment, the more likely they are to consume green products and services. In the crisis situation, Peszko (2020) pointed out the dilemma between short-term personal and environmental choice. However, Wang et al. (2019) found inconsistent results between psychological distance and construal level. Time perspective (as measured by CFC), as well as many other psychological attributes can be enhanced through the cognitive accumulation of information and knowledge.

Time perspective is commonly measured through the CFC construct which originally contains 12 items that measure the extent to which individuals consider the future implications of their action. The examples of items are 'I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level' and 'I think that sacrificing now

is usually unnecessary since future outcomes can be dealt with at a later time' (Strathman et al., 1994). The scale used in this research was adapted from the original scale to be context-specific. A low CFC (low construal) refers to the concern towards immediate consequences of one's action in relation to short-term goals and values while a high CFC (high construal) refers to the future-oriented interpretation of the action in relation to long-term goals. A number of research points out that people with higher CFC tend to make behavioral decisions that lean towards sustainable choices since the future collective benefit of sustainable products outweigh the immediate disadvantage. On the other hand, individuals with lower CFC are less willing to opt for the choice that yields collective benefit (Hanss, 2012; Joireman et al., 2006; Joireman et al., 2001; Kortenkamp & Moore, 2006). The relationship between CFC and sustainable consumption behavior can also be implied in terms of environmental values as consumers with high environmental CFC are expected to place value towards the future of sustainability. As a result, past research on PEB studied values and time perspective together (Joireman et al., 2001; Milfont & Gouveia, 2006).

Sustainable development is an elusive and abstract concept that reinforces high levels of mental construal and psychological distance. People think of it as uncertain and unfamiliar which leads to the lack of immediate and proximal consequence. In Thailand, the picture of the plastic pollution problem became clearer in the minds of the lay public as a result of intense communication campaigns promoted during the past few years. Despite being an abstract issue, psychological distance in relation to sustainable development is improved as people are more engaged with the issues, whether it is the increased media exposure or the promotion of new lifestyles. This psychological attribute is worth exploring during the COVID-19 crisis where the basic healthcare needs to be achieved before the consumers could consider further about the consequences of their action. SUPs food and drink containers are extensively used during the situation that all food consumption in the country is transformed to take-away orders. Personal containers are rejected since one’s health is the top priority. The virus situation is happening at the very moment and the impact is outspread to every individual. Sustainability of the planet, waste management problem, and plastic contamination in the food are the issues with higher psychological distance. Consumers are unsure about whether it happens, when, where, and to whom the impact would be. Therefore, this study will integrate parts of the questions about the consumption during the crisis.

2) Environmental Value. As discussed in the social dilemma concept, value can have an implication on social conflict which is known as an obstacle towards sustainable consumption (Joireman et al., 2001; Milfont & Gouveia, 2006). The term 'environmental values’ is derived from social psychology school. It can be used to describe how humans view nature and environment as reflected in the New Environmental Paradigm (NEP) (Dietz et al., 2005). Values and environmental values also exhibit direct influence on environmental consumption behavior. A large number of consumer research concluded that values are the key

motivation behind every decision. Individuals develop a particular set of values overtime; as a result, they possess different motivations and act differently to serve a different set of values. Previous research on environmental values affirmed a significant contribution of values and its related constructs to behavioral intention, PEB, and sustainable consumption (Albayrak et al., 2010; Do Paco et al., 2009; Oliver & Rosen, 2010; Thøgersen & Ölander, 2002). Joireman et al. (2001) pointed out that individuals tend to take part in PEB if they believe that such behaviors will generate benefit on things they value (i.e., the self, others, and the environment). PEB can also add value to the self. According to the Maslow's hierarchy of needs, individuals can act sustainably to enhance self esteem or self actualization if they believe that it is the right thing to do.

A number of research analysed consumers' PEB based on Schwartz's personal values and social values. Milfont and Gouveia (2006) claimed that a board approach to human values is more appropriate than a specific measurement. However, Gilg et al. (2005) believed that the general value measurement does not always reflect specific environmental concerns. Moreover, values can be very issue-specific. For example, within the environment universe, an individual may be concerned about biodiversity loss more than energy saving since different degrees of values are placed on different topics. The motivations behind one PEB can not be generalized to all PEB (Gregory & Lewis, 1999). This study, therefore, used domain-specific environmental values, rather than values in general, as a value construct.

Environmental values, concern, consciousness, attitude and awareness are the constructs that are closely interrelated and thus often being studied together as an integrated construct (Do Paco et al., 2009; Gilg et al., 2005; Pavalache-Ilie, 2017; Straughan & Roberts, 1999). Van Dam (2016) added that values are sometimes viewed as part of identity. Albayrak et al. (2010) stressed the synonymous among environmental concern, attitude and awareness. Do Paco et al. (2009) stated that the attitude, by definition, should express environmental concern. Oliver and Rosen (2010) discussed environmental values as attitudes toward the environment. However, they added that if environmental concern and awareness do not align with one's value system, pro-environmental action may not be presented. Pavalache-Ilie (2017) asserted that value is related to individual preferences, needs, motives and attitudes.

To evaluate the value construct, Gregory and Lewis (1999) categorized the tools for identifying environmental values into economic measures, ecological relationships, expressed-preference surveys, and small-group elicitations. In addition, Banerjee and McKeage (1994) examined environmentalism, which is proven to have consistent relationship with values (Dietz et al., 2005), based on the beliefs about the relationship of humanity and nature, the importance of the environment to the self, the perceived seriousness of environmental problems, and the need of lifestyle adjustment to prevent environmental damage (Oliver & Rosen, 2010). O'Riordan (1985) proposed the analysis of values based on the concept of 'ecocentrism'

and ‘technocentrism’. Ecocentrism refers to the supportive relationship between human and nature while technocentrism relies on technological advancement to take control over the environment. Stern and Dietz (1994) proposed the ‘values basis of environmental concern’ which consists of egoistic values, altruistic values and biospheric values. Egoistic values represent values placed on personal cost and benefit while altruistic values and biospheric values represent values placed on society and the ecosystem accordingly. Moreover, for the past decades, the measurement of ecological value has been dominated by the New Environmental Paradigm (NEP) which is designed to measure concern towards the environment at individual level since it measures where individuals place values: self or nature (Van Dam, 2016). It focuses on human-nature relationships by incorporating the ‘limit to growth’ and ‘man over nature’ concept at two ends of the spectrum. The measurement instrument of Ecologically-Conscious Consumer Behavior (ECCB) integrates parts of NEP that includes items related to concern over the harm of product packaging which are ‘I will not buy products which have excessive packaging’ and ‘whenever possible, I buy products packaged in reusable containers’ (Straughan & Roberts, 1999; Tilikidou et al., 2002). ECCB is occasionally referred to as Ecologically Conscious Consumer Scale (ECCS) which, as appears in Gilg et al. (2005), includes the item ‘Looking for products using less packaging’. Regarding the representativeness of NEP and ECCB/ECCS, Roberts (1996) found that consumers who scored high in ECCS also believe in limits to growth concept and tend to avoid products with excessive use of packaging. Schwartz and Miller (1991) and Albayrak et al. (2011) also affirmed that the act of avoidance (e.g., consumer refusal to buy from restaurants that use styrofoam packaging) is regarded as one of the green values.

However, when actual decisions are not aligned with personal values, the gap in responsibility feeling exists. Consumers will develop guilt feeling that they should decide differently in a more optimal choice (Bechtel & Churchman, 2003). In the theories of emotions and affect, pride, guilt, and shame are self-conscious emotions against personal or subjective standards. Guilt is developed as a negative self-evaluation which leads to three behavioral consequences. One would either change, deny, or disguise such guilty behavior (Lindsay-Hartz et al., 1995). This negative emotion could be alleviated through behavioral improvement in the next consumption decision. In food delivery, when consumers find out that a restaurant uses PS foam containers, they may avoid ordering from such restaurants in the next order to lessen feelings of guilt. One could deny the non-environmentally friendly behavior by rationalizing such behavior. For example, the excuse of hygiene reasons during the COVID-19 event might allow consumers to feel less guilty. Lastly, individuals might disguise unpreferable behavior. This option is often likely within a context that social norms dominate.

6.2 System-led sustainable consumption: Social Practices and the Systems of Provision

Social practices and the systems of provision concept proposes that sustainable consumption practices can be understood through Gidden's structuration theory which believes that in order to understand context-specific social practices, a meso-level examination of the system of production, provision, and consumption need to replace a sole focus on micro or macro level agencies since single dimension analysis can not depict the interrelations among structure and agencies (Jackson, 2005; Sternberg, 1986; Van Dam, 2016; Welch & Warde, 2015). The system of provision approach is developed out of the narrowness of the mainstream neo-classical utilitarian approach. For example, the price of the product is governed by the price structure which is influenced by the actors and factors at different levels. Fine et al. (2018) identified components in the systems of provision as structures, processes, agents/actors, and relations. The social practices model, as shown in Figure 2.7, explains that the everyday (un)sustainable consumption practices are reproduced by the collective actions of individuals based on their lifestyles. These actions are supported or constrained by the available infrastructures and the systems in which they are resided. A certain system exists to prevent individual actors from externalizing their cost to fulfil self interest (Van Dam, 2016). In other words, the interplay between individual motives and the socio-technical infrastructure reproduce consumption practice (Seyfang, 2009; Spaargaren & Van Vliet, 2000). Berkhout (2003) pointed out that unless the system is designed to reinforce green consumption, it is not likely to expect individual consumers to have a green lifestyle. The actors' activities, in turn, confirm and reinforce these systems(Spaargaren & Van Vliet, 2000).

The actors in this research include, first, the plastic producers who design and innovate choices of plastic packaging to feed the market. Second, the food retailers and restaurants who decide what kind of packaging to use. Third, the food delivery platforms who facilitate the supply and demand of SUPs. Fourth, the end consumers are faced with limited choice and low involvement in regard to food delivery packaging. Lastly, the government can intervene by offering incentives to turn the market into the preferred direction. In addition, the projects and initiatives developed from the cooperation among many actors and sustainable niches also play a role in shaping the market system. Each actor possesses different ability, capability and willingness to support greener consumption, therefore, the decisions must be framed within the system of provision.

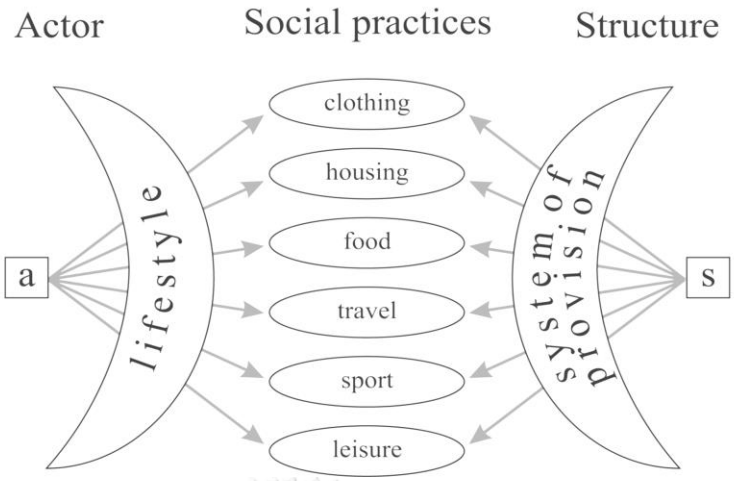

Figure 2.7: The social practices model
(Spaargaren & Van Vliet, 2000)

'Behavioral lock-in' refers to a particular consumption pattern that is constrained within a particular system with a particular set of infrastructure. During the COVID-19 event, Thai consumers were locked into buying takeaway meals. Consumers' choice about packaging is limited within the functions available on application; although consumers can make notes not to receive excessive packaging, the platform and food retailers fail to do so for many reasons. The staff often ignore the requests about non-food aspects, the food is sometimes pre-packed, the retailers run out of (or do not have) other packaging options. It can be implied that demand for greener choice can not be fulfilled if the supply side fails to deliver green values. The reproduction of sustainable consumption practice can not be achieved.

Since this approach believes that sustainable transition needs to be driven by socio-technical regimes rather than individuals, the solution to these structural limitations involves collective action. Individuals must be aware that everytime they make a purchase, the market is reinforced. As a result, a concept of 'eco-sufficiency' was proposed (Seyfang, 2009). The slowdown in consumption of unsustainable products and services can gradually redirect consumption patterns that have long been rooted in the society. Individuals should exercise their voice as consumers through ethical consumption by using their money to vote for products or brands that align with their values. Consumers are no longer viewed as passive recipients but rather a co-providing partner in the system. Moreover, the process of 'differentiation' within the system of provision can also improve consumption behavior. The differentiation pertains to the refinement of demand and supply structure, as well as the supportive components (Jackson, 2005; Seyfang, 2009). One of the examples of differentiation is the arrangement of waste infrastructure, which, together with behavioral instruments, can produce desirable practices. In food delivery service, the introduction of deposit-return programs is a configuration of the providers that

allows consumers to live a zero waste lifestyle. Another structural adjustment at the policy level is to implant a new lifestyle of deconsumption of public utilities such as energy and water, or to improve the utility system to be more efficient. In this research, deconsumption in food order transactions is unlikely. However, the deconsumption of unwanted packaging (sauces, seasoning, pastes, and side dishes) and cutlery can be promoted.

To correct prices in the market, another key measure that can redirect consumption and provision choice is through pricing mechanisms. Pricing intervention can be implemented at two stages. First, subsidies on green packaging such as tax incentives can make it become cheap enough for the restaurants to afford. The subsidisation can be initiated at the national level from the central government or at the business level by food delivery platforms to increase green value to the brand and among their partners. Another stage that can be intervened is to put price on SUPs packaging as a disincentive for customers to avoid using SUPs. These measures enable the price signal to be precisely communicated to both ends.

Viewing the systems of provision from a 'System Thinking' lens. Meadows and Wright (2008) described the system as consisting of elements, interconnections, and a function or purpose. The elements represent actors and factors in the system, interconnections are how they interact, the purpose of the system is the mutual goal that keeps the system operating. While the elements may be easy to identify, the interconnections within the subsystem are less obvious and need to be studied at a mental level. The purpose of the system also depends on how each actor views value. Actors who play intermediate roles such as food delivery drivers may place value on economic return while the platforms may value intangible things such as customer satisfaction. On the other hand, some customer groups may value the environmental aspect of placing online food delivery orders more than the others. The challenge is that these unaligned values may produce undesired system behavior. Meadows and Wright (2008) further pointed out that most of the problems are produced by the undesirable behaviors within the system. It is interesting to view sustainable consumption from a system theory perspective as today's consumption involves more actors who offer more choices at more affordable cost for less waiting time. Especially the business environment that is very adaptive and responsive to changing factors inside and outside of the system in order to survive. Therefore, it is necessary to understand elements, as well as the whole system and its dynamics. System thinking can be assisted through the development of ecosystem or modelling such as system dynamic modelling which was constructed in this research.

By stepping out from individual consumers' perspective, a holistic consideration of the systems of provision will be analysed. Department for Environment Food and Rural Affairs (2008) categorized stakeholder to promote PEB into four main groups: the government sector, the business sector, the third sector, and the consumer. In this research, the government sector performs a governance role by regulating the production, distribution, use, and disposal of plastic packaging. The

business sector can also play a governance role through self-regulation by setting up a standard for the industry to improve the sustainable performance of the market as a whole. Business can improve the market environment in which competition among the players is value-driven, not profit-driven. The third sector refers to non-profit actors or niches that support sustainable initiatives. Currently, a sector that plays a supporting role in reducing plastic waste in the food delivery business is the for-profit actor in different markets that joins the sustainability program in forms of partnerships.

6.2.1 Market governance towards sustainability in platform food delivery market

Sustainable market systems can produce sustainable economic transactions. Unfortunately, with the failures in the mainstream market, a sustainable market is hindered by conflict of interest among the actors and between actors-structure. First, economic prosperity is always a development priority in every country. 'Measurement failure' refers to the fact that Gross Domestic Product (GDP) is the world's growth indicator that considers economic growth to be the sole goal of the market. Second, 'self-regulation failure' refers to the voluntary nature of sustainability practice at corporate level. Environmental law and regulation differs from country to country and thus allows firms to maximize economic benefit. The companies usually react to the demand and pressure from external bodies in a responsive manner only to meet the minimum regulation requirement. Therefore, market governance is a key to sustainable market systems which could influence demand and supply of goods and services. In order to build and govern markets that foster sustainable consumption, the government and business sector are expected to play roles in shaping the market structure.

From the public governance perspective, the review of relevant laws, regulation, policy, and practices from other countries showed that most measures were formed on the basis of Extended Producer Responsibility (EPR)[8] which requires the business to take responsibility for waste created from the consumption of their products or services. In the Webinar on Reducing Single-Use Plastics in Food Delivery and Takeaway: Experiences from Europe and East-and Southeast Asia, Paquot (2020) presented the European Commission efforts towards the reduction of the impact of SUP products on the environment. The directive on Single-Use Plastic Products 2019/904, which will be transposed into national law by July 2021, introduces different measures for each SUP item which takes into account consumer behavior and needs, as well as opportunities for businesses. The measures were designed on the basis of the availability of SUP alternatives. For products with available alternatives, measures such

[8] EPR is the measure that encourages material recovery at the post-consumption stage of a product. It aims to push producer's responsibility beyond the scope of production and delivering throughout the product life cycle.

as market bans are proposed. Products with no clear alternative, on the other hand, will be tackled by prevention measures such as consumption reduction, and better waste management practices such as EPR. Most of the SUPs in the takeaway food sector have their readily available alternatives. The european's market restriction and substitutions in article 5, and article 18 in The Packaging and Packaging Waste Directive (PPWD), covers food and beverage containers, cutlery, plates, straws, beverage stirrers, cups, and others made of oxo-degradable plastic and expanded polystyrene. In addition, the consumption reduction efforts in article 4 aims at reducing food containers and beverage cups including covers and lids. The member states can choose appropriate measures which include the consumption reduction targets, economic instruments, and the increase in availability of alternatives (e.g., reusable containers). The directive also introduces product design requirements which state that caps and lids need to remain attached to bottles, as well as the harmonized packaging labels. The EPR of food and beverage containers and packaging is explicitly stated in article 8 which requires the producers to cover the costs of waste prevention, waste management (collection and treatment), litter clean-up and data gathering. In addition, article 10 requires the producers to raise consumer awareness by providing information on the availability of reusable alternatives, reuse systems, waste management options, and the impact of such waste. Involving systems and structural adjustment, EPR is expected to be fully implemented by the end of 2024. In conclusion, the commission proposes ideal solutions towards SUP in food delivery operations which include the promotion of durable or circular alternatives, the economic instrument to prevent free future waste, and the consideration of biodegradable solutions. In the meantime, the Chinese government has shown its concern on a pile of waste from this emerging service through measures that promote alternative packaging in food delivery, as well as e-commerce transactions. China also calls for the optimization of business models, waste segregation and recycling facilities (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2020). Other relevant policies and measures that specifically mention food packaging include, the Single Use Plastics Directive, the European Organization for Packaging and the Environment, EPR: take back requirements, government-led initiatives for packaging awareness, Products with Reduced Packaging (LPRP), and The Containers and Packaging Recycling Act (CPRL) in Europe, Indonesia, Lao PDR, Philippines, and Japan (The European Organization for Packaging and the Environment, 2015).

Furthermore, an interactive governance which is established as partnership among private and public entities, as well as Non-Governmental Organization (NGO) such as the Plastic ACTion (PACT) project in Singapore. The project is initiated by the World Wide Fund for Nature (WWF) who assists both company commitments and sectoral collaboration towards plastic reduction which focuses on an entire industry. Grab, Foodpanda and Deliveroo signed the PACT food delivery pledge which includes several initiatives such as setting 'no cutlery' as a default, providing guidelines and exploring alternatives for takeaway packaging. This initiative can save one million SUPs each week in Singapore. The ultimate goal of this

project is to eliminate unsustainable takeaway food packaging used by their partners within 2024 by developing restaurant guidelines, evaluate and adopt alternative materials, and pilot tests with returnable packaging. Under the PACT, Foodpanda and Deliveroo partner with bearPack, a packaging company, to develop a reuse system. In addition, the Alternative Materials Tool system is developed to help the merchant partners to choose the least environmental impact packaging material. Furthermore, a move from civil society can be seen in a campaign on www.change.org. A petition is titled ‘reduce plastic from food delivering operations’. It started in 2018 in India and targets eight Indian food delivery operators. This campaign received 700,000 supporters. International agencies also tackle this emerging challenge in fast-growing businesses like food delivery. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), German organization, in partnership with PCD, Thailand initiated the project called 'rethinking plastics - circular economy solutions to marine litter'. The project includes 'reducing single-use plastics in food delivery and takeaway' as one among the issues. The project also developed a guideline handbook for the restaurants, food delivery platforms, and consumers on the management of SUPs in the food delivery business. Other institutions such as Friedrich Ebert Stiftung (FES), German also works with TDRI and Center for Research on Inequality and Social Policy (CRISP), Thailand on reducing negative externalities created from activities under the platform economy.

Unfortunately, since this business is relatively new to the market, the laws and regulations in Thailand are not being comprehensively implemented throughout the operation cycle. For example, the regulator works on the draft regulation in the ride hailing sector relating to pricing and customer protection. For waste issues, government measures can be seen in the overall use and production of SUPs. In alignment with the national strategy, the Plastic Waste Management Road Map 2018-2030 sets to ban microbeads, cap seal, and OXO plastic bags in 2019 while plastic bags less than 36 microns in thickness, Styrofoam food containers, SUP cups and straws will be banned in 2022 (Pollution Control Department, 2018). Government also provides tax incentives to promote the use of bio-packaging by offering a 25% reduction on corporate income tax spent on biodegradable packaging. The increase in tax reduction amount is being considered. Although waste from the food delivery sector is not specifically regulated; the Pollution Control Department (PCD) actively takes steps towards SUP in food delivery and takeaway as COVID-19 underlines the urgency of the problems. During the 2020 pandemic, PCD expects to see a 30% increase in food delivery consumption and thus generate 15% increase in plastic waste (Jangprajak, 2020). As a result, PCD and other 14 agencies, including four key food delivery platforms, developed a guideline for plastic waste management in food delivery and signed a Memorandum of Understanding (MOU) in August 2020. The proposed strategies include the default setting of ‘no cutlery’ opt-in function in mobile application, eco label, economic incentive (discount) or disincentive (charges) to the consumers and tax measures, the promotion of environmentally-friendly restaurants, information dissemination among actors along the supply chain especially the

consumers, the provision of incentives to the food retailers for alternative packaging, the subsidy of green packaging, the development of reuse packaging system in specific area, the standardization of green packaging in food retailing sector, source separation and recyclable packaging, and the data collection for further analysis and evaluation.

Governance in platform economy. Despite consuming less resources and physical spaces compared to other industries, platform economy boosts unnecessary consumption and produces a considerable amount of negative externalities. The platform has potential, especially in terms of data assets, that should be leveraged to create positive externalities by enhancing public welfare and minimising environmental impact. However, the current CSR scheme of the platform is still an after-process which is considered as external (Achavanuntakul, 2020). To what extent platforms should be regulated; could it be treated as infrastructure or public utilities that contribute to the welfare of the public? In recent years, the platform has started to be perceived as emerging public goods residing in the private sector's infrastructure due to the large amount of public data that the platform acquired. Since open data is the fundamental principle of open government, aggregate data sharing should yield benefits, rather than costs, to the society. Ultimately, the platform is expected to extend its role beyond merely the key actor in the two-sided market (Tangkitvanich, 2020). In a two-sided market, sustainable consumption and production can be potentially achieved through a sharing economy, in which platforms have enough resources and capability to settle themselves in. The current rent-seeking behavior could be lessened through the introduction of innovation, which can be catalysed through legal mechanisms. Vaidiyakorn (2020) suggested that the platform should utilise its data assets and adjust its business model into one that serves a circular economy such as the development of deposit and return schemes. Other stakeholders may find themselves benefited from the shared data, especially in business operation management such as inventory management. The expected role of a platform in the economy is to match resources available in the market; to optimise the demand and supply that are left unmatched by market mechanisms (Jatusripitak, 2020).

6.2.2 Business-led sustainability: Corporate Social Responsibility (CSR)

Apart from the state government, businesses can improve the market system through different levels of CSR or Corporate Environmental Responsibility (CER). CER is a recent term that is often studied under the umbrella of CSR. Hence, the term CSR and CER are generally interchangeable. It can be clearly seen that the private sector’s contribution to the world economy also generates negative social and environmental externalities which prevent the market from functioning efficiently and sustainably. As a result, the centrality of the private sector in sustainability development agenda is highlighted in the White Paper (United Nations Global Compact, 2014). Also, the government, civil society, and Non-Profit Organisation demand more responsible acts from the private sector as a ‘moral licence’ to operate (Blowfield & Murray, 2014). The assumption is that for-profit organizations

have potential to deliver solutions that unlock the needs of their customers, as well as alleviating the world's problems (Scheyvens et al., 2016). The assumption is based on the evidence that business grows stronger in many aspects including the management capability, the provision of skills, innovation, resources and competency to tackle development problems. Also, the business entity plays a key role in society through products and services offered. If the companies can create a new lifestyle, it can also create sustainable consumption patterns. The World Business Council for Sustainable Development (WBCSD), initially defined CSR as the business's ongoing commitment to act ethically and contribute to economic progress while improving the quality of life of the community and society as a whole. Nevertheless, rather than giving an intrinsic definition, Blowfield and Frynas (2005) viewed CSR as an umbrella term which includes the practices where corporations are responsible for impact from business activities on their stakeholders, the wider society, and the environment.

The level of CSR ranges from responsive to proactive actions. As one of the most original model, as shown in Figure 2.8, Carroll (1991) classified CSR into four levels: economic responsibility (to be profitable), legal responsibility (to comply with legal framework), ethical responsibility (to act ethically), and philanthropic responsibility (the voluntary actions that benefit the society or environment). Hoffman (2000) and Porter and Kramer (2006) proposed regulatory compliance and creative responsibility practices. Regulatory Compliance refers to the situation when a company responds to other stakeholders in the market system such as the state, NGOs, and civil society through the mitigation of negative externalities caused in order to avoid legal liabilities and to acquire legitimacy to stay in the market. On the other hand, creative responsibility takes place when businesses actively innovate new sustainable ideas that could create common value within the industry. Sen and Bhattacharya (2001) believed that CSR ranges from merely shareholder responsibilities to active corporate responsibilities beyond stakeholder expectations. Bocken's social-marketing based approaches for business-led sustainable consumption consist of reactive market approach, proactive market approach and proactive absolute reduction (Bocken, 2017). The magnitude of corporate responsibility increases correspondingly from the basic responsibility to consumption reduction approach. Sindhi and Kumar (2012) stated that the factors influencing CER can be categorized into external and internal drivers. External factors include regulatory framework, market forces, stakeholder pressure, and self-regulation. Internal factors include organizational features such as the firm's financial capabilities, the size and the firm's position in the market.

From a value-driven marketing perspective, Kotler et al. (2019) identified three different roles that the corporate could take (Figure 2.9). First, the innovator facilitates a sustainable market system through the supply of environmentally friendly products to the market. This includes packaging companies and social enterprises. Second, the propagator plays a role in promoting and initiating the buzz of green products within the niche markets as a start of environmental conversation among the lay public. Lastly, the investor is the big brand that supports the propagator by bringing the product into the mainstream market and adjusts the choice structure in the market. The authors suggest that to deliver impacts, all three types of business are needed.

Figure 2.8: Carroll's Corporate Social Responsibility pyramid

The International Union for Conservation of Nature and Natural Resources (IUCN) suggested that the companies have three options to solve the ocean plastics problem. First, eco-design at the stage of production helps minimize environmental impact of the product through increase in recyclability, reduction of plastics used, or replacement of materials. Second, the development of plastic stewardship to manage plastics at the use and disposal stage through the provision of facilities such as a take-back program, which is based on EPR principle. Lastly, changing business models allows businesses to push their competitive edge and meet customers needs without exploiting the earth (International Union for Conservation of Nature and Natural Resources (IUCN), 2020). In the near future, corporate responsibility will become a new normal; businesses will be competing not only on the product and service, but also on what they can offer to the world.

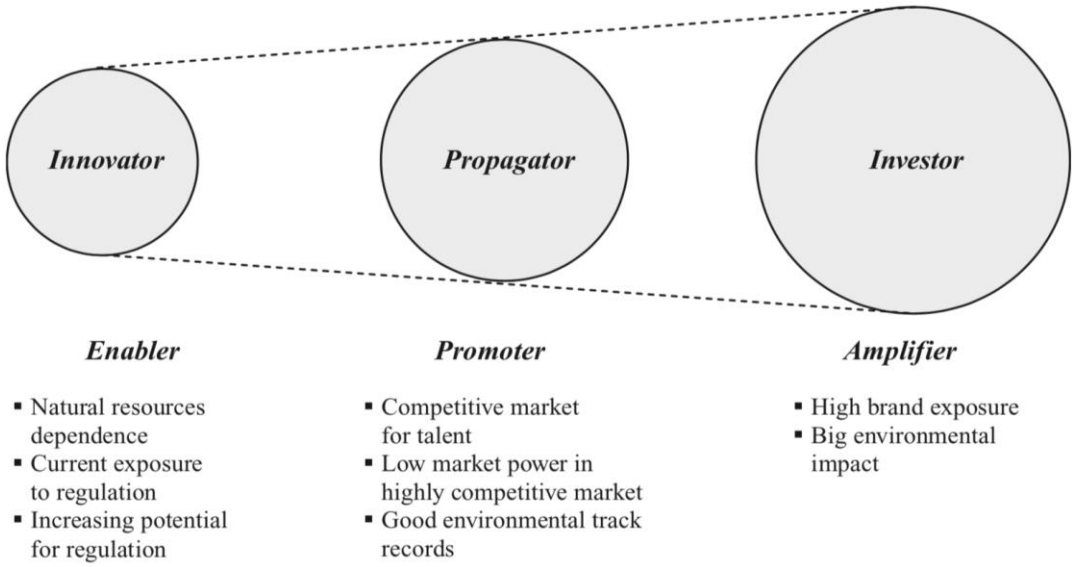

Figure 2.9: Roles of corporate actors towards environmental sustainability (Kotler et al., 2019)

However, past research pointed out that in Carroll's CSR pyramid, the economic aspect is not correlated with the other three aspects: legal, ethical, and philanthropic. The assumption is that the economic benefit goes in different directions with social and environmental interest. The trade-offs in sustainable development pertain to the structural limitations that prevent the market system from functioning efficiently. From a macromarketing perspective, sincere companies may face difficulties in adopting sustainable practice in the market where other players are profiting from unsustainable and unethical ways of doing business. For instance, mass production lessens the cost of production, inducing higher demand. Price is used as a key to product differentiation and competitiveness. Still, price does not reflect the true cost. Therefore, with limited resources, corporates may choose to invest in the activities that yield direct economic benefits rather than societal or environmental benefits. Orsato (2006) and Van Dam (2016) analysed reasons behind corporate decisions to act sustainably based on psychological theory. Similar to individual decisions, van Dam argued that companies are also facing dilemmas between positive corporate attitudes towards sustainability and the actual behavior. Key to achieving the optimal utilization of resources is to understand the actual costs and benefits they deliver, especially non-monetary costs that appear in forms of environmental degradation. The internalization of costs is one of the CSR concepts that should be considered. EPR is one of the measures under the concept of internalization since it internalizes the externalities that would otherwise be left trashing the planet with limited carrying capacity. externalities can be identified by analysing the true cost of production or service. Externalities cover all negative consequences, direct and indirect, that are not being presented on a price tag. Currently, the sellers are not paying for the cost of waste management, soil and water contamination, death of marine animals, and many other costs.

A wide range of studies about business-led green initiatives have gone into areas such as emission reduction in the production system of consumer goods, sustainably sourced material, energy and resource consumption, and green packaging for non-food items. The current development issues in the ride-hailing food delivery sector in Thailand includes the issue of fair treatment of the partner restaurants and the partner drivers which represent a stumbling block for the companies' brand image. As the business unit gets bigger, the challenge in managing partners becomes intensified. The platform's position to tackle responsibility issues has been centered around the equity of its driver partners. They communicate responsibility actions such as the provision of necessary protection equipment to the drivers. However, the strategies have not gone beyond what is already expected. Environmental responsibility is limited to the 'no cutlery' function in the application. Furthermore, COVID-19 offers 'license to pollute' as both customers and service providers use it as an excuse for using SUPs with less guilt. This presents a research gap and a challenge for the marketing of green packaging in the ever-growing food delivery sector.

In addition, behavioral economics and green marketing are the concepts that establish on the psychological ground as the mechanisms to improve sustainability in consumption. Because consumers do not act rationally, behavioral mechanisms have to be carried out to bridge the values-action gap through the intervention at the decision-making end rather than influencing attitudes and mindsets. As part of CSR, Companies can adopt behavioral economics and green marketing as the mechanisms to tackle behavioral change in reducing SUPs consumption in the online food delivery sector.

1) Behavioral economics

From an economic perspective, irrational consumption can be understood through the non-utilitarian approach under behavioral economics. It assumes that the consumer has bounded rationality and often acts upon cognitive heuristics which are the biases that act as a shortcut to simplify decision making processes. In contrast, neoclassical economic principles believe that individuals decide deliberately on benefit maximization. Behavioral economics explores the psychological foundations of economics based on social psychology theory as it believes that perfect rationality is too ideal (Mathis & Steffen, 2015). Kahneman (2011) illustrated two systems of mind functioning. System one is an automatic and quick decision with little or no cognitive effort (subconsciousness) while system two is based on thorough analysis which requires more effort (consciousness). Behavioral economics is reflected in system one which relies on heuristics. He further analysed that informative instruments should be used with system two while behavioral instruments should target system one because not every decision is made rationally. Dawnay (2005) added that decisions that use little cognitive effort can become habits. In behavioral study, system one is believed to be more realistic because most decisions are made under many constraints which leads to limited cognitive capability (Kiełczewski et al., 2017). Seyfang (2009) highlighted that in behavioral economics, extrinsic motivations such as

economic incentives overshadow intrinsic motivations such as values. Therefore, it does not aim to change the individual value system.

Without cognitive processing, behavioral economics is a tool to change behavior without changing mind. The approach in shifting consumption action is to offer a 'prompt' that assists the decision making with limited time and effort. The behavioral instrument in behavioral economics school can be referred to as 'nudges' which capture inattentive consumers who base their decision on heuristics and have limited self-control (Alpizar et al., 2020). Nudging can be done by the framing of a problem, physical environment adjustment, change to the default setting, and the use of social norms (Lehner et al., 2016). Choice architecture, or modification, or behavioral engineering is one of the nudging tools that rearrange consumption choices so as to influence the way in which choices are made. Behavioral economics takes part at the behavioral end rather than the cognitive decision due to the aligned research result that green packaging is not the first product attribute that consumers consider when making the decision to buy (Ketelsen et al., 2020). Nudging in the mobile application of food delivery platforms can be seen in the 'no cutlery' default setting that consumers have to opt in if they need plastic cutlery which can reduce a significant amount of cutlery distributed. The adjustment in default settings can be viewed as a 'choice architecture', one of the behavioral instruments that influence how the choice is made at the action stage. It does not, however, have an effect on intrinsic factors such as attitudes or perceptions of individuals.

2) Green marketing

Green marketing is a type of marketing strategy designed to promote environmental attributes of the products or activities related to corporate environmental responsibility. Commercially, it aims to satisfy human needs or wants in a way that minimizes the environmental impact. Socially, it aims to change public behavior towards sustainability. In accordance with traditional marketing philosophy, green marketing acts as a bridge between the brand and its customers and sometimes, among the customers. Jackson (2005) highlighted the importance of marketing theory in explaining consumers' emotional response towards the sustainability aspect. Marketing studies consumers behavior and the reasons or drivers behind such behavior. Then, it delivers implicit values that the target customers seek for, leading to improved emotional response to the brand. Brand attitudes, image, perception, attachment, and equity are the valuable assets that are not easily obtained and retained. Nguyen and Nguyen (2018) suggested that green marketing consists of three components: green corporate social responsibility, green product development and green internal processes.

Research has found a significant relationship between green marketing and the positive response towards the product or the brand (e.g., Akturan, 2018; Collins et al., 2007; Nguyen & Nguyen, 2018; Nordin & Selke, 2010). Green marketing could contribute to vertical differentiation of the product which

derived from the differentiation in quality attributes of the product rather than pricing attributes (horizontal differentiation) (Van Dam, 2016). Such differentiation is more sustained and more likely to spill over to other aspects of the brand. Many agreed that green marketing could potentially enhance the competitive advantage of the brand (e.g., Akturan, 2018; Peattie, 1995; Podnar & Golob, 2007; Porter & Kramer, 2006; Wever, 1996). More specifically, green packaging or reduced packaging is one among the strategies that green marketing could play a role in leveraging and enhancing its value. A number of research confirmed that green packaging can deliver marketing implication such as value added to the product, enhanced consumer perception towards brand and the product, increased willingness to pay, and improved consumption decision (Arnaud, 2017; Chen et al., 2017; Isa & Yao, 2013; Magnier et al., 2016; Orzan et al., 2018; Rokka & Uusitalo, 2008; Van Birgelen et al., 2009). On the other hand, excessive packaging and non-green packaging can lead to the possibility of negative brand perception and attitude (Chen et al., 2017; Koenig-Lewis et al., 2014; Monnot et al., 2015; Seo et al., 2016). Van Birgelen et al. (2009) pointed out some conditions that the consumers respond positively to brands that commit to the environment. However, they are not willing to trade green packaging attributes with product quality (and taste). Although having green packaging can influence psychological constructs of the consumers, the evidence that it could influence consumption behavior is not yet confirmed.

At the same time, green marketing can develop negative emotional responses or skepticism if consumers no longer trust the brand. Business opportunistic practices, cumulative consumer sophistication, and perceived negative brand associations may weaken consumer trust and bring about the perception of greenwashing. Commonly, the lowered trustworthiness resulted from actions that do not align with claimed sustainability (Akturan, 2018). Greenwashing refers to the marketing and communication about sustainable corporate behaviors without holistic consideration or actual understanding. Greenwashing often carries false claims and misleading information that can contribute to branding advantages. For instance, a brand may heavily promote an ethical campaign just to draw public attention to its (artificial) green image and obscure irresponsible behaviors. In relation to packaging consumption, Nordin and Selke (2010) revealed that greenwashing is one of the major barriers that prevent consumers from opting for sustainable packaging choice. This doubt in corporate practice can be alleviated through information provision. Product labelling is claimed to be one of the tools to weaken the perception of greenwashing (Collins et al., 2007; Nordin & Selke, 2010). However, alternative products used in the market that are labeled ‘eco-friendly’ should also be monitored with standards. As a consequence of the increasing greenwashing actions, green skepticism becomes widespread. Green skepticism is originally defined as the consumers' tendency to doubt the environmental benefits or the environmental performance of a green product (Mohr et al., 1998). It is found to have a relationship with green purchase intention, environmental concern, environmental knowledge, PCE, and PEB (Albayrak et al., 2011; Cleveland et al., 2005; Goh & Balaji, 2016).

Apart from green marketing, social marketing, macromarketing, corporate marketing, and demarketing are the relevant marketing concepts that are relevant to the research and often being discussed within the business and sustainability literatures. During the past decades, various marketing techniques have been adopted as part of the effort to encourage change in consumption behavior. First, social marketing or societal marketing is originally adopted in health and wellbeing behavioral studies and later adopted as a tool to encourage sustainable behavior such as waste separation, energy saving and consumption of green/organic products. The core theory in social marketing is the behavioral theory which consists of (1) individual level theory which includes concepts on social and cognitive psychology as discussed under rational and irrational decision, (2) network level theory which looks at individual as a member of the society that can be influenced by norms and opinion of others, (3) organizational level theory which focuses on organization structure and the role of its members, and (4) societal level which considers the structural relations within green market. Social marketing is also a behavioral tool to 'unfreeze' the rooted habits. Second, macromarketing deals with changing collective consumption practices at the societal level in a way that benefits the market and the environment as a whole (Edward Maibach, 1993). Similarly, corporate marketing reflects the shift in focus from product level to a more holistic view at corporate level. Third, corporate marketing originated from an idea that marketing should be viewed as a social process that is designed to benefit stakeholders in the market system. Companies should not only offer green products to green consumers, but also consider the social aspects along the greening process (Podnar & Golob, 2007). Lastly, while traditional marketing creates demand for consumption, demarketing discourages consumption. In sustainable consumption study, demarketing can be applied on non-environmentally-friendly products to reduce their demand and green marketing can be used to promote alternative products such as reusable food containers. Demarketing can be used to stimulate rethinking of unnecessary consumption that causes high negative spillover to the environment. The relevant idea pertains to the sufficiency-driven business model where companies optimize the usage and delivery of their products so that the functionality is maximized and resource consumption and waste are minimized (Bocken, 2017). In this research, as demarketing leads to deconsumption, the example of demarketing activities include cutlery opt-out/opt-in function in food delivery platform's application and the elimination of excessive packaging or unwanted side dishes.

6.2.3 Customer perception and expectation of CER

The analysis of CSR and CER often involves a corporate marketing concept since it is evident that corporate responsibility can deliver benefits not only to the company, but also to the market as a whole. By examining CER and its effect, researchers need to know how stakeholders interpret and respond to each type of CER strategy in order to design a program that answers the needs of the society and yet matches with customers' values. As discussed in the green marketing section,

corporate's green activities can influence customer's emotional value attachment to the brand which could lead to increase in sales. Stakeholders' expectation is the study area that increasingly gains research interest within CSR literature based on expectational relationships. By considering CER as a value creation activity, it is important to know how the initiatives can deliver value to the brand's target customer as a stakeholder and what customers expect from the brand. Podnar and Golob (2007) conducted a research on customer expectations of CSR and found the significant positive relationship between CSR expectations and individuals intention to support CSR activities. Similarly, Collins et al. (2007) studied CSR in the context of sustainable corporate performance and affirmed that individuals have beliefs about what the corporate should do in order to advance the development cause and such beliefs can influence customers' responses on the firm's sustainability initiatives. Sen and Bhattacharya (2001) studied consumer reactions and responses to CSR and found the mediating role of personal beliefs to customers' responses to CSR.

In branding study, individual customers develop a specific set of perceptions towards the brand. Brand associations refer to all subjective elements that constitute the brand. The example of brand associations includes the brand's presenter, distribution channel, how they advertise, packaging used, and the news about the brands. Positive and negative brand associations influence market response through individuals evaluation of the brand. How much each association affects the brand depends on the degree of customers' personal beliefs and values placed on such association (Collins et al., 2007). The opportunistic behavior of the brand may strike negative brand association for customers who value fairness, justice and equity. At the same time, the 'no cutlery' function may increase positive evaluation for green, rather than non-green customers. However, once the customers develop a positive emotional attachment to one aspect of the brand, such bias will diffuse to other attributes and will eventually improve the overall brand impression. Smith et al. (2010) defined Halo Effect as judgments made about an aspect that is clustered around judgments of other aspects. Halo Effect is presented in every type of CSR and it is a key strategy in CSR communication to manage consumer perception towards the brand. A well-managed Halo Effect can create a positive brand perception which is regarded by marketers as a valuable asset that needs to be maintained as it could yield long-term brand loyalty.

In marketing and psychology research, CER and green marketing practice can also produce another emotional attachment attribute. Brand admiration refers to the feeling of affection, connection, and passion to the brand (Albert, 2009). Park et al. (2017) found strong linkage between brand admiration and brand's value. They affirm that brand admiration is the most desirable state of the brand's health as it delivers value to the customers and, in turn, to the brand itself. The emotional attachment attributes are enhanced when companies' values match with customers' personal values. These attributes thus lead to short-term competitive advantage and long-term brand equity. Brand admiration may as well be mediated through the Halo Effect of green marketing when it transfers sustainable values. From

the study of original triangular theory by Sternberg (1986), brand admiration in the consumption context involves the stages of yearning, liking, and commitment. Brand altruism, which often derives from CSR activities, is also one among factors contributing to brand admiration (Albert, 2009; Collins et al., 2007). Albert (2009) concluded that the characteristics of brand admiration include passion, attachment, positive evaluation, positive emotion, and brand commitment. However, they further found that these dimensions have very high correlation (> 0.7), meaning that brand admiration can be measured as a unidimensional construct.

6.2.4 Proposed business-led sustainable initiatives

The initiatives that were tested in both studies were obtained from the review of concepts and cases of sustainability adopted in food delivery business in Thailand and other countries as discussed in this chapter. Each initiative is discussed with its related concepts under sustainable consumption theory as summarized in Table 2.2.

Table 2.2: Business-led sustainable initiatives in online food delivery market

	No cutlery default	**Labelling program**	**Packaging procurement**	**Deposit-return scheme**
Details	Platforms set 'no cutlery' as a default option on their application. Plastic cutlery is on request.	Platforms provide in-app labelling for merchants that use green packaging.	Platforms partner with packaging suppliers and offer discounts to merchant partners. Government subsidies should be considered in parallel.	Platforms develop a deposit-return system for returnable food packaging. Government provides support on systems and infrastructure.
Objectives	Reduce	Redirect	Replace	Reuse
Instrument/ mechanism	Behavioral instruments (behavioral economics)	Behavioral instruments (information provision)	Market-based instruments	System and infrastructure provision
Theoretical base	Setting default is a 'choice architecture' under the behavioral economics' 'nudging' concept	Information provision tackles information failure, which can lead to better consumption decisions.	Subsidies on green packaging can improve pricing failure in the market system.	Dealing with structural adjustment, the market needs a new business model and a new set of consumption practices.

1) No cutlery default. Currently, ‘opt-in and opt-out’ function in applications for cutlery rejection is only applicable to a limited number of restaurants in some platforms. The initiative requires the platforms to set cutlery ‘opt-in’ function as a default for every restaurant partner throughout the platforms. If consumers want the cutlery, they will need to make a request. This initiative weakens the barrier of sustainable consumption practice through the adjustment in the service process. Another key obstacle is the compliance with the request. It is very often that the customers receive unwanted cutlery. Hence, the platforms need to establish mutual understanding with their drivers and restaurant partners to comply with the ‘no cutlery’ request. Theoretically, setting default can be regarded as a choice architecture which is a behavioral instrument in behavioral economics that could reduce the number of steps taken by consumers to opt for a greener option. Adjusting choices can be viewed as the improvement in a system of provision since it is the structural adjustment that has direct result on actual consumption practices.

2) Labelling program. The initiative demands platforms to provide in-app information about the type of packaging material used by each partnered restaurant and label restaurant that use environmentally-friendly packaging with a ‘green certified’ label. In the first phase, this can be done in forms of voluntary positive labelling. Additionally, the platforms can promote restaurants as a category under the ‘green choice’ banner. Ideally, information provision can lessen the information gap which can lead to better consumption decisions based on rational choice theory of sustainable consumption. Practically, from a marketing perspective, restaurants can benefit from the enhanced brand attitudes when the perceived brand ‘greenness’ and ‘transparency’ is increased. Green labelling can act as a differentiation point that enhances the competitive advantage of the restaurant (Van Dam, 2016). The more information provided, the less likely the perception of greenwashing is perceived (Nordin & Selke, 2010). Although scholars in developmental communication affirm that negative labelling is more influential in the context of behavioral change, it is not practical to apply in a commercial context (Van Dam, 2016). However, a mandatory negative labelling should be considered when the ban of PS foam, straw and SUPs cups comes into force in 2022 according to the roadmap. From the policy viewpoint, information provision or informative instruments or communicative instruments is endorsed by many development schools as one of the policy mechanisms that the governing actors could adopt to induce behavioral change.

3) Packaging procurement. The initiative requires the delivery platforms to procure greener packaging (through strategies such as partnership with packaging suppliers) and sell to the restaurant at an affordable price. Platforms’ bulk purchase will allow the suppliers to gain economies of scale which will result in lower price. This initiative aims to change the system of practice from the supply side through the provision of affordable and greener packaging options. It holds the principle of CSR that the platforms are expected to absorb additional cost incurred from changing to green packaging to correct the pricing failure in the market. When the demand for

green packaging grows, market mechanisms would make the price drop. The existing players in the food delivery market have enough capitals, partners, and therefore capability to drive the market system towards sustainability. However, as endorsed in sustainable development goal 17: partnership for sustainability, a partnership among actors in the system should be formed. Apart from the platforms and the restaurants, another key stakeholder in this initiative are the green packaging suppliers who would also benefit from this project. This strategy can be promoted as part of companies' green marketing to enhance marketing benefits gained from responsible corporate behavior.

4) Deposit-return scheme. The deposit-return scheme requires the delivery platforms to develop a packaging return system. Customers are required to pay a deposit. After use, they are required to roughly rinse their containers and return at the drop sites located in different areas. Alternatively, they can make a pick-up appointment via application. The platforms will then take back the containers to properly clean and reallocate back to the restaurants. Possible pilot projects could be tested around the CBD where the platforms' kitchens are located for the ease of logistics management. Dealing with the structural adjustment, this initiative requires a higher level of CSR beyond the expected regulatory compliance. New business model is needed so as to provide supportive infrastructure that facilitates the reduction of SUPs packaging waste by incorporating zero waste and circular economy concepts. Many major cities have experienced the successful implementation of the deposit-return scheme as part of EPR (United Nations Environment Programme, 2018). However, as the key 'reason to buy' of food delivery consumers is the 'convenience' attribute that the platforms offer as the key selling point, this scheme is challenging for the food delivery business. Ellen MacArthur Foundation (2019) stated that businesses can leverage the potentials of reusable packaging emerged from the increasing concerns on plastic pollution. However, despite the fact that this initiative supports a circular economy, the overall economic return might be negative due to the high operation and logistics cost. Partnership is also necessary in this approach throughout the scheme. Ultimately, this reuse scheme aims to mitigate the environmental impact that stems from the inefficient disposal practice as the SUPs food packages are usually contaminated with food residue thus cannot be properly recycled.

Ellen MacArthur Foundation (2019) pointed out that the underlying reasons for the platforms to adopt sustainable business models are, first, there are untapped business opportunities in the innovative market such as the reuse market that can enhance consumption experiences of the users. Second, global alignment towards plastic pollution reduction is the key driver that allows private and public agencies, as well as consumers to collectively achieve global commitment. Third, consumer preference and behavior have shifted towards the digitalised/ innovative consumption experience together with ecological concerns which allows business to deliver customized value. Lastly, environmental benefits from using alternative packaging is evident.

CHAPTER 3
RESEARCH METHODOLOGY

1. Overall study and research design

This research investigated sustainable consumption through two main perspectives: demand-led and system-led. Therefore, it was structured into two parts according to the main research question. As shown in Table 3.1, the first study examined consumers' behavior, perceptions and attitudes towards SUPs issue in food delivery service context. The effectiveness of corporate initiatives was measured on a consumer basis through consumers' acceptance level and intention to support. This consumer data was obtained through online survey, paper-based face-to-face survey and semi-structured in-depth interview. The data was then analysed quantitatively through cluster analysis, and qualitatively through thematic analysis. The second study investigated interrelationship among stakeholders in order to understand the system and to identify leverage points through system dynamic. Qualitatively, a semi-structured interview was conducted as part of the stakeholder analysis. The interview data was subject to thematic analysis. Quantitatively, Behavior-Over-Time (BOT) graphs utilized consumer data obtained from study 1, and secondary analysis to evaluate the waste reduction potential of each proposed initiative. Additionally, input for initiative evaluation was partially obtained from the stakeholder semi-structured interview. The details of each study are described in the next sections.

Table 3.1: Summary table of research methodology and data analysis approach

Research Questions	Research Methods	Data Analysis
1. What are the environmental profiles of platform food delivery customers? 1.1 What are the consumer perceptions towards SUPs generated from the food delivery business? 1.2 How can food delivery customers be clustered? What are the profiles of each cluster?	Mixed method *Quantitative* - Online survey (n=400) - Paper-based, face-to-face survey (n=50) *Qualitative* - Semi-structured, in-depth interview (n=20)	- Cluster analysis - Thematic analysis
2. What are the high leverage points in the system that can be adjusted to reduce SUPs in the food delivery business?	Mixed method *Quantitative* - Data obtained from study 1, and secondary analysis *Qualitative* - Semi-structured interview (n=14)	- System analysis through system dynamic modelling - Behavior-Over Time (BOT) graph

2. Study one: Demand-led sustainable consumption

To answer the question 'what are the environmental profiles of platform food delivery customers?', two sub questions were proposed. First, what are the consumer perceptions towards SUPs generated from the food delivery business? Second, how can food delivery customers be clustered? What are the profiles of each cluster? As the study involves COVID-19 factor, the survey included questions that reflect the context of the COVID-19 pandemic in comparison to the normal scenario to detect changes in consumption perception and practices. One set of questionnaires was developed as a tool to collect data for this study. The first part of the questionnaire consists of questions about basic consumption behavior in relation to online food delivery such as order frequency, pattern and experience. In addition, the questionnaire included specific questions in relation to perception towards SUPs in the online food delivery service. The second part of the questionnaire asks about environmental psychological constructs, namely time perspective and environmental values. The third part of the questionnaire includes questions about perception and expectation towards corporate responsibility. This part also includes consumers' response to sustainable initiatives. Lastly, demographic variables were collected in the last part of the questionnaire.

2.1 Variables and scales

The variables and items are given further details on what they measure, together with their theoretical background and implications as presented in Table 3.2.

Table 3.2: Theoretical implication of questionnaire items

Items	Implication
Order frequency	
How many times per week do you place order(s) via Grab, LINE MAN, Gojek or Foodpanda application on your own smartphone at these following periods: Before COVID-19, during the restaurants dine-in closure, and after the restaurants reopened?	This item aims to track behavioral change across time periods. Having lockdown measure as a catalyst, it can tell how order frequency changes after the catalyst is implemented and withdrawn.
SUPs cutlery usage	
Do you use SUPs cutlery more often during COVID-19?	This item aims to investigate behavioral change regarding SUPs cutlery usage during COVID-19.
Cutlery availability	
How often do you have metal cutlery available at your eating place?	This item aims to obtain the facts concerning the availability of washable, reusable cutlery. It points out the necessity of SUPs cutlery.

Excessive packaging concern	
I think most of my food delivery orders have excessive and unnecessary packaging	This item measures consumers' opinion on the excessiveness and necessity of packaging.
Perception towards foam packaging	
What do you think about a restaurant that uses Styrofoam containers?	
Foam is fine. No problem	This item indicates that the respondent has low concern or knowledge about the negative consequences of Styrofoam containers.
The restaurant should change to other materials for health reasons.	This item indicates the respondent's **avoidance attitudes**. They concern or are acknowledged about the negative health/ environmental consequences of Styrofoam containers.
The restaurant should change to other materials for environmental reasons.	
Perception towards biodegradable packaging	
What do you think about restaurants that use containers labelled 'Biodegradable'?	
Indifferent. Any box is the same.	This item indicates that the respondent has low involvement or knowledge with/about the issue. They tend to ignore the attributes of different materials.
The restaurant has environmental responsibility	This item indicates that the respondent impresses that the restaurant that uses biodegradable packaging has environmental responsibility. However, this impression can potentially cause '**green-washing**' when consumers have insufficient or false information.
Not sure about the environmental attributes of biodegradable product	This item indicates that the respondent is not easily convinced by the advertised message. Which is an act of **skepticism.**
Consideration of Future Consequence (CFC) - measuring 'time perspective'	
How much do you agree with the following statements ?	
[CFC1] I think that using fewer SUPs is usually unnecessary now because future consequences can eventually be dealt with at a later time.	This statement represents a low construal level where consumers focus on current gain from using SUPs more than future loss that might occur. (Reverse coding)
[CFC2] Even if the negative consequences of SUPs waste will not result in these few years, I think it is important to take serious warnings about them.	This statement represents a high construal level where consumers are future-oriented and are able to perceive the urgency of the problems.

[CFC3] I consider how the plastics waste situation might be in the future and try to reduce the use of SUPs in my everyday life.	This statement represents a high construal level where consumers are able to visualize the abstract, uncertain future consequences and how **habitual consumption** might contribute to the future problems.
[CFC4] Convenience is the biggest factor in my food ordering decisions.	This item measures how 'convenience' plays roles in influencing consumption decisions. It measures convenience-based consumption attitudes that weaken **conscious consumption** decisions. (Reverse coding)
[CFC5] If I crave it, I will get it. Other issues can be figured out later	This statement reflects how digital disruption influences food consumption demand as it weakens **conscious consumption** decisions. It reflects impulse purchase where consumers satisfy their immediate wants before considering the consequences of their actions. (Reverse coding)
Ecologically Conscious Consumer Scale (ECCS) - measuring 'environmental value'	
How much do you agree with the following statements?	
[ECCS1] It's time to avoid products that have excessive packaging	This item reflects an **avoidance attitude** towards excessive packaging.
[ECCS2] It's time to buy products that use environmentally-friendly containers	These items show consumers' concern towards the behaviors that may spill negative consequences on things they value. It also communicates the belief that their everyday consumption needs to be changed.
[ECCS3] It's time to start bringing reusable container to buy food	
[ECCS4] Using SUPs during COVID-19 is acceptable because it can reduce the chance of virus transmission	This item conveys that there is no conflict between SUPs consumption and personal values. The value is placed around 'self/health' than on the 'environment', and therefore, contribute to less **guilt feeling**. (Reverse coding)
[ECCS5] Humans can continue to produce and consume as usual, no need to change anything since nature will eventually adjust itself to the balance point	This statement implies that consumers' value is not aligned with the **New Environmental Paradigm (NEP)** which is based on the 'Limit to Growth' concept. (Reverse coding)
Corporate Social Responsibility (CSR) expectation	
How much do you agree with the following statements?	
I think that food delivery platforms should provide options for customers to reduce SUPs from food delivery orders.	This item reflects consumers' expectation that the platforms should extend their responsibility towards waste reduction at consumption end.

I think that food delivery platforms should encourage their restaurant partners to reduce unnecessary plastic packaging or change to environmentally-friendly packaging even if it involves higher cost.	This item reflects consumers' expectation that the platforms should work among their partners to reduce or replace plastic packaging throughout the operation cycle.
I believe that business must actively reduce SUP consumption to prevent plastic pollution.	This item reflects consumers' expectation that business should play active roles in reducing SUPs consumption.
Acceptance of initiatives	
How much do you agree with the following initiatives	This item measures consumers's acceptance level of proposed business-led sustainable initiatives.
Intention to support initiatives	
How much do you want to support the initiatives	This item measures consumers' intention to support the proposed business-led sustainable initiatives.
Willingness to pay for green/ returnable packaging	
- How much will you pay extra for green packaging (..... THB / Piece) - How much are you willing to pay a deposit for one returnable container?	This item measures consumers' willingness to pay (WTP) for single-use green packaging and returnable packaging deposit.

1) Behavior and perception

This study targeted environmental behavior relating specifically to SUPs consumption in food delivery business from placing orders to usage of SUPs. Perception was also measured through specific items relating to SUPs from food delivery. In the questionnaire, targeted behaviors in this research were structured into two parts. First, the general food ordering behavior and second, PEB relating to the SUPs in food delivery especially the use of cutlery. The questionnaire also included behavior before and during the COVID-19 event, as well as the behavioral intention after COVID-19. For perception, this research examined the dynamic of consumers' perception toward SUPs consumption in food delivery. The study specifically examined consumers' guilt of using SUPs before and during the COVID-19 situation. The questionnaire also investigated the concern about excessive packaging and green packaging. The question set for behavioral and perception constructs is shown in Table 3.3 below.

Table 3.3: The question items for behavioral and perception constructs

	Behavioral and perception items	Scale
1.	How many times per week do you place order(s) via Grab, LINE MAN, Gojek or Foodpanda application on your own smartphone at these following time •Before COVID-19 (normal situation) •During COVID-19 (the restaurant closed for dine-in) •After the restaurant reopened for dine-in	Frequency scale (6 points)
2.	How often do you have metal cutlery available at your eating place?	Frequency scale (5 points) (never - always)
3.	Do you use SUPs cutlery more often during COVID-19?	Frequency scale (5 points) (very less - very often)
4.	I think most of my food delivery orders has excessive and unnecessary packaging	Likert scale (5 points) (strongly disagree - strongly agree)
5.	What do you think about restaurants that use Styrofoam containers?	1. Foam is fine. No problem. 2. The restaurant should change to other materials for health reasons. 3. The restaurant should change to other materials for environmental reasons.
6.	What do you think about restaurants that use containers labelled 'Biodegradable'?	1. Indifferent, any box is the same. 2. The restaurant has environmental responsibility 3. Not sure about the environmental attributes of biodegradable product

The rationale that this study measured situation-specific sets of behavior and perception rather than general PEB or general environmental perception construct can be explained by 'the corresponding rule'. The rule states that one PEB cannot be generalized to other PEBs. Also, one psychological construct cannot be generalized to others. Many research found inconsistent results between general measurement and situation-specific measurement of constructs such as energy and water conservation, household recycling, the use of public transport, the purchasing behavior of organic product, and Bring-Your-Own behavior (Cleveland et al., 2005;

Collins et al., 2007; Do Paco et al., 2009; Gilg et al., 2005). In addition, van Beek et al. (2013) studied health-related behavior: eating and exercise and confirmed that, in order to predict behavior, a variable is best measured at a behavior-specific level. On the other hand, Milfont and Gouveia (2006) claimed that a broad and universal approach to measure psychological constructs is preferable in detecting relationships, and thus be more appropriate. Therefore, behavioral and perception items were developed within the context of the consumption of SUPs in the food delivery business.

2) Environmental psychology variables

Among testing variables, time perspective and environmental values are specific constructs that were measured through its particular scales.

Time perspective is commonly measured through the Consideration of Future Consequence (CFC) which originally contains 12 items that measure the extent to which individuals consider the future implications of their action. The examples of items are 'I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level' and 'I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time' (Strathman et al., 1994). Toepoel (2010) pointed out to the flexibility of CFC that it is a changeable construct with acceptable internal consistency. As a result, time perspective scale has been adjusted from time to time in different research areas such as climate change and behavioral health to represent the domain-specific measurement of the urgency of the problem (e.g., van Beek et al., 2013; Wang et al., 2019). This study, therefore, selected some of the items from CFC and modified them into SUPs consumption context as presented in table 3.4. All items were measured by a five-point likert scale.

Table 3.4: The question items for time perspective construct

	Domain-specific CFC items	Coding
1.	I think that using fewer SUPs is usually unnecessary now because future consequences can eventually be dealt with at a later time.	Reverse coding
2.	Even if the negative consequences of SUPs waste will not result in these few years, I think it is important to take serious warnings about them.	Normal coding
3.	I consider how the plastics waste situation might be in the future and try to reduce the use of SUPs in my everyday life.	Normal coding
4.	Convenience is the biggest factor in my food ordering decisions.	Reverse coding
5.	If I crave it, I will get it. Other issues can be figured out later	Reverse coding

Environmental values commonly involve the measurement instrument of Ecologically-Conscious Consumer Behavior (ECCB) which is based on the concept of the New Environmental Paradigm (NEP). According to the review in the previous chapter, a general value. This study, therefore, used behavioral-specific environmental value, rather than value in general, as a value construct. This research selected ECCB items related to concern over the harm of product packaging such as 'I will not buy products which have excessive packaging' and 'whenever possible, I buy products packaged in reusable containers' (Straughan & Roberts, 1999; Tilikidou et al., 2002). ECCB is occasionally studied as Ecologically Conscious Consumer Scale (ECCS) which, as appeared in Gilg et al. (2005), includes the item 'Looking for products using less packaging'. Regarding the representativeness of NEP and ECCB/ECCS, Roberts (1996) found that consumers who scored high in ECCS also believe in limits to growth concept, the principal of NEP, and tend to avoid products with excessive use of packaging. As presented in table 3.5, the first two questions were taken from the original ECCB scale. Question three and four reflect the values based on the 'limits to growth' concept. The last question is based on guilt feeling, which is self-conscious emotions against personal or subjective values. The items were measured by a five-point likert scale.

Table 3.5: The question items for environmental values construct

	Domain-specific ECCS items	Coding
1.	It's time to avoid products that have excessive packaging	Normal coding
2.	It's time to buy products that use environmentally-friendly containers	Normal coding
3.	It's time to start bringing reusable container to buy food	Normal coding
4.	Using SUPs during COVID-19 is acceptable because it can reduce the chance of virus transmission	Reverse coding
5.	Humans can continue to produce and consume as usual, no need to change anything since nature will eventually adjust itself to the balance point	Reverse coding

3) Expectation towards corporate responsibility and initiatives

This study measured customers' expectations of the brand's responsibility. The measurement items were derived from the review of relevant literature (e.g., Maignan, 2001; Mårtensson & Berndtros, 2014; Park & Lee, 2014). For instance, Maignan (2001) proposed a measurement instrument based on Caroll's definition of CSR ranging from economic responsibilities to ethical responsibilities. However, this study specifically measured consumers' expectation on how much the

firm should do in order to tackle plastic problems. As presented in table 3.6, this questionnaire section was divided into two main parts. The first part examines the personal importance of CSR. The latter part measures consumers' acceptance, intention, and WTP for four business-led sustainable initiatives. The explanations, examples, and illustrations of each initiative were provided in the questionnaire. The items were measured by a five-point likert scale.

Table 3.6: The question items for CSR expectation and initiatives

	CSR expectation items	**Coding**
1.	I think that food delivery platforms should provide options for customers to reduce SUPs from food delivery orders.	Normal coding
2.	I think that food delivery platforms should encourage their restaurant partners to reduce unnecessary plastic packaging or change to environmentally-friendly packaging even if it involves higher cost.	Normal coding
3.	I believe that business must actively reduce SUP consumption to prevent plastic pollution.	Normal coding
	Perception towards business-led sustainable initiatives	**Coding**
1.	How much do you agree with the 'no cutlery default' program	Normal coding
2.	- How much do you agree with the 'eco-labelling' program? - How much do you want to support restaurants that use green packaging?	Normal coding
3.	- How much do you agree with the 'packaging procurement' program? - How much will you pay extra for green packaging (..... THB / Piece)	Normal coding
4.	- How much do you agree with the 'reuse' program? - How much do you want to participate in the 'reuse' program? - If yes, how much are you willing to pay a deposit for one returnable container?	Normal coding

4) Demographic Variables

From the review of platform food delivery's consumers in Thailand, demographic variables that distinct user and non-user groups include gender, age, income and education which are the common data to be collected. Demographic characteristics are the most fundamental form of clustering and segmentation since they are easy to identify. It is commonly used in traditional market segmentation according to its concreteness. However, Jeevan (2014), in their proposed conceptual framework on marketing and segmentation, stated that it is hard to define green consumers based on their demographic characteristics. Annunziata and Vecchio (2013) also made clear

that in the study of sustainable food consumption, psychological variables are more predictive of behavioral intention when compared to demographic variables. Trivedi et al. (2015) added to this finding that environmental-specific variables are more stable when compared to demographic criteria as a segmentation indicator. Albayrak et al. (2010) also found that demographics are not the accurate and sole determinant of environmental psychological attributes and that psychological variables are more stressed in green segmentation. Cleveland et al. (2005) and Park and Lee (2014) also affirmed that in green marketing research, psychological factors such as beliefs and attitudes are better predictors of green behaviors when being compared to demographic variables. Therefore, the study based its cluster analysis on psychological attributes and further investigated the relationship of other variables with demographic variables.

2.2 Target population and sampling method

The online questionnaire targeted the users (as opposed to non-users) of online food delivery platforms. Sample size was calculated based on a formula by (Yamane, 1967). Statista (2019) revealed that platform-to-consumer food delivery has 1.9 million users in 2019 and is projected to reach 2.4 million in 2020 and 2.9 million in 2021. With a 95% confidence level (P = 0.05), the sample size equals 400 users. This research relied on probability sampling technique which utilizes a simple random sampling method that gives the population an equal chance to be selected. A representative sample was combined to reduce selection bias. The representative sample method involves the investigation of demographic characteristics of the population and the selection of samples that possess the desired characteristics. Market research revealed that the majority of food delivery customers are females 25-34 years old. Therefore, the survey distribution was based on this customer profile to minimize the differences between sample and population. In addition, 10% of the sample size, which equals to 40, was selected as a target group for survey pre-test.

$$n = \frac{N}{1 + Ne2}$$

2.3 Data collection method

1) An online questionnaire was developed from the review of constructs and scales in the past research. The reasons for this study to use online surveys are as follows. First, online surveys provide easy access to a large number of potential survey respondents located in different geographic areas. Second, it tends to receive higher response rates with higher accuracy since the respondents can participate at any convenient time and place. The data is obtained in a format that is easy to manage. Moreover, despite having lower social desirability when being compared to other survey techniques such as focus groups, online surveys have lower costs and barriers such as misunderstandings or biases that might occur in human communication (Dillman et al., 2014). Online survey methods have gained acceptance since it is proven

to deliver equivalent data quality at a lower cost than the traditional survey methods (Deutskens et al., 2006; Fricker, 2016; Oliver & Rosen, 2010). Regarding the coverage and representativeness, online surveys may fail to reach the population without internet access. However, this research targeted the users of online food delivery platforms which own smartphones and the internet. Therefore, Online surveys were expected to reach most of the targeted population. The questionnaire was created on Google Forms platform for ease of data collection and syncing. The scale type is mainly five-point Likert scale. Before the actual survey, the scales used to measure psychological variables were tested for its validity and reliability. Manipulation checks were conducted to affirm that the respondents interpret each question correctly. 40 draft questionnaires were distributed as a pre-test for revision and improvement.

2) Paper-based face-to-face surveys were conducted qualitatively to enhance data's validity and reliability. It aims to increase sample representativeness and to reduce coverage biases of online panels. The survey questionnaire used in the face-to-face survey is an offline, print-out version of an online questionnaire. As the population of this study owns smartphones and has access to the internet, 50 offline samples were aimed. Offline survey allows researchers to use purposive sampling techniques since they can make judgement on who should be surveyed, despite being subjective. However, the disadvantage of paper-based surveys is that it tends to be subject to non-response errors as some questions can be omitted, unlike online platforms where all questions can be set as required.

3) Semi-structured in-depth interviews were conducted in parallel. This mixed method can be counted as data triangulation where various research methods are conducted to answer the same research questions to enhance data validity and reliability. In this research, the same set of questions used in online surveys were used as a question guideline in semi-structured in-depth interviews. According to Creswell and Poth (2016), a sample size of 20-30 is appropriate for qualitative research in social science study since it aims to obtain extensive details from individual respondents rather than to generalize the information. By using purposive sampling technique, the sample was selected based on geodemographics information according to the population characteristic. Face to face interviews exhibit higher social desirability and thus are able to gain more in-depth sentiment information. It also allows the researcher to reach the population beyond the coverage of online surveys. However, face to face interviews possess higher cost, economically and time. Also, as this part is qualitative research, the potential of biases in data collection and interpretation need to be considered. Acquiescence bias and Social desirability bias are the respondent biases that refer to the way the respondents answer yes to anything that is being proposed. They tend to answer what they think is right and reinforce their self image so as to be liked. To avoid this, researchers developed indirect questions or scenarios to deviate the issue out of the 'self'. For researcher bias, confirmation bias may come into effect during data interpretation and coding. It refers to the situation when the researcher develops a hypothesis or assumption and tries to affirm those assumptions through the respondents' answer. The researcher must regularly reevaluate sentiments of

respondents' data and challenge predeveloped beliefs. Moreover, leading questions and wording bias could be avoided by using respondents' language and not summarizing the information in the researcher's own words (Corbin & Strauss, 2014; Malhotra, 2015). A pre-test was conducted for further revision and improvement of the question set.

2.4 Data analysis

This study conducted correlation analysis throughout the constructs in order to detect possible relationships among variables. It also utilized descriptive analysis to explain the set of data collected. The main analysis in this study is cluster analysis. All data was statistically analysed using the Statistical Package for Social Sciences (SPSS)

1) Cluster analysis was conducted quantitatively with factors derived from social psychology theory under the umbrella of sustainable consumption in relation to environmental issues so as to understand the differences of insights among the group. Cluster analysis is a multivariate statistical analysis that is useful for identifying relationships between groups of subjects where there is no obvious hypothesis so as to identify the differences between groups. The mathematical logic behind cluster analysis is to study the coefficients that tell the degree of similarities and dissimilarity among groups (Trebuňa & Halčinová, 2013). In this study, item analysis was conducted to evaluate the empirical linkage among a large number of questionnaire items and eliminate items with low item-rest correlations. After the items are regrouped, hierarchical cluster analysis with Ward's method with the squared Euclidean equation identifies clusters which exhibit lowest homogeneity between the groups and highest homogeneity within the group by finding the appropriate cutoff for segmentation. After the clusters are identified, the research relied on the Analysis of Variance (ANOVA), cross-tabulation with Chi square, and Fisher's exact statistics to examine how each cluster responds to variables that are expected to differ across them.

2) Thematic analysis was adopted as a data analysis method for data obtained from both in-depth consumer interviews and semi-structured stakeholder interviews. It was defined by Braun and Clarke (2006) as a method to identify, analyse, and report patterns (themes) within the data set. Thematic analysis looks beyond the surface meanings into the true implication of each assigned code. Codes are a list of items from the data that have a recurring pattern relating to the issues within the research area. Thematic analysis requires a researcher to transcript the data and immerse in the context. After individual data is gathered and thoroughly interpreted, codes are developed during the data coding process to identify key ideas and issues that emerge among the data set. Codes can be drawn directly from the verbal language used by the interviewer, which is called 'emic code' or from the more conceptual language or 'etic code'(Corbin & Strauss, 2014). Occasionally, new codes can emerge, and old codes can be reviewed as the coding process is conducted. The process continues until the data coding is saturated. Codes are then combined and categorised into themes in which codes are analysed in a more systematic way (Boyatzis, 1998). Theoretical

interpretations can be engaged in thematic analysis to systematically align the analysis with the core theories and concepts of the study (Corbin & Strauss, 2014).

3. Study two: System-led sustainable consumption

To answer the question 'What are the high leverage points in the system that can be adjusted to reduce SUPs in the food delivery business? Sustainable consumption requires systematic comprehension from both individual consumers and other actors in the system. The consumption practices are not only shaped by consumer demand, but also largely by the consumption provision actors, the supportive niches and the process in societal systems. Therefore, this part of the research examined the SUPs issue in the food delivery sector from the holistic point of view.

3.1 Data collection method

The input in this analysis includes primary data from the semi-structured interview of relevant actors. Secondary data was obtained from the review of publications and media, mainly from contents posted on online platforms comprising the news and interviews. Due to the limitation during the COVID-19 situation, the interviews were conducted as online interviews through Google Meet, Microsoft Teams and Zoom software. The interviews were recorded as audio files and transcribed. The data underwent coding analysis and thematic analysis as discussed in the previous section (study 1). The consumer research results from study 1 in this research were also treated as inputs for the SD analysis.

3.2 Target population and interview questions

Semi-structured interviews were conducted on four groups of respondents. The policy-level stakeholders, platform companies, restaurant partners, and sustainable niches as presented in Table 3.7. The complete questionnaire can be found in Appendix I.

Table 3.7: Interview samples

Interview samples and questions	
1. Food delivery platforms (4 platforms) Grab Food/ LINE MAN/ Gojek/ Foodpanda	- Information about overall orders and order categories (food and drink) (for waste calculation purpose) - What are the company's measures to support the reduction of SUPs packaging in the delivery business (if any)? - What has been/ will be done to improve the 'opt-in' measure at both consumer and merchant ends? - Comments, suggestion, and expectation towards the Memorandum of Understanding (MOU) signed to reduce SUPs waste from food delivery. - Is there any promotion/ incentive for the merchant partners who want to take part in SUPs packaging reduction effort? - What has been/ will be communicated to the public, merchant partners, drivers and other relevant parties regarding SUP packaging issues?

		- Evaluate four proposed initiatives - The potential of platforms' cloud kitchens to help reduce SUPs in the system. - System dynamic model review - Where in the system should be improved the most with the goal to reduce SUP packaging? - What kind of support from the government is needed to achieve SUPs reduction in the system?
2.	**Food retailers** (5-10 retailers) Grandpa's kitchen, De tum, Tia Heng food, Por Pochaya, Unbranded Cafe.	- Information about online orders via delivery platforms and order categories (food and drink) (for waste calculation purpose). - What types of packaging are used? What are packaging components in one order? - Is there any measure at your retail to support the reduction of SUPs packaging in the delivery orders? - What are the challenges in reducing SUP in the food delivery sector? - What are the guidelines towards 'no cutlery' orders? - Evaluate four proposed initiatives - Where in the system should be improved the most with the goal to reduce SUP packaging?
3.	**Sustainable niches** (5-10 niches)	
	- **Platforms** KeawKeaw/ GreenIm/ Locall.bkk	- What are the challenges in operating sustainable niches? - What kinds of messages about plastic waste do you communicate to which group of audience? - Evaluate four proposed initiatives - What are your expectations towards each actor in the system? - System dynamic model review - Where in the system should be improved the most with the goal to reduce SUP packaging?
	- **Sustainability-based projects** Send plastic back home/ Wasteless Delivery/ 'Mai-Kor-Rub' Facebook community	
	- **Opinion leaders/ influencers** Facebook page: 3-wheels uncle, ReReef, Greenery.	
4.	**Policy-level agencies** (4 units)	
	- **Ministry of Natural Resources and Environment** Pollution Control Department (PCD)/ Department of Environmental Quality	- What should be the role and responsibility of the business sector in being a change-maker? - What roles could the government and civil society play in order to overcome structural limitations? - What are the most important SUP waste management policies that should be a priority? - Evaluate four proposed initiatives

Promotion (DEQP) - **Institutions under government** Plastic Institute of Thailand/ Institute of Public Policy and Development (IPPD)	- System dynamic model review - Where in the system should be improved the most with the goal to reduce SUP packaging?

3.3 Data analysis

To answer research question 2 'What are the high leverage points in the system that can be adjusted to reduce SUPs in the food delivery business?', this study used a System Dynamic approach to analyse the possible points of improvement in the market system whether it be the information provision, choice architecture, corporate sustainable solution, or the development of supportive infrastructures. The qualitative understanding was presented in the larger System Dynamic model while the evaluation of consumption interventions were calculated through the Behavior Over Time graphs.

System dynamic (SD) or systems thinking was chosen as an approach for this analysis since SD allows the researcher to see where in the system sustainable values can be enhanced and delivered to the customers, the firms itselves, and the environment (high-leverage points of systems) (Abdelkafi, 2015). SD is an approach to explore factors, actors and their relationship in the system. It portrays the big picture of a complex issue that involves multi-layered stakeholders and therefore, opens doors to many solutions throughout the system; thus, allows us to identify measures and strategies to improve behavior of the system (Forrester, 2007; Myrtveit, 2007). A complex issue needs to be tackled on a system-thinking basis rather than on a compartmentalised thinking basis due to the non-static characteristic of the system. The concept of SD is to view the issue as part of the bigger system; which, in itself, includes many subsystems (Richmond, 1994). A holistic point of view enables us to understand the issue more effectively with goals to leverage long-term and collective interests. SD also takes into account subtle factors, so called, 'mental models' that may not be explicitly presented but can influence the system, such as consumer perception, incentives and recognition (Caulfield & Maj, 2001; Forrester, 2007). Therefore, the results from SD analysis will contribute to the enhanced understanding of the targeted issue at micro level, as well as the macro systems and linkages among them.

The examples of other models used in system analysis of sustainable development research include Agent-Based Modelling (ABM) or Group Model Building (GMB). SD focuses on the dynamic at macro level with the structure as unit of analysis while ABM focuses on agent at micro level in a less complex system where only few agents play a role (Ding et al., 2018). On the other hand, GMB is beneficial for projects that need active collaboration among stakeholders where proven methodologies are available. It is often used at the stage of causal loop diagram development but not representing the dynamic of the system. SD has successfully

assisted the development of both business strategies based on existing market situations and the context-specific development policies (Bayer, 2004). SD is found applicable within development and sustainability studies such as green business practice, business model for sustianability, customer expectation management, waste and water management, recycling and reuse behavior, the penetration of electric vehicles, food waste, and household energy consumption (e.g., Abdelkafi, 2015; Ding et al., 2018; Hsieh & Yuan, 2010; Lee et al., 2019; Zhang & Qin, 2014).

Causal loop diagrams and stock and flow diagrams are the main tools in SD models. Causal loop diagram depicts the interrelationship among different elements in the system that influence system behaviors. It believes that the cause-and-effect relationship can not be best explained in a simple linear manner, which is static, but rather in a more comprehensive loop. Causal loop diagram consists of arrows that represent causal relationships among the variables. Figure 3.1 illustrates two types of loops: positive (reinforcing (R)) and negative (balancing (B)) depending on the direction of casual relationship among factors. Reinforcing loops occur when change in one variable causes change in other variables in the same direction, and thus reinforcing the loop. Snowball effects can be presented in reinforcing loops. Balancing loops occur when change in one variable causes change in other variables in the opposite direction, and thus creating balance of the loop. Stock and flow diagrams are the modeling notations that calculate the accumulations of stocks in the system by taking into account the inflow, outflow, and rate of change which determine how the stock grows or shrinks overtime. As shown in Figure 3.2, the arrows show the inflow and outflow into and out of the stocks which determine the stock level. Valves represent the rate of flows. The cloud-shaped icon represents the non-specified sources and sinks of the flows beyond the system's boundaries. Stock can be money in the bank, users of public parks, or in this case, amount of SUP waste from food delivery business. One may begin the analysis with causal loop diagrams to see linkages among variables and to simplify the relationship. However, another school of thought sees causal loop diagrams as part of the SD model (Bayer, 2004). This research, therefore, developed causal loop diagrams in parallel with the SD as the relationship of factors contributing to the dependent variable are quite straightforward.

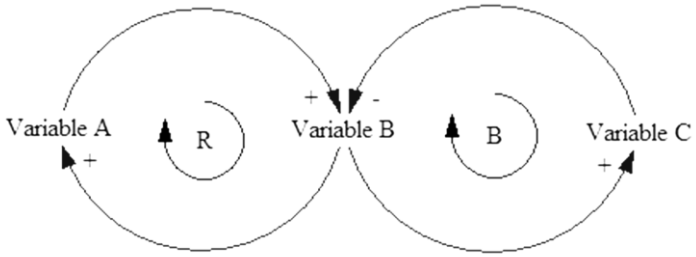

Figure 3.1: Simple causal loop diagram

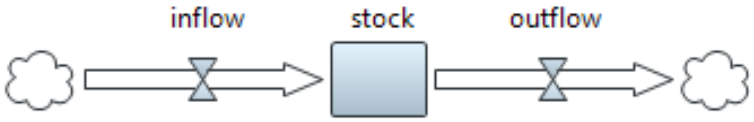

Figure 3.2: Simple stock and flow diagram

SD can be understood from a mathematical modeling perspective through differential equations. Reflecting one another; the differential equation can be used to explain the original stock and flow diagram as the differential equation consists of state variables, derivatives (rate of change), and parameters which represent stock, flow and variables of the stock and flow diagram (Bayer, 2004; Fortmann-Roe & Bellinger, 2013; Gupta, 2014). The differential equation model can be simply written as below where X is state variable, *dX/dt* is the derivative with respect to time, $\propto$ represents the parameter that control the growth rate of *X*. The differential equations also specify the initial values (*n*) of the state variables at a specific point in time as $X(0) = n$.

$$\frac{dX}{dt} = \propto \times X$$

SD can be conducted quantitatively through model simulation, and qualitatively through the examination of causal relationships within the system. While the numerical equation aims for analytical traceability, the system thinking concept in SD aims for a more qualitative and illustrative understanding of trajectories and results from model simulations (Fortmann-Roe & Bellinger, 2013). However, not every nonlinear trajectories have analytical solutions (Bayer, 2004). In addition, Coyle and Exelby (2000) studies different types of SD models and points out the risk of using quantitative SD analysis as it may not lead to the right policy decision and may not reflect actual relationships. On the other hand, qualitative analysis, in many cases, leads to deep understanding of the system which could assist effective policy decisions. As claimed by Bayer (2004) that a good model incorporates all factors deemed to be important despite the availability of its numerical data to estimate the parameters. Therefore, apart from qualitative model development and descriptive analysis, this research conducted quantitative simulation on the targeted dependent variable, the amount of final SUPs consumption in food delivery business, using the Behavior Over Time (BOT) graph.

There is no shortcut to finding high leverage points in the system. The complex system is counterintuitive. Hence, the author gathered all variables thought to be relevant within the research scope to construct the model regardless of their numerical implication. The model was constructed via Vensim software which is a simulation modelling tool commonly used to simulate SD models. Figure 3.3 graphically illustrates the subsystems with variables and their relationship within the food delivery plastics system. The proposed business initiatives, as appear in blue in

Figure 3.3, were analysed through BOT graphs, one of the system thinking tools. To understand the dynamics of the system, BOT graphs allow the researcher to learn how behavior is changing which, in turn, represents the structure of the system. BOT graphs can illustrate behavior of different scenarios taking into account different variables. The target behavior in this research is the final consumption of SUPs in food delivery. The baseline scenario or Business-As-Usual (BAU) scenario was calculated from the amount of SUPs pieces per order estimated by the private and public sector. The input to the graph includes data obtained from customers' acceptance level of corporate sustainable initiative and primary data from semi-structured interviews with the platforms, food retailers, government agencies, and sustainable niches.

The model was constructed based on the comprehensive information relating to the role that each stakeholder plays in relation to SUPs reduction, expectation of the government role, perceived key success and failure factors in the system, challenges and pressure that are the stumbling block to sustainable business practice, the importance of network and partnership for sustainability, the sustainability of the sustainable niches, the factors reinforcing/undermining the growth and expansion of such niches, sustainable initiatives as the means or an end, and greenwashing potential. Information from stakeholders enhances the understanding of the dynamics and flows within the system and thus be beneficial to the SD model adjustment. In the analysis step, quantitative parameters were subject to the BOT graph analysis. Other information that numerical implication is unknown was analysed descriptively through the illustration of diagrams.

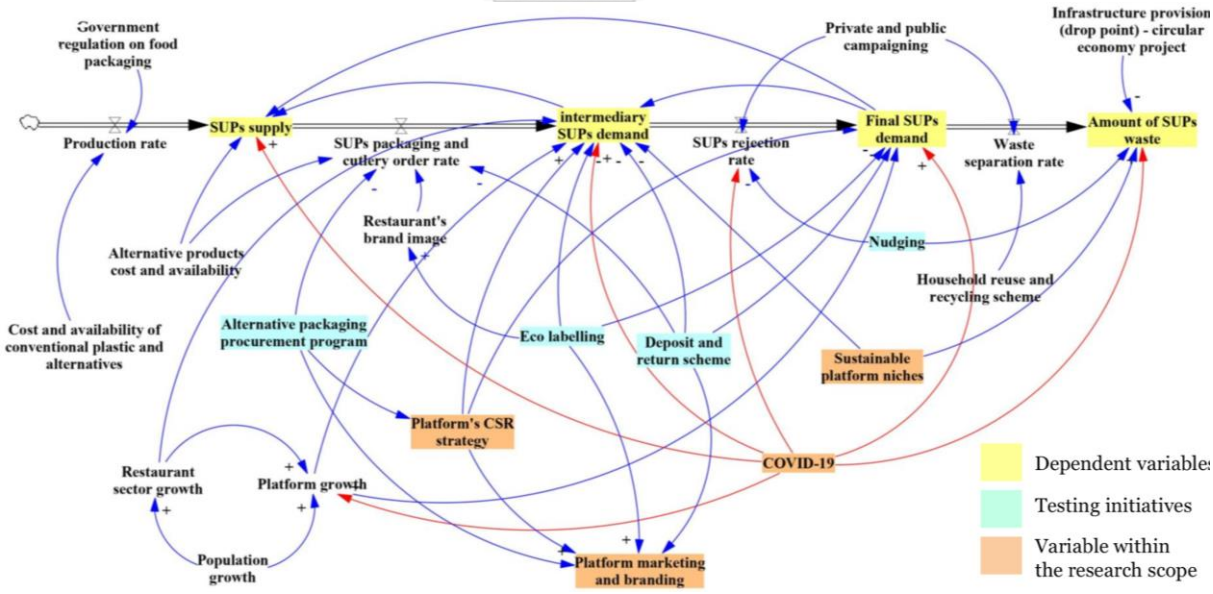

Figure 3.3: System dynamic model of SUPs in food delivery business via Vensim

CHAPTER 4
DATA ANALYSIS AND RESULTS

1. Demand-led Sustainable Consumption: Quantitative analysis

Consumer research was conducted in order to answer research question 1, what are the environmental profiles of platform food delivery customers? 40 pre-tests were distributed prior to the actual survey. The questionnaire was adjusted according to the pre-test feedback. The major adjustments were related to psychological components. The pre-test results reflected some ambiguity, irrelevancy, and redundancy. Some of the items were toned down to make it easier for the general public to understand. Some words were adjusted to enhance familiarity. Some grouping and regrouping were done. More examples were provided throughout. The final survey was made via Google form and was distributed via social media during 28 October 2020 - 25 December 2020, 444 results were obtained. Another 50 surveys were acquired through paper-based face-to-face surveys.

1.1 Data cleaning

After coding, data cleaning was the first step taken before conducting analysis. Missing data and outliers were observed and eliminated. First, two cases of missing data were filled with imputed values (Joseph et al., 2010). Both missing values are presented in demographic questions, which was, province. Therefore, they were replaced by the mode value as 'province' is categorical data type. The survey presented a low rate of missing data since 90 per cent of data was obtained through online surveys where all questions were set as required, while another 10% of survey data was collected through face-to-face survey. Both missing values appeared in the paper-based surveys.

This research then conducted outlier analysis to detect and eliminate data that presented significant distance from other observations in the data set. Univariate outliers and multivariate outliers were removed. Z-score values were computed to identify univariate outliers while Mahalanobis distance values were used to observe multivariate outliers. Z-score (standard score) looked into data points that are located too far from the mean where mean is 0 and standard deviation is 1. In this approach, data that presented z-score values outside the threshold of -3 and 3 were treated as outliers. As a result, 13 cases of survey data were eliminated. Then, multivariate outliers were identified through the calculation of Mahalanobis distance values which indicated the distance between point and distribution. The Mahalanobis distance values with $p < 0.001$ were eliminated. As a result, two cases were dropped from the data set. After eliminating 15 cases of outliers (13 cases in an online data set and 2 cases in offline data set), 479 complete cases were treated as input for the analysis.

1.2 Reliability of the survey

In order to affirm the reliability of data obtained via online and offline (paper-based) channel, various analysis was performed throughout the testing variables. Descriptive analysis, independent samples t-test, Chi-square test, and reliability test yielded results as follows. First, it can be descriptively observed that paper-based sample consists of more females based in Bangkok with lower income class. Second, it can also be observed from the behavioral profiles that sample collected offline (paper-based) ordered significantly less *during* the dine-in prohibition measure. Third, only perception towards foam packaging was found to be significantly differ. Paper-based respondents are more concerned about health impact of foam food containers while larger proportion of online respondents think that foam is fine. To conclude, despite having higher social desirability, paper-based survey is subjected to sampling bias as the survey was distributed purposively based on researcher's evaluation. However, the reliability of measurement scales, CFC and ECCS were satisfactory in both online and paper-based data. No other differences between results obtained from online sample and paper-based sample were found in other constructs.

1.3 Descriptive analysis

1.3.1 Demographic profile

The descriptive statistics of respondents demographic profiles are detailed in Table 4.1. The majority of respondents were female (68.7%) aged between 18-35 (57%) ($\bar{x}$=35.37) with Bachelor's degree (54.3%) lives in Bangkok and vicinities (84.8%), possessing high household income between 75,000–100,000+ THB (44.1%) and work as company employee (40.5%). It can be claimed that the obtained samples demographically represented the population of food delivery customers in Thailand as the majority of application users are clustered in Bangkok and vicinities with middle to high income and education (Statista, 2019). Likewise, Wongnai and LINE MAN found that food delivery customers are aged between 25-34 years old with high income (Wongnai, 2020) while Gojek found that the majority of its customers are female. The wider age range of food delivery customers would be between 17-38 years old (Marketingoops, 2019; Witoorut, 2019).

When examining the differences between samples collected via online survey and paper-based survey, several observations can be identified. First, paper-based survey obtained slightly more females. Second, paper-based survey was conducted in Bangkok, making the residential characteristic of the sample biased towards Bangkok. Third, paper-based sample are clustered in the upper middle-income group while online sample are clustered in high income group. Lastly, less student and more company employee were found in paper-based survey. However, no statistically significant difference was presented in any variables. These sampling bias can be found in non-random sampling since paper-based survey was distributed by the researcher using purposive sampling technique aiming to capture target population.

Table 4.1: Demographic profiles of survey respondents

	Variables	Online sample (n=431)		Paper-based sample (n = 48)		Overall sample (n= 479)	
		Frequency	%	Frequency	%	Frequency	%
Gender	Male	135	31.3	13	27.1	**148**	**30.9**
	Female	295	68.4	34	70.8	**329**	**68.7**
	Others	1	0.2	1	2.1	**2**	**0.4**
Age $\bar{x}$ *Online 35.3 Paper 35.7 Overall 35.4*	18-35	245	56.8	28	58.3	**273**	**57**
	36-49	135	31.4	14	29.2	**149**	**31.1**
	50-65	51	11.8	6	12.5	**57**	**11.9**
Education Level	Lower than Bachelor's	13	3	1	2.1	**14**	**2.9**
	Vocational school	3	0.7	0	0	**3**	**0.6**
	Bachelor's	234	54.3	26	54.1	**260**	**54.3**
	Higher than Bachelor's	180	41.7	21	43.7	**201**	**41.9**
	Others	1	0.2	0	0	**1**	**0.2**
Residence	Bangkok and vicinities (Nonthaburi, Samut Prakan, Samut Sakhon, Nakhon Pathom, Pathum Thani)	358	83.1	48	100	**406**	**84.8**
	Others (e.g., Chiangmai, Rayong, Songkhla)	73	16.9	0	0	**73**	**15.2**
Household Income	Low income (0–35,000 THB)	124	28.8	11	22.9	**139**	**28.2**
	Lower middle income (35,000–65,000 THB)	89	20.6	12	25	**111**	**21.1**
	Upper middle income (65,000–100,000 THB)	84	19.5	14	29.2	**98**	**20.5**
	High income (>100,000 THB)	134	31.1	11	22.9	**145**	**30.3**
Occupation	Student	36	8.4	2	4.2	**38**	**7.9**

State employee/ official	80	18.6	9	18.8	**89**	**18.6**
Company employee	172	39.9	22	45.8	**194**	**40.5**
University employee	26	6	4	8.3	**30**	**6.3**
Business owner	68	15.8	6	12.5	**74**	**15.4**
Self-employed	18	4.2	3	6.3	**21**	**4.4**
Unemployed	22	5.1	2	4.2	**24**	**5.0**
Others	9	2.1	0	0	**9**	**1.9**

1.3.2 Behavioral profile

The behavioral construct comprised three parts. It asked about ordering frequency at three different periods: before, during and after COVID-19. It also asked about cutlery availability and cutlery usage behavior.

1) Ordering behavior was assessed through a question 'how many times per week do you place order(s) via Grab, LINE MAN, Gojek or Foodpanda application on your own smartphone at these following periods: Before COVID-19, during the restaurants dine-in restriction, and after the restaurants reopened?'. As illustrated in the Alluvial diagram (Figure 4.1), respondents placing less than one order per week before COVID-19 were divided out to other higher frequency levels during the dine-in prohibition period indicating that they ordered more often. After the restaurants reopened, the total size of respondents ordering less than one time per week bounced back to the size smaller than the pre-pandemic level indicating that the order frequency remained higher even after the lockdown measures were eased.

As statistically appeared in Figure 4.2, before COVID-19 period, the respondents ordered around 1 time per week on average ($\bar{x}$=1.32, S.D.=0.970). During the restaurant dine-in restriction, the respondents ordered around 3 times per week on average ($\bar{x}$=2.66, S.D.=1.211). However, after the restaurant reopened for dine-in, the respondents ordered around 2 times per week on average ($\bar{x}$=1.78, S.D.=1.081). These illustrations and statistics conveyed change in consumption behavior influenced by the COVID-19-influenced government's lockdown measure.

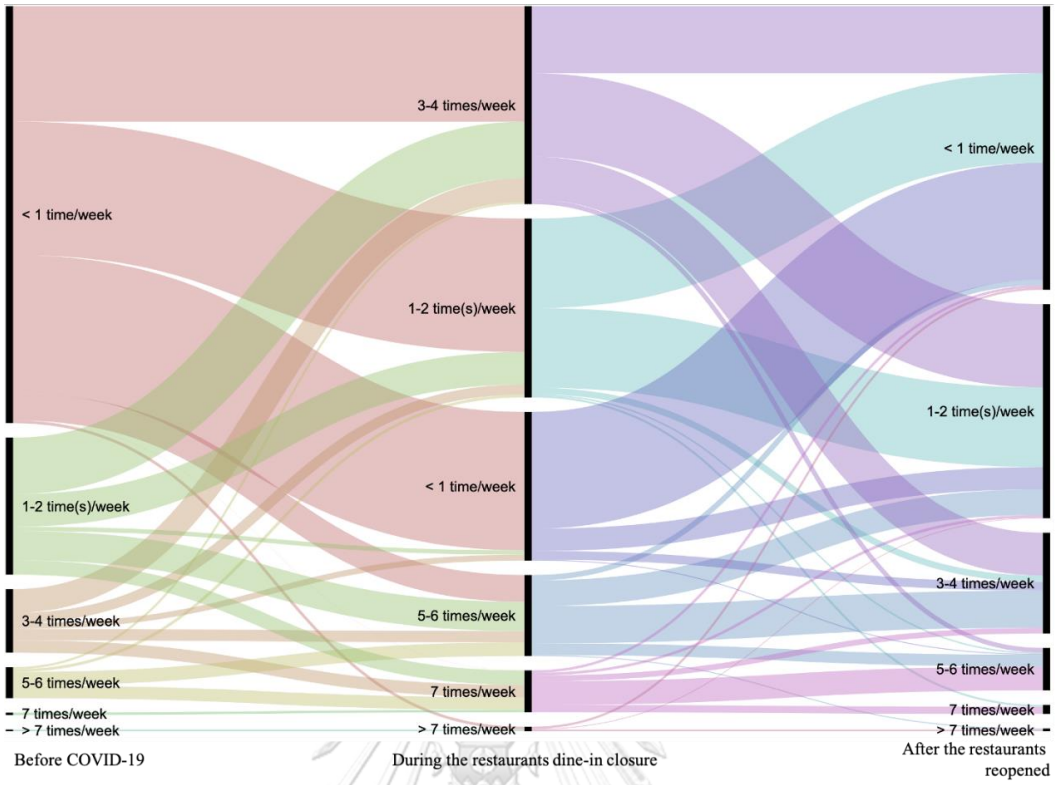

Figure 4.1 : Alluvial diagram of change in ordering frequency at different periods

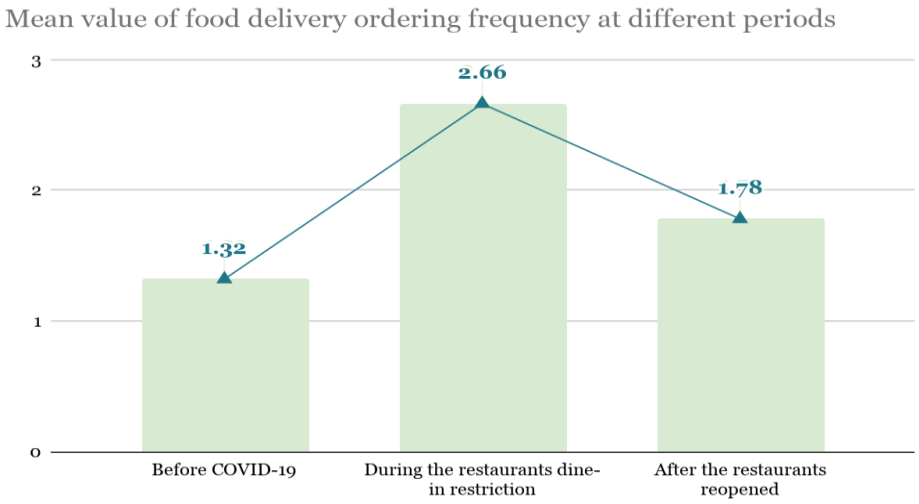

Figure 4.2: Change in mean values of ordering frequency at different periods

To obtain statistical evidence of the change in mean values illustrated in Figure 4.2, a paired t-test was conducted to compare the means at three different times (Ho = the means at three periods are equal). As reported in Table 4.2, all *p* values were less than 0.05, so Ho was rejected. The result indicated that mean

values at three different periods were statistically significantly different. The statistical result supported the concern of the environmentalists that the COVID-19 disruption will lead to long-term behavioral change in consumption. In this case, having COVID-19 as a catalyst, people tend to order food delivery more often even after the catalyst was withdrawn.

Table 4.2: Paired samples test of ordering frequency at different periods

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Before & During	479	.558	.000
Pair 2	During & After	479	.616	.000
Pair 3	Before & After	479	.609	.000

When examining the differences between samples collected via online survey and paper-based survey, it is found that paper-based sample ordered significantly less at the period *during* the dine-in prohibition measure, when being compared to online samples (p = 0.026, F = 4.979)

2) Cutlery availability. When asking 'how often do you have metal cutlery available at your eating place?' 42% of the respondents reported that they always have metal cutlery available at their eating place while 23.8% of the respondents reported that they have their cutlery available at their eating place most of the time. The reported mean value is 3.79 with a standard deviation of 1.334. The frequency statistic is illustrated in Table 4.3.

Table 4.3: Descriptive statistics of cutlery availability

		Frequency	Percent
Valid	never available	45	9.4
	available sometime	49	10.2
	neutral	70	14.6
	available most of the time	114	23.8
	always available	201	42.0
	Total	479	100.0

3) Cutlery usage. When asking 'Do you use SUPs cutlery more often during COVID-19?', the majority of the respondents (26.1%) answered 'very less'. While other respondents answered unchanged (25.7%), quite often (24%), quite less (20.5), and very often (3.8%) as reported in Table 4.4. The reported mean value was 2.59 with a standard deviation of 1.214.

Table 4.4: Descriptive statistics of SUPs cutlery usage

		Frequency	Percent
Valid	Very less	125	26.1
	Quite less	98	20.5
	Unchanged	123	25.7
	Quite often	115	24.0
	Very often	18	3.8
	Total	479	100.0

1.3.3 Environmental perception

Perception construct comprised three parts: excessive packaging, foam packaging, and biodegradable packaging.

1) Excessive food delivery packaging concern was assessed through the question 'I think most of my food delivery orders have excessive and unnecessary packaging' with five-point likert scale (strongly disagree - strongly agree). The reported mean value was 4.05 (agree) with a standard deviation of 1.093. Almost half of the respondents (45.5 per cent) strongly agreed that their food delivery order came with excessive and unnecessary packaging. The frequency distribution is illustrated in Table 4.5.

Table 4.5: Descriptive statistics of excessive packaging concern

		Frequency	Percent
Valid	strongly disagree	20	4.2
	disagree	21	4.4
	neutral	90	18.8
	agree	130	27.1
	strongly agree	218	45.5
	Total	479	100.0

2) Perception towards styrofoam packaging was assessed through a question 'what do you think about a restaurant that uses Styrofoam containers?' with three answer options. Most respondents (55.5%) thought that the restaurant should change to other materials for environmental reasons, while some (34.3%) were concerned about the health aspect. As this data type is nominal, the frequency distribution is illustrated in Table 4.6. When examining the differences between samples collected via online survey and paper-based survey, a significant difference was detected (p=0.022, Pearson Chi-Square=7.657). Descriptively, online respondents think that foam is fine (10.9%). They concerned less about health impact of foam food containers (32.7%) and more about environmental impact (56.4%). On the other hand, the results from paper-based respondents showed a proportion of 2.1%, 50%, and 47.9% sequentially.

Table 4.6: Descriptive statistics of perception towards Styrofoam

		Frequency	Percent
Valid	Foam is fine. no problem.	48	10.0
	the restaurant should change to other materials for health reason.	165	34.4
	the restaurant should change to other materials for environmental reason.	266	55.5
	Total	479	100.0

3) Perception towards biodegradable packaging. When being asked 'What do you think about restaurants that use containers labelled 'Biodegradable'?'. Most respondents (68.7%) believed that the restaurant has environmental responsibility. However, some of them were not sure about the actual environmental attributes of biodegradable products (29%). As this data type is nominal, the frequency distribution is illustrated in Table 4.7.

Table 4.7: Descriptive statistics of perception towards biodegradable packaging

		Frequency	Percent
Valid	indifferent. any box is the same.	11	2.3
	the retaurant has environmental responsibility	329	68.7
	not sure about the environmental attributes of biodegradable product	139	29.0
	Total	479	100.0

1.3.4 Environmental psychology: environmental attitude

Two environmental psychology constructs explored in this research were *time perspective* which was measured through Consideration of Future Consequence scale (CFC), and *environmental value* which was measured through Ecologically Conscious Consumer Scale (ECCS). Each construct contained five items with five-point likert scale (strongly disagree - strongly agree). When examining internal consistency, reliability analysis showed that these ten items exhibit high Cronbach's alpha reliability score of 0.767 (Table 4.8) which fell into the threshold value (>0.7) (Nunnally, 1994). To confirm reliability of scales in online survey, reliability analysis revealed satisfactory Cronbach's alpha score of 0.778. Mean value of each construct was used for the analysis to represent the overall result of the scale.

The mean scores showed that survey participants scored positive in both constructs. Out of 5, CFC showed the mean value of 3.86 and a standard deviation of 0.598 while ECCS yielded mean value of 3.99 and a standard deviation of 0.589 as shown in Table 4.9. Online samples presented slightly lower mean values than the paper-based sample in both constructs, CFC ($\bar{x}$=3.85, 3.90) and ECCS ($\bar{x}$=3.98, 4.06). The differences were not statistically significant in both constructs (CFC p=0.537, F=0.381) (ECCS p=0.352, F=0.870). These two constructs also showed a strong positive correlation with Pearson correlation value of 0.609 as presented in Table 4.10 indicating that both scales are closely related. Online sample showed Pearson correlation value of 0.609 while slightly higher correlation was detected in paper-based survey (0.619). The integration of similar variables can be found in other relevant studies (e.g., Do Paco et al., 2009; Gilg et al., 2005; Pavalache-Ilie, 2017)

Table 4.8: Reliability statistics of environmental attitude

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.767	.790	10

Table 4.9: Descriptive statistics of environmental attitude

	N	Minimum	Maximum	Mean	Std. Deviation
CFC	479	2.00	5.00	3.8568	.59870
ECCS	479	2.20	5.00	3.9961	.58983
Valid N (listwise)	479				

Table 4.10: Correlation matrix of environmental attitude

Correlations

		CFC	ECCS
CFC	Pearson Correlation	1	.609**
	Sig. (2-tailed)		.000
	N	479	479
ECCS	Pearson Correlation	.609**	1
	Sig. (2-tailed)	.000	
	N	479	479

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

1.3.5 CSR expectation

The CSR expectation construct asked about customers' expectation towards business responsibility. It contained three items which presented high internal consistency with Cronbach's alpha of 0.787 (Table 4.11) which fell into the threshold value of > 0.70 (Nunnally, 1994). To confirm reliability of scales in online survey, reliability analysis revealed satisfactory Cronbach's alpha score of 0.789. As presented in Table 4.12, when examining the whole construct, overall consumer expectation towards CSR was

considerably high ($\bar{x}$=4.63, S.D.=0.553). By items, EXP1 ‘I think that food delivery platforms should provide options for customers to reduce SUPs from food delivery orders’ received moderate score. EXP2 ‘I think that food delivery platforms should encourage their restaurant partners to reduce unnecessary plastic packaging or change to environmentally-friendly packaging even if it involves higher cost’ scored the least, while EXP3 ‘I believe that business must actively reduce SUP consumption to prevent plastic pollution’ scored the highest. Online samples presented slightly lower mean values than the paper-based sample in overall expectation ($\bar{x}$=4.61, $\bar{x}$=4.72). The differences were not statistically significant (*p*=0.216, F=1.54).

Table 4.11: Reliability statistics of CSR expectation

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.787	.796	3

Table 4.12: Descriptive statistics of CSR expectation

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
OVERALL	479	2.67	5.00	4.6291	.55391
EXP1	479	2	5	4.65	.649
EXP2	479	1	5	4.52	.751
EXP3	479	3	5	4.72	.573
Valid N (listwise)	479				

1.3.6 Acceptance level, intention to support, and willingness to pay towards initiatives

1) No cutlery defaults

The survey participants were asked to rate how much they agree with this initiative on a five-likert scale (strongly disagree - strongly agree). Majority of the respondents (77.9%) strongly agreed with the concept. This item yielded a mean value of 4.70, which is strongly agree, and a standard deviation of 0.649. The frequency distributions are shown in Table 4.13.

Table 4.13: Descriptive statistics of acceptance level of ‘no cutlery default’

		Frequency	Percent
Valid	strongly disagree	3	.6
	disagree	2	.4
	neutral	26	5.4
	agree	75	15.7
	strongly agree	373	77.9
	Total	479	100.0

2) Packaging procurement

The survey participants were asked to rate how much they agree with this initiative on a five-likert scale (strongly disagree - strongly agree). Majority of the respondents (54.7%) strongly agreed with the concept. This item yielded a mean value of 4.22, agree, and a standard deviation of 1.054. When being asked 'how much will you pay extra for one box of green packaging (THB/piece)', Majority of the respondents (34.4%) were willing to pay five THB per piece with a mean value of 3.20 THB per piece, with a standard deviation of 2.252. The frequency distributions of both items are shown in Table 4.14 and 4.15.

Table 4.14: Descriptive statistics of acceptance level of 'packaging procurement'

		Frequency	Percent
Valid	strongly disagree	15	3.1
	disagree	23	4.8
	neutral	65	13.6
	agree	114	23.8
	strongly agree	262	54.7
	Total	479	100.0

Table 4.15: Descriptive statistics of 'willingness to pay more for green packaging'

		Frequency	Percent
Valid	not willing to pay	48	10.0
	1THB/piece	74	15.4
	2THB/piece	92	19.2
	3THB/piece	73	15.2
	4THB/piece	3	.6
	5THB/piece	165	34.4
	6THB/piece	2	.4
	7THB/piece	5	1.0
	10THB/piece	15	3.1
	more than 10THB/piece	2	.4
	Total	479	100.0

3) Eco-labelling

The survey participants were asked to rate how much they agree with this initiative on a five-likert scale (strongly disagree - strongly agree). Majority of the respondents (77.5%) strongly agreed with the concept. Interestingly, none of the respondents strongly disagreed with this 'eco-labelling' initiative. This item yielded a mean value of 4.71, which is strongly agree, and a standard deviation of 0.595. From a customer perspective, intention to support the restaurants under this initiative was examined through a five-likert scale (strongly does not want to support - strongly want to support). Majority of the respondents (71.4%) showed strong positive intention to support this initiative. Likewise, only two respondents had negative intentions. This item yielded a mean value of 4.64, strong positive intention, and a standard deviation of 0.631. The frequency distributions of both items are shown in Table 4.16 and 4.17.

Table 4.16: Descriptive statistics of acceptance level of ‘eco-labelling’ initiative

		Frequency	Percent
Valid	disagree	3	.6
	neutral	26	5.4
	agree	79	16.5
	strongly agree	371	77.5
	Total	479	100.0

Table 4.17: Descriptive statistics of ‘intention to support eco-labelling initiative

		Frequency	Percent
Valid	strong negative intention	1	.2
	negative intention	1	.2
	neutral	31	6.5
	positive intention	104	21.7
	strong positive intention	342	71.4
	Total	479	100.0

4) Deposit-return scheme

The survey participants were asked to rate how much they agree with this initiative on a five-likert scale (strongly disagree - strongly agree). Majority of the respondents (38.8%) strongly agreed with the concept. This item yielded a mean value of 3.76, which is agree, and a standard deviation of 1.271. From a customer perspective, intention to support this initiative was examined through a five-likert scale (strongly does not want to support - strongly want to support). Majority of the respondents (37.8%) showed strong positive intention to support this initiative. This item yielded a mean value of 3.70, positive intention, and a standard deviation of 1.306. When being asked ‘how much deposit you are willing to pay for one box of returnable container (THB/piece)’, the majority of the respondents (38%) were willing to pay a deposit of 1-30 THB per piece, with a standard deviation of 1.252. The frequency distributions of these items are shown in Table 4.18, 4.19, and 4.20.

Table 4.18: Descriptive statistics of acceptance level of ‘deposit-return scheme’

		Frequency	Percent
Valid	strongly disagree	37	7.7
	disagree	45	9.4
	neutral	101	21.1
	agree	110	23.0
	strongly agree	186	38.8
	Total	479	100.0

Table 4.19: Descriptive statistics of ‘intention to support deposit-return scheme’

		Frequency	Percent
Valid	strong negative intention	46	9.6
	negative intention	39	8.1
	neutral	107	22.3
	positive intention	106	22.1
	strong positive intention	181	37.8
	Total	479	100.0

Table 4.20: Descriptive statistics of ‘willingness to pay deposit’

		Frequency	Percent
Valid	not willing to pay	107	22.3
	less than 30THB/piece	182	38.0
	31-50THB/piece	125	26.1
	51-70THB/piece	27	5.6
	71-100THB/piece	22	4.6
	101-150THB/piece	11	2.3
	more than 150THB/piece	5	1.0
	Total	479	100.0

1.4 Item analysis

Prior to cluster analysis, an item analysis was performed in order to determine that all of the items in the CFC and ECCS scales were related to the same domain. As detailed in Table 4.21, the corrected item-total correlation showed that all of the items had high item-rest correlations (> 0.25). None of the items, if removed, would yield any significant improvement in Cronbach’s alpha value. This result corresponded to Cronbach’s alpha shown in Table 4.8 (0.767) which conveyed overall reliability. Therefore, none of the items were removed from the final scale.

Table 4.21: Item-total statistics of environmental attitude

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
CFC1	34.91	23.407	.401	.752
CFC2	34.51	25.309	.454	.750
CFC3	34.68	24.626	.520	.742
CFC4	37.07	23.382	.337	.764
CFC5	35.87	21.258	.511	.736
ECCS1	34.96	23.471	.482	.741
ECCS2	34.66	24.531	.537	.740
ECCS3	35.03	23.510	.467	.743
ECCS4	36.83	23.018	.373	.758
ECCS5	34.87	23.597	.432	.747

1.5 Cluster analysis

Hierarchical cluster analysis with Ward's method was used to classify respondents into groups with highest in-group homogeneity and between group heterogeneity. The interval measure was the Squared Euclidean distance. Through this technique, individuals were paired repeatedly according to their similarity until there is only one cluster left. The percentage variation of the Agglomerative coefficients and the observation of Dendrogram using Ward linkage indicated that a three-cluster solution was the most reasonably appropriate and interpretable solution. After the optimum number of clusters was decided, the clusters were labelled according to their environmental psychology statistical characteristics as presented in Table 4.22.

Table 4.22: Descriptive statistics on environmental attitude of each cluster

Ward Method		CFC	ECCS
Cluster 1 – Moderate	Mean	3.8839	4.0819
	N	317	317
	Std. Deviation	.38700	.44940
Cluster 2 – Low	Mean	3.1516	3.2637
	N	91	91
	Std. Deviation	.54759	.51197
Cluster 3 – High	Mean	4.6394	4.5521
	N	71	71
	Std. Deviation	.33911	.28778
Total	Mean	3.8568	3.9961
	N	479	479
	Std. Deviation	.59870	.58983

The three clusters are labelled:

Cluster 1 Moderate environmental attitude (n = 317)
Cluster 2 Low environmental attitude (n = 91)
Cluster 3 High environmental attitude (n = 71)

When examining the differences among groups, the results of One-Way ANOVA test appeared in Table 4.23 indicated that the null hypothesis of equal means among the groups should be rejected ($p < 0.05$) and it could be concluded that the groups had different means. Post Hoc comparison was then conducted to confirm the statistical significance among the three pairwise groups ($p < 0.05$), as shown in Table 4.24. When observing each item individually, it was confirmed that every item displayed significantly different means across three clusters ($p < 0.05$) as shown in Table 4.25.

Table 4.23: ANOVA test of differences in environmental attitude

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
CFC	Between Groups	88.971	2	44.485	257.088	.000
	Within Groups	82.365	476	.173		
	Total	171.335	478			
ECCS	Between Groups	73.090	2	36.545	186.634	.000
	Within Groups	93.206	476	.196		
	Total	166.295	478			

Table 4.24: Post Hoc comparison of environmental attitude

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
CFC	1	2	.73226*	.04947	.000	.6160	.8486
		3	-.75552*	.05462	.000	-.8839	-.6271
	2	1	-.73226*	.04947	.000	-.8486	-.6160
		3	-1.48779*	.06587	.000	-1.6426	-1.3329
	3	1	.75552*	.05462	.000	.6271	.8839
		2	1.48779*	.06587	.000	1.3329	1.6426
ECCS	1	2	.81812*	.05263	.000	.6944	.9419
		3	-.47025*	.05810	.000	-.6068	-.3337
	2	1	-.81812*	.05263	.000	-.9419	-.6944
		3	-1.28838*	.07007	.000	-1.4531	-1.1236
	3	1	.47025*	.05810	.000	.3337	.6068
		2	1.28838*	.07007	.000	1.1236	1.4531

*. The mean difference is significant at the 0.05 level.

Table 4.25: ANOVA test of differences in each environmental attitude items

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
CFC1	Between Groups	209.264	2	104.632	171.676	.000
	Within Groups	290.110	476	.609		
	Total	499.374	478			
CFC2	Between Groups	47.083	2	23.541	89.403	.000
	Within Groups	125.339	476	.263		
	Total	172.422	478			
CFC3	Between Groups	33.484	2	16.742	47.107	.000
	Within Groups	169.172	476	.355		
	Total	202.656	478			
CFC4	Between Groups	258.774	2	129.387	168.837	.000
	Within Groups	364.780	476	.766		
	Total	623.553	478			
CFC5	Between Groups	149.622	2	74.811	64.838	.000
	Within Groups	549.217	476	1.154		
	Total	698.839	478			
ECCS1	Between Groups	57.473	2	28.736	42.794	.000
	Within Groups	319.634	476	.671		
	Total	377.106	478			
ECCS2	Between Groups	44.722	2	22.361	67.584	.000
	Within Groups	157.491	476	.331		
	Total	202.213	478			
ECCS3	Between Groups	44.647	2	22.324	30.823	.000
	Within Groups	344.743	476	.724		
	Total	389.390	478			
ECCS4	Between Groups	110.662	2	55.331	51.352	.000
	Within Groups	512.883	476	1.077		
	Total	623.545	478			
ECCS5	Between Groups	180.958	2	90.479	179.538	.000
	Within Groups	239.882	476	.504		
	Total	420.839	478			

Then, the bivariate analyses including cross-tabulation with Chi square, Fisher's exact statistics and One-Way ANOVA comparison of means were used to profile the obtained clusters and to confirm that the differences of mean among the groups are statistically significant.

1.5.1 Demographic profile of clusters

Despite the past evidence of weak association between demographic variables and environmental attitude, this research attempted to identify variables that could possibly describe consumer characteristics of each cluster. The statistical details and implications of the demographic profile of each cluster are presented in table 4.26. However, this research found that only gender, age, and occupation were statistically different across clusters. Although some frequency statistics can be explained descriptively; educational level, residence, and household income were not significant identifiers of the level of environmental attitude represented through three clusters. The details of statistical analysis can be found in Appendix II.

Table 4.26: Summary table of statistical demographic differences

Variable	Sample	Cluster 1 (Moderate)	Cluster 2 (Low)	Cluster 3 (High)	Test statistic and significance	Implication
Gender (%)	Female 68.7%	Female 71%	Female 52.7%	Female 78.9%	Likelihood Ratio* = 11.15 (p=0.025)	females are in the groups with moderate to high environmental attitude while male dominates in the group that has lower environmental attitude.
Age ($\bar{x}$)	35.37	35.35	32.26	37.99	ANOVA F= 6.50 (p=0.002)	Younger people have lower environmental attitudes while older people have higher environmental attitudes.
Educational level (%)	*Bachelor's 54.3% Master's 34.5% Doctoral 7.5%*	*Bachelor's 52.7% Master's 36.6% Doctoral 7.6%*	*Bachelor's 56% Master's 30.8% Doctoral 5.5%*	*Bachelor's 59.2% Master's 31% Doctoral 9.9%*	*Likelihood Ratio* = 11.94 (p=0.611)*	*There is no difference in educational level among clusters.*
Residence (%)	*Bangkok & vicinities 84.8%*	*Bangkok & vicinities 85.8%*	*Bangkok & vicinities 79.1%*	*Bangkok & vicinities 87.3%*	*Likelihood Ratio* = 50.27 (p=0.755)*	*There is no difference in residence among clusters.*
Household income (%)	*0-35k = 28.2% 35k-65k=21.1% 65k-100k=20.5% >100k=30.3%*	*0-35k = 26.1% 35k-65k=23.7% 65k-100k=21.8% >100k=28.4%*	*0-35k =36.1% 35k-65k=13.9% 65k-100k=18.1% >100k=31.9%*	*0-35k =29.9% 35k-65k=18.3% 65k-100k=18.3% >100k=33.3%*	*Pearson chi-square = 13.35 (p=0.647)*	*There is no difference in household income among clusters.*
Occupation (%)	Student 7.9% Government 18.6% Company 40.5% University Employee 6.3% Business owner/self-employed 19.9% Unemployed 5%	Student 7.9% Government 21.8% Company 40.3% University Employee 6.3% Business owner/self-employed 18.3% Unemployed 3.2%	Student 9.9% Government 13.2% Company 45.8% University Employee 3.3% Business owner/self-employed 23.1% Unemployed 11%	Student 5.6% Government 11.3% Company 36.8% University Employee 9.9% Business owner/self-employed 22.5% Unemployed 5.6%	Likelihood Ratio* = 31.22 (p=0.013)	Students, company employees, self-employed, and unemployed groups have low environmental attitudes. Government employees and business owners have moderate environmental attitudes

*more than 20% of cells have expected count less than 5. Therefore, Likelihood Ratio is used instead of Pearson Chi-Square value.

1) Gender

The differences in gender among three clusters were statistically significant. The Chi-square test showed that all three groups had significant differences in gender (p=0.025). In cross-tabulation, the percentage of females in cluster 2 (low environmental attitude) was significantly lower than in the other two clusters while the percentage of male was dominant in cluster 2. From these statistics, it can be implied that females tended to be in the groups with moderate to high environmental attitude (cluster 1 and 3) while male dominated the group that had lower environmental attitude (cluster 2).

2) Age

The differences in age among three clusters were statistically significant (F = 6.497, p = 0.002). Despite the overall significance, the Post Hoc comparisons test showed that the difference between cluster 1 (moderate environmental attitude) and cluster 3 (high environmental attitude) was not statistically significant (p = 0.074). For ease of analysis, the age was grouped into three ranges, 18-35, 36-49, and 50-65. Descriptively, the percentage of respondents in cluster 1 and cluster 3 in all three age ranges was only slightly different while cluster 2 (low environmental attitude) notably contained larger young respondents aged between 18-35. From these statistics, it can be implied that younger people tend to have lower environmental attitudes while older people have higher environmental attitudes.

From the descriptive statistics of the age differences among clusters, the results were reversely analysed for its relationship with the measurement scale items, namely time perspective and environmental value. For time perspective, the Chi-square test yielded p value of 0.004, meaning that all three age ranges had significant differences in CFC ($p < 0.05$). For environmental value, the Chi-square test yielded p value of 0.000, meaning that all three age ranges have significant differences in ECCS ($p < 0.05$). The descriptive statistics of both constructs showed that, the higher the age range, the higher CFC/ECCS scores. The cross-tabulation test exhibited the same pattern; most younger people aged 18-35 scored between 2-3 (out of 5) while people aged 36-49 and 50-65 scored the most between 4.2-5 (out of 5). This can be implied that younger generations possess higher psychological distance (lower CFC) and lower environmental value.

When analysing further on the convenience item through the question ‘convenience is the biggest factor in my food ordering decisions’, the Chi-square test yielded p value of 0.000, meaning that all three age ranges had significant differences in attitude towards convenience when using food delivery service ($p <$ 0.05). younger people aged 18-35 mostly agreed with the statement while people aged 36-49 and 50-65 mostly disagreed.

3) Educational level

The differences in educational level among three clusters were *not* statistically significant. The Chi-square test showed that all three groups had no significant differences in educational level (p = 0.611). However, descriptive analysis in cross-tabulation revealed that the percentage of the respondents with the degree lower than bachelor's were clustered in a lower environmental attitude group while none of them possessed a high environmental attitude. The respondents with vocational degrees also resided in cluster 2 (low environmental attitude). Bachelor's degree holders, as well as Master's degree holders were equally dispersed in all clusters. Respondents with doctoral degrees dominated in a high environmental attitude cluster. Descriptively, despite insignificant relationships, it can be implied that people with higher educational levels have a higher environmental attitude while non-bachelor holders have lower environmental attitudes.

4) Residence

The differences in residence among three clusters were not statistically significant. The Chi-square test showed that all three groups had no significant differences in residence (p = 0.755). However, despite the unbalanced sample distribution, it can be observed from cross-tabulation results that people living in Bangkok and vicinities had slightly higher environmental attitudes than people in other parts of the country. Such observations were in line with other studies such as Schwartz and Miller (1991) and Straughan and Roberts (1999).

Another observation is that people living in Chiangmai were notably aggregated in cluster 3 (high environmental attitude), double the size of which in cluster 1 and 2. This observation possibly pertained to the fact that Chiangmai is a major city where a number of sustainable initiatives have been implemented. The sustainable characteristic of the city is centered around zero-waste and sustainable/organic food consumption concepts. People in Chiangmai tend to develop a sustainable mindset and thus possess the Lifestyle of Health and Sustainability (LOHAS) characteristics (Holliday, 2017; Nisachon, 2015; Puangkingkaew & Tantiprabha, 2018).

5) Household income

The differences in household income among three clusters were not statistically significant. The Chi-square test showed that all three groups had no significant differences in residence (p = 0.647). However, it can be observed from cross-tabulation results that people with lower income tended to be clustered in cluster 2 (low environmental attitude) while higher income people tended to be clustered in cluster 3 (high environmental attitude).

6) Occupation

The differences in occupation among three clusters were statistically significant. The Chi-square test showed that all three groups had significant differences in occupation (p = 0.013). It can also be observed from cross-tabulation results that students, company employees, self-employed, and unemployed groups tended to have low environmental attitudes (cluster 2). Government employees/officials and business owners tended to have moderate environmental attitudes (cluster 1) and only university employees who possess high environmental attitudes (cluster 3).

1.5.2 Behavioral differences

The statistical behavioral differences among clusters, ordering behavior, cutlery availability, and cutlery usage are summarized in Table 4.27. The details of statistical analysis can be found in Appendix II.

Table 4.27: Summary table of statistical behavioral differences

Variable	Overall sample	Cluster 1 (Moderate)	Cluster 2 (Low)	Cluster 3 (High)	Test statistic and significance
Ordering behavior: before (x̄)	1.32 (S.D. = 0.97)	1.30 (S.D. = 0.96)	1.78 (S.D. = 1.12)	1.01 (S.D. = 0.80)	ANOVA F = 5.58 (p=0.004)
Ordering behavior: during (x̄)	2.66 (S.D. = 1.21)	2.81 (S.D. = 1.20)	2.79 (S.D. = 1.24)	1.97 (S.D. = 1.15)	ANOVA F = 6.82 (p=0.001)
Ordering behavior: after (x̄)	1.78 (S.D. = 1.08)	1.78 (S.D. = 1.07)	2.26 (S.D. = 1.09)	1.39 (S.D. = 1.03)	ANOVA F = 6.97 (p=0.001)
Cutlery availability (x̄)	3.79 (S.D. = 1.33)	3.74 (S.D. = 1.36)	3.39 (S.D. = 1.31)	4.28 (S.D. = 1.11)	ANOVA F =9.55 (p=0.000)
Cutlery usage (x̄)	2.59 (S.D. = 1.21)	2.65 (S.D. = 1.20)	2.69 (S.D. = 1.22)	2.28 (S.D. = 1.23)	ANOVA F =3.61 (p=0.028)

1) Ordering behavior across three clusters at different time periods are presented in Figure 4.3. When examining overall order frequency, cluster 2 (low environmental attitude) ordered the most while cluster 3 (high environmental attitude) ordered least frequent. Although the one-way ANOVA test showed statistically significant differences in overall ordering frequency among three clusters at all three periods (F = 5.580, 6.817, 6.971; p = 0.004, 0.001, 0.001), Post Hoc tests revealed some insignificant differences between some pairs. Before the dine-in

restriction, the order frequency between cluster 1 (moderate environmental attitude) and cluster 3 were not significantly different. During the restriction and after the restriction, the order frequency between cluster 1 and cluster 2 were not significantly different

By cluster, although the Post Hoc comparison test showed that there are statistically significant differences in ordering frequency between some clusters at some particular periods, when observing the change in ordering behavior of each cluster over time, such behavior changed at different magnitudes. Studied as a behavioral catalyst, COVID-19 influenced consumption behavior of cluster 1 the most (order frequency changed 116% and 37% across three periods) with standard deviations of 0.96,1.20, and 1.07. The consumption level of cluster 2 was least affected (order frequency changed 57% and 19% across three periods) with standard deviations of 1.12, 1.24, and 1.09. To conclude, cluster 1 exhibited the largest changes in consumption level overtime. They responded the most to new measures and adjusted their behavior accordingly. Cluster 2 showed the smallest changes across three periods. They responded the least to changing external conditions. Cluster 3 showed a considerably high rate of behavioral change, closer to that of cluster 1 (order frequency changed 95% and 29% across three periods) with standard deviations of 0.80, 1.15, and 1.03.

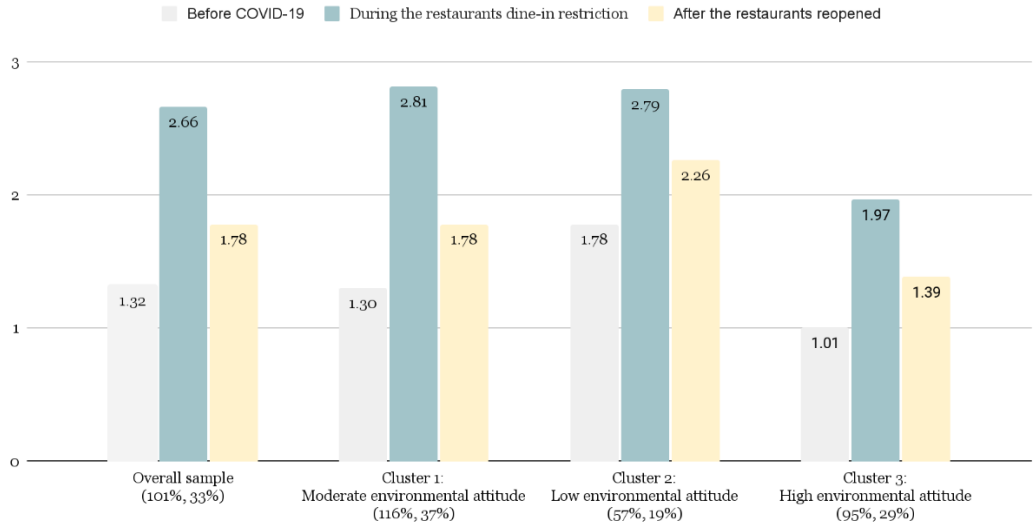

Figure 4.3: Change in mean values of ordering frequency

2) Cutlery availability looked at how frequently the respondents have metal cutlery available at their eating place. The five-likert scale ranged from never available to always available. Overall, cutlery usage rates were statistically significantly different across three clusters (F= 9.550, *p*=0.000). However, despite the overall significance, Post Hoc comparisons test showed that the difference in cutlery availability between cluster 1 (moderate environmental attitude) and cluster

2 (low environmental attitude) was not statistically significant (p=0.096). Descriptively, cluster 3 was more likely to have metal cutlery available at their eating place.

3) Cutlery usage examined how frequently the respondents used SUPs cutlery. The five-likert scale ranged from very less to very often. Overall, cutlery usage rates were statistically significantly different across three clusters (F=3.611, p=0.028). Despite the overall significance, the Post Hoc comparisons test showed that only the difference between cluster 1 (moderate environmental attitude) and cluster 3 (high environmental attitude) was statistically significant (p=0.029). Descriptively, cluster 3 used relatively less SUPs cutlery with their food delivery orders.

1.5.3 Psychological differences

1) Hypothesis development and testing

Psychological differences across three clusters were assessed through 12 hypotheses. The targeted variables included: excessive packaging concern, perception towards foam and biodegradable packaging, CSR expectation, acceptance level of initiatives, intention to support initiatives, willingness to pay for green packaging and willingness to pay deposit for returnable food container.

Hypothesis 1 (H1): There are differences in concern about excessive packaging among three groups.

Hypothesis 2 (H2): There are differences in perception towards foam packaging among three groups.

Hypothesis 3 (H3): There are differences in perception towards biodegradable packaging among three groups.

Hypothesis 4 (H4): There are differences in CSR expectation among three groups.

Hypothesis 5 (H5): There are differences in acceptance level of ‘no cutlery default’ initiative among three groups.

Hypothesis 6 (H6): There are differences in acceptance level of ‘packaging procurement’ initiative among three groups.

Hypothesis 7 (H7): There are differences in willingness to pay for green packaging among three groups.

Hypothesis 8 (H8): There are differences in acceptance level of ‘eco-labelling’ initiative among three groups.

Hypothesis 9 (H9): There are differences in intention to support the ‘eco-labelling’ initiative among three groups.

Hypothesis 10 (H10): There are differences in acceptance level of 'deposit-return scheme' initiative among three groups.

Hypothesis 11 (H11): There are differences in intention to support the 'deposit-return scheme' initiative among three groups.

Hypothesis 12 (H12): There are differences in willingness to pay deposit for returnable food container among three groups.

The hypotheses that are tested on clustered samples yield the results as concluded in Table 4.28. The details of statistical analysis can be found in Appendix II.

Table 4.28: Hypotheses conclusion and discussions

Hypothesis	Test results	Implication
H1: There are differences in concern about excessive packaging among three groups.	Supported p=0.000, F=17.299	The group with higher environmental attitude has higher concern about the excessiveness of food delivery packaging, while the group with lower attitude possesses lower concern.
H2: There are differences in perception towards foam packaging among three groups.	Supported p=0.000	The group with higher environmental attitude tends to have negative perceptions towards foam packaging that could harm the environment, while the group with lower attitude possesses more neutral perceptions.
H3: There are differences in perception towards biodegradable packaging among three groups.	Supported p=0.018	The group with higher environmental attitude tends to have lowest greenwashing potential. On the other hand, this group tends to be skeptical about green products. A group with a moderate environmental attitude tends to be easily deceived by corporate's green marketing programs. Also, the group with low environmental attitude possesses the highest ignorant characteristic while a group with high environmental attitude has lowest ignorant potential .
H4: There are differences in CSR expectation among three groups.	Supported p=0.000, F=51.362	The group with higher environmental attitude has higher expectation towards the business responsibility, while the group with lower attitude possesses lower expectation.
H5: There are differences in acceptance level of 'no cutlery default' initiative among three groups.	Supported* p=0.000, F=13.700 The difference in acceptance level	The group with higher environmental attitude has a higher acceptance level of 'no cutlery default' initiative, while the group

	between cluster 1 and cluster 3 is not statistically significant	with lower environmental attitude possesses lower acceptance level.
H6: There are differences in acceptance level of 'packaging procurement' initiative among three groups.	Not supported p=0.082, F=2.509	The acceptance level of 'packaging procurement' initiative is not influenced by environmental attitude
H7: There are differences in willingness to pay for green packaging among three groups.	Supported* p=0.000, F=10.085 The difference in willingness to pay for green packaging between cluster 1 and cluster 3 is not statistically significant	The group with high and moderate environmental attitude has the same level of willingness to pay for green packaging, while the group with lower attitude possesses considerably lower willingness to pay.
H8: There are differences in acceptance level of 'eco-labelling' initiative among three groups.,	Supported* p=0.000, F=22.318 The difference in acceptance level between cluster 1 and cluster 3 is not statistically significant	The group with higher environmental attitude has a higher acceptance level of 'no cutlery default' initiative, while the group with lower environmental attitude possesses lower acceptance level.
H9: There are differences in intention to support the 'eco-labelling' initiative among three groups.	Supported p=0.000, F=14.123	The group with higher environmental attitude has higher intention to support the 'eco-labelling' initiative while the group with lower attitude possesses a lower level of such intention.
H10: There are differences in acceptance level of 'deposit-return scheme' initiative among three groups.	Supported p=0.000, F=10.723	The group with higher environmental attitude has a higher acceptance level of 'deposit-return scheme' initiative, while the group with lower environmental attitude possesses a lower level of acceptance level.
H11: There are differences in intention to support the 'deposit-return scheme' initiative among three groups.	Supported* p=0.000, F=8.194 The difference in supporting intention between cluster 1 and cluster 2 is not statistically significant	The group with higher environmental attitude has higher intention to support the 'deposit-return scheme' initiative, while the group with lower attitude possesses lower intention.
H12:There are differences in willingness to pay deposit for returnable food container among three groups.	Supported p=0.002	The group with higher environmental attitude has higher willingness to pay deposit for returnable food container, while the group with lower attitude possesses lower willingness to pay.

(1) Hypothesis 1 (H1): There are differences in concern about excessive packaging among three groups.

This section examined the differences in concern about excessive packaging among three clusters (if any). The One-way ANOVA showed that all three groups concern differently about excessive packaging (F=17.299, p=0.00). Therefore, **hypothesis 1 was supported**. When conducting Post Hoc comparisons test, the result showed that all three pairwise groups possess statistically significantly different mean ($p < 0.05$). Descriptively, out of 5, cluster 3 concerns the most about excessive packaging ($\bar{x}$ = 4.49) while cluster 1 concerns slightly lower ($\bar{x}$ = 4.10); cluster 2 possesses lowest concern ($\bar{x}$ = 3.54). From these results, it can be implied that the group with higher environmental attitude has higher concern about the excessiveness of food delivery packaging, while the group with lower attitude possesses lower concern.

(2) Hypothesis 2 (H2): There are differences in perception towards foam packaging among three groups.

This section examined the differences in perception towards foam packaging among three clusters (if any). In Cross-tabulation, the proportion of each cluster were reported, when looking at the item 'foam is fine, no problem', respondents in cluster 2 (low environmental attitude) agreed with this statement the most (23.1%), followed by cluster 1 (moderate environmental attitude) (7.9%) and cluster 3 (high environmental attitude) (2.8%) consecutively. On the other hand, ' The restaurant should change to other materials for environmental reasons' received most scores in percentage from cluster 3 (high environmental attitude) (73.2%), followed by cluster 1 (moderate environmental attitude) (55.2%) and cluster 2 (low environmental attitude) (42.9%) consecutively. From the interpretation, the difference across the groups' proportion together with the uniformity can be detected. Chi-square test was performed to investigate if the differences were statistically significant. The Chi-square test showed that all three groups had significant differences in perception towards foam packaging (p = 0.000). Therefore, **hypothesis 2 was supported**. From these results, it can be implied that the group with higher environmental attitude tends to have negative perceptions towards foam packaging that could harm the environment, while the group with lower attitude possesses more neutral perceptions.

(3) Hypothesis 3 (H3): There are differences in perception towards biodegradable packaging among three groups.

This section examined the differences in perception towards biodegradable packaging among three clusters (if any). In Cross-tabulation, the proportion of each cluster were reported, when looking at the item 'indifferent, any box is the same', respondents in cluster 2 (low environmental attitude) agreed with this statement the most (4.4%), followed by cluster 1 (moderate environmental attitude) (1.9%) and cluster 3 (high environmental attitude) (1.4%) consecutively. When

investigating the statement 'the restaurant has environmental responsibility', cluster 1 (moderate environmental attitude) agreed with this statement the most (72.6%) followed by cluster 2 (low environmental attitude) (67.0%) and cluster 3 (high environmental attitude) (53.5%) consecutively. On the other hand, the *skeptics* statement 'not sure about the environmental attributes of biodegradable product' received most scores in percentage from cluster 3 (high environmental attitude) (45.1%), followed by cluster 2 (low environmental attitude) (28.6%) and cluster 1 (moderate environmental attitude) (25.6%) consecutively. From the interpretation, the difference across the groups' proportion can be detected. Chi-square with Fisher's Exact was performed[9] to investigate if the differences are statistically significant. The Fisher's Exact test showed that all three groups had significant differences in perception towards biodegradable packaging (p = 0.018). Therefore, **hypothesis 3 was supported**.

From these results, it can be implied that the group with higher environmental attitude tends to have lowest greenwashing potential as they scored the least among three groups in item 'the restaurant has environmental responsibility'. On the other hand, this group tends to be skeptical about green products as the large number of them, among three groups, agreed with the item 'not sure about the environmental attributes of biodegradable products'. A group with moderate environmental attitude tends to go with the flow, they are easily convinced by corporate's green marketing program as they scored highest in greenwashing potential item. It is also worth pointing out that the group with low environmental attitude possesses the highest ignorant characteristic as they, among three groups, most agreed with the item 'indifferent. any box is the same'. In contrast, a group with a high environmental attitude agreed the least with such a statement.

(4) Hypothesis 4 (H4): There are differences in CSR expectation among three groups.

This section examined the differences in CSR expectation among three clusters (if any). The One-way ANOVA showed that all three groups possess different levels of CSR expectation (F = 51.362, p = 0.00). Therefore, **hypothesis 4 was supported**. When conducting Post Hoc comparisons test, the result showed that all three pairwise groups possess statistically significantly different mean ($p < 0.05$). Descriptively, cluster 3 has the highest expectation ($\bar{x}$ = 4.88) while cluster 1 expects slightly lower ($\bar{x}$ = 4.71); cluster 2 possesses lowest expectation ($\bar{x}$ = 4.16). From these results, it can be implied that the group with higher environmental attitude has higher expectation towards the business responsibility, while the group with lower attitude possesses lower expectation.

By items, all three groups possess different levels of CSR expectation in all CSR items (F = 32.443/ 38.556/ 66.222, p = 0.000/ 0.000/ 0.000) in 'I think that food delivery platforms should provide options for customers to reduce

[9] **The Fisher's Exact test** is used to compute p value since the Chi-square tests reveal that 2 cells (22.2%) have expected count less than 5.

SUPs from food delivery orders', 'I think that food delivery platforms should encourage their restaurant partners to reduce unnecessary plastic packaging or change to environmentally-friendly packaging even if it involves higher cost', and 'I believe that business must actively reduce SUP consumption to prevent plastic pollution' consecutively.

(5) Hypothesis 5 (H5): There are differences in acceptance level of 'no cutlery default' initiative among three groups.

This section examined the differences in acceptance level of 'no cutlery default' initiative among three clusters (if any). The One-way ANOVA showed that all three groups possess different acceptance levels of 'no cutlery default' initiative (F = 13.700, p = 0.00). Therefore, **hypothesis 5 was supported**. However, despite the overall significance, the Post Hoc comparisons test showed that the difference in acceptance level between cluster 1 (moderate environmental attitude) and cluster 3 (high environmental attitude) was not statistically significant (p = 0.372). Descriptively, cluster 3 has the highest acceptance level of this initiative ($\bar{x}$ = 4.86) while cluster 1 has slightly lower acceptance level ($\bar{x}$ = 4.75); cluster 2 possesses lowest acceptance level ($\bar{x}$ = 4.40). From these results, it can be implied that the group with higher environmental attitude has higher acceptance level of 'no cutlery default' initiative, while the group with lower environmental attitude possesses lower acceptance level.

(6) Hypothesis 6 (H6): There are differences in acceptance level of 'packaging procurement' initiative among three groups.

This section examined the differences in acceptance level of 'packaging procurement' initiative among three clusters (if any). The One-way ANOVA showed that the differences in acceptance level of 'packaging procurement' initiative among three groups were not statistically significant (F = 2.509, p = 0.082). Therefore, **hypothesis 6 was *not* supported**. Post Hoc comparisons test also showed that means among three pairwise groups were not statistically significantly (p = 0.068, 0.983, 0.280). Descriptively, cluster 1 has the highest acceptance level of this initiative ($\bar{x}$ = 4.28) while cluster 3 has slightly lower acceptance level ($\bar{x}$ = 4.25); cluster 2 possesses lowest acceptance level ($\bar{x}$ = 4.00). From these results, it can be implied that the acceptance of 'packaging procurement' initiative was not influenced by environmental attitude.

(7) Hypothesis 7 (H7): There are differences in willingness to pay for green packaging among three groups.

This section examined the differences in willingness to pay for green packaging among three clusters (if any). The One-way ANOVA showed that all three groups possessed different willingness to pay for green packaging (F = 10.085, p = 0.00). Therefore, **hypothesis 7 was supported**. However, despite the overall significance, Post Hoc comparisons test showed that the difference in willingness to pay for green packaging between cluster 1 (moderate environmental attitude) and cluster 3 (high environmental attitude) was not statistically significant (p

= 1.000) as reported in Table 4.66 as they had exactly the same means ($\bar{x}$ = 3.42 THB). The descriptive statistic also showed that cluster 2 possesses lowest willingness to pay for green packaging ($\bar{x}$ = 2.26 THB). From these results, it can be implied that the group with high and moderate environmental attitude has the same level of willingness to pay for green packaging, while the group with lower attitude possesses considerably lower willingness to pay.

(8) Hypothesis 8 (H8): There are differences in acceptance level of 'eco-labelling' initiative among three groups.

This section examined the differences in acceptance level of 'eco-labelling' initiative among three clusters (if any). The One-way ANOVA showed that all three groups possessed different acceptance levels of 'eco-labelling' initiative (F = 22.318, p = 0.00). Therefore, **hypothesis 8 was supported**. However, despite the overall significance, the Post Hoc comparisons test showed that the difference in acceptance level between cluster 1 (moderate environmental attitude) and cluster 3 (high environmental attitude) was not statistically significant (p = 0.653). Descriptively, cluster 3 has the highest acceptance level of this initiative ($\bar{x}$ = 4.85) while cluster 1 has slightly lower acceptance level ($\bar{x}$ = 4.78); cluster 2 possesses lowest acceptance level ($\bar{x}$ = 4.35). From these results, it can be implied that the group with higher environmental attitude has higher acceptance level of 'no cutlery default' initiative, while the group with lower environmental attitude possesses lower acceptance level.

(9) Hypothesis 9 (H9): There are differences in intention to support the 'eco-labelling' initiative among three groups.

This section examined the differences in intention to support the 'eco-labelling' initiative among three clusters (if any). The One-way ANOVA showed that all three groups possessed different levels of intention to support (F = 14.123, p = 0.00). Therefore, **hypothesis 9 was supported**. When conducting Post Hoc comparisons test, the result showed that all three pairwise groups possessed statistically significantly different mean (p < 0.05). Descriptively, cluster 3 has the highest intention to support ($\bar{x}$ = 4.86) while cluster 1 has slightly lower intention ($\bar{x}$ = 4.67); cluster 2 possesses lowest intention to support ($\bar{x}$ = 4.36). From these results, it can be implied that the group with higher environmental attitude has higher intention to support the 'eco-labelling' initiative, while the group with lower attitude possesses a lower level of such intention.

(10) Hypothesis 10 (H10): There are differences in acceptance level of 'deposit-return scheme' initiative among three groups.

This section examined the differences in acceptance level of 'deposit-return scheme' initiative among three clusters (if any). The One-way ANOVA showed that all three groups possessed different acceptance levels of 'deposit-return scheme' initiative (F = 10.723, p = 0.00). Therefore, **hypothesis 10 was supported**. When conducting Post Hoc comparisons test, the result showed that all

three pairwise groups possessed statistically significantly different mean ($p < 0.05$). Descriptively, cluster 3 has the highest acceptance level of 'deposit-return scheme' initiative ($\bar{x} = 4.30$) while cluster 1 has lower acceptance level ($\bar{x} = 3.74$); cluster 2 possesses lowest acceptance level of the initiative ($\bar{x} = 3.38$). From these results, it can be implied that the group with higher environmental attitude has higher acceptance level of 'deposit-return scheme' initiative, while the group with lower environmental attitude possesses a lower level of acceptance.

(11) Hypothesis 11 (H11): There are differences in intention to support the 'deposit-return scheme' initiative among three groups.

This section examined the differences in intention to support the 'deposit-return scheme' initiative among three clusters (if any). The One-way ANOVA showed that all three groups possessed different intentions to support the 'deposit-return scheme' initiative ($F = 8.194$, $p = 0.00$). Therefore, **hypothesis 11 was supported**. However, despite the overall significance, the Post Hoc comparisons test showed that the difference in supporting intention between cluster 1 (moderate environmental attitude) and cluster 2 (low environmental attitude) was not statistically significant ($p = 0.230$). Descriptively, cluster 3 has the highest intention to support the 'deposit-return scheme' initiative ($\bar{x} = 4.23$). Cluster 1 possesses lower intention ($\bar{x} = 3.67$) while cluster 2 possesses only slightly lower intention than cluster 1 ($\bar{x} = 3.42$). From these results, it can be implied that the group with higher environmental attitude has higher intention to support the 'deposit-return scheme' initiative, while the group with lower attitude possesses lower intention.

(12) Hypothesis 12 (H12): There are differences in willingness to pay deposit for returnable food container among three groups.

This section examined the differences in willingness to pay deposit for returnable food container among three groups (if any). In Cross-tabulation, the proportion of each cluster was reported, cluster 2 (low environmental attitude) are least willing to pay while half of cluster 1 (moderate environmental attitude) are willing to pay less than 30 THB/piece. Likewise, half of cluster 3 (high environmental attitude) are willing to pay more than 30 THB/piece. From the interpretation, the difference across the groups' proportion can be detected. Chi-square with Fisher's Exact was performed to investigate if the differences were statistically significant. The Fisher's Exact test showed that all three groups had significant differences in willingness to pay deposit for returnable food container ($p = 0.002$). Therefore, **hypothesis 12 was supported**. From these results, it can be implied that the group with higher environmental attitude has higher willingness to pay a deposit for returnable food container, while the group with lower attitude possesses lower willingness to pay.

2) Discriminant analysis

Regarding the testing of continuous variables measuring psychological constructs, the tests of equality of group means revealed how much each variable contributes to discriminant function. The result, as appeared in Table 4.29, suggested that the variable 'CSR expectation', specifically, 'the expectation towards businesses' active role in reducing plastic consumption' provides the largest differences between the means of the clusters as it possessed the lowest Wilks' Lambda value. Meanwhile, the 'intention to support 'deposit-return scheme' initiative presented the lowest discriminatory power with the highest Wilks' Lambda value.

Table 4.29: Discriminant analysis

Tests of Equality of Group Means

	Wilks' Lambda	F	df1	df2	Sig.
Concern	.898	17.299	2	476	.000
CSR EXP 1	.880	32.443	2	476	.000
CSR EXP 2	.861	38.556	2	476	.000
CSR EXP 3	.782	66.222	2	476	.000
ACCEPT 1	.914	13.700	2	476	.000
ACCEPT 2	.862	22.318	2	476	.000
INT 2	.876	14.123	2	476	.000
WTM	.954	10.085	2	476	.000
ACCEPT 4	.945	10.723	2	476	.000
INT 4	.958	8.194	2	476	.002

3) Psychological profile of clusters

From the hypothesis testing across three clusters, the psychological profiles of each cluster were summarized as follows. The statistical psychological differences are presented in Table 4.30.

(1) Cluster 1: Moderate environmental attitude. This group possesses moderate concern about excessive packaging. They have moderate health and environmental concerns regarding foam packaging. They have a positive perception towards biodegradable packaging. They have moderate expectations towards the business responsibility. When it comes to sustainable initiatives, this cluster has a moderate acceptance level and intention to support all initiatives. They have the moderate willingness to pay for returnable containers in deposit-return schemes. However, they have the same level of willingness to pay for green packaging as a cluster 3.

(2) Cluster 2: Low environmental attitude. This group possesses the lowest concern about excessive packaging. Despite some environmental concern, they are more likely to perceive that using foam packaging is acceptable. They feel indifferent about biodegradable packaging. They have the lowest expectation towards the business responsibility. When it comes to sustainable initiatives, this cluster has the lowest acceptance level and intention to support all

initiatives. They have the lowest willingness to pay for returnable containers in deposit-return schemes and for green packaging.

(3) Cluster 3: High environmental attitude. This group possesses the highest concern about excessive packaging. They tend to have environmental concerns towards foam packaging. They are most likely to be skeptical about the claims of biodegradable packaging. They have the highest expectation towards the business responsibility. When it comes to sustainable initiatives, this cluster has the highest acceptance level and intention to support all initiatives. They have the highest willingness to pay for returnable containers in deposit-return schemes. However, they have the same level of willingness to pay for green packaging as a cluster 1.

Table 4.30: Summary table of statistical psychological differences

Variable	Sample	Cluster 1 (Moderate)	Cluster 2 (Low)	Cluster 3 (High)	Test statistic and significance
Concern towards excessive packaging (x̄)	4.05 (S.D. = 1.09)	4.10 (S.D. = 1.05)	3.54 (S.D. = 1.26)	4.49 (S.D. = 0.73)	ANOVA F = 17.29 (p=0.000)
Perception towards foam packaging (%)	Foam is fine 10% Health concern 34.4% Environmental concern 55.5%	Foam is fine 7.9% Health concern 36.9% Environmental concern 55.2%	Foam is fine 23.1% Health concern 34.1% Environmental concern 42.9%	Foam is fine 2.8% Health concern 23.9% Environmental concern 73.2%	Pearson chi-square = 30.08 (*p*=0.000)
Perception towards biodegradable packaging (%)	Indifferent 2.3% Impressed 68.7% Skeptical 29%	Indifferent 1.9% Impressed 72.6% Skeptical 25.6%	Indifferent 4.4% Impressed 67% Skeptical 28.6%	Indifferent 1.4% Impressed 53.5% Skeptical 45.1%	Likelihood Ratio* = 11.95 (*p*=0.018)
CSR expectation (x̄)	4.63 (S.D. = 0.55)	4.71 (S.D. = 0.47)	4.16 (S.D. = 0.71)	4.88 (S.D. = 0.27)	ANOVA F =51.36 (*p*=0.000)
Acceptance level of 'no cutlery default' initiatives (x̄)	4.70 (S.D. = 0.65)	4.75 (S.D. = 0.61)	4.40 (S.D. = 0.88)	4.86 (S.D. = 0.38)	ANOVA F =13.70 (*p*=0.000)
Acceptance level of 'packaging procurement' initiatives (x̄)	4.22 (S.D. = 1.05)	4.28 (S.D. = 1.03)	4.00 (S.D. = 1.13)	4.25 (S.D. = 1.01)	*ANOVA F =2.51 (p=0.082)*
Acceptance level of 'eco-labelling' initiatives (x̄)	4.71 (S.D. = 0.60)	4.78 (S.D. = 0.52)	4.35 (S.D. = 0.83)	4.85 (S.D. = 0.34)	ANOVA F =22.32 (*p*=0.000)

Acceptance level of 'deposit-return scheme' initiatives (x̄)	3.76 (S.D. = 1.27)	3.74 (S.D. = 1.22)	3.38 (S.D. = 1.37)	4.30 (S.D. = 1.20)	ANOVA F =10.72 (*p*=0.000)
Intention to support 'eco-labelling' initiatives (x̄)	4.64 (S.D. = 0.63)	4.67 (S.D. = 0.60)	4.36 (S.D. = 0.78)	4.86 (S.D. = 0.39)	ANOVA F =14.12 (*p*=0.000)
Intention to support 'deposit-return scheme' initiatives (x̄)	3.70 (S.D. = 1.31)	3.67 (S.D. = 1.31)	3.42 (S.D. = 1.30)	4.23 (S.D. = 1.16)	ANOVA F =8.19 (*p*=0.000)
Willingness to pay for green packaging (x̄)	3.20 THB (S.D. = 2.25)	3.42 THB (S.D. = 2.16)	2.26 THB (S.D. = 1.92)	3.42 THB (S.D. = 2.56)	ANOVA F =10.09 (*p*=0.000)
willingness to pay deposit for returnable food container (%)	Not willing to pay 22.3% ≤ 30 THB/piece 38% 31-50 THB/piece 26.1% 51-70 THB/piece 5.6% 71-100 THB/piece 4.6% > 100 THB/piece 3.3%	Not willing to pay 20.9% ≤ 30 THB/piece 39.7% 31-50 THB/piece 25.9% 51-70 THB/piece 6.6% 71-100 THB/piece 5% > 100 THB/piece 1.9%	Not willing to pay 38.9% ≤ 30 THB/piece 33.3% 31-50 THB/piece 18.1% 51-70 THB/piece 0% 71-100 THB/piece 4.2% > 100 THB/piece 5.6%	Not willing to pay 13.8% ≤ 30 THB/piece 35.6% 31-50 THB/piece 33.3% 51-70 THB/piece 6.9% 71-100 THB/piece 3.4% > 100 THB/piece 6.8%	Likelihood Ratio* = 31.55 (*p*=0.002)

*more than 20% of cells have expected count less than 5. Therefore, Likelihood Ratio is used instead of Pearson Chi-Square value.

1.6 Other assumed relationship among variables

After each variable was observed, other relationships among some theory-based psychological constructs were explored. Some constructs were made up of two variables. Chi-square, Pearson correlation, ANOVA, and descriptive analysis were used to identify the relationship among variables depending on the types of targeted variables. As shown in Table 4.31, the analysis revealed that 29 out of 36 pairs established significant relationships in forms of coefficients or differences in means. Among these, one pair presented partial correlation and six pairs showed no significant relationship.

Table 4.31: Summary table of relationships among constructs

	NEP attitudes	Green skepticism attitudes	Conscious consumption	Guilt-related feelings	Excessive packaging concern	Avoidance attitudes	CER expectation	WTP for green packaging	WTP for returnable containers
NEP attitudes		- (p=0.362)	• (p=0.042, 0.000)	• (p=0.000)	• (p=0.000)	• (p=0.000, 0.017)	• (p=0.000)	• (p=0.006)	- (p=0.165)
Green skepticism attitudes			• (p=0.004, 0.014)	- (p=0.102)	• (p=0.009)	• (p=0.000, 0.000)	- (p=0.059)	- (p=0.289)	• (p=0.000)
Conscious consumption				• (p=0.000, 0.000)	• (p=0.000, 0.000)	• (p=0.005, 0.000, 0.000, 0.000)	/ (p=0.151, 0.001)	• (p=0.030, 0.001)	• (p=0.043, 0.002)
Guilt-related feelings					• (p=0.000)	• (p=0.000, 0.000)	• (p=0.001)	- (p=0.080)	• (p=0.000)
Excessive packaging concern						• (p=0.000, 0.000)	• (p=0.000)	• (p=0.004)	• (p=0.033)
Avoidance attitudes							• (p=0.000, 0.000)	• (p=0.000, 0.050)	• (p=0.000, 0.003)
CER expectation								• (p=0.000)	• (p=0.000)
WTP for green packaging									• (p=0.000)
WTP for returnable containers									

* (-) There is no significant relationship between variables, (/) There is partial significant relationship between variables, (•) There is significant relationship between variables

Some interesting relationships are further discussed as follows:

1.6.1 Guilt-related feelings

Guilt-related feelings was assessed through a question ‘using SUPs during COVID-19 is acceptable because it can reduce the chance of virus transmission’ as part of an ECCS (ECCS4). Guilt is a self-conscious emotion against personal or subjective values. Avoidance behavior could be developed as a consequence of guilt (Albayrak et al., 2011; Bechtel & Churchman, 2003). People with more guilt feelings also tend to make decisions based on rationality (Lindsay-Hartz et al., 1995). Chen et al. (2017) also pointed out that guilt feeling can lead to consumers developing negative brand perception. The statistical tools included Pearson correlation test for continuous variables and ANOVA test for categorical variables. The hypothesis testing details can be found in Appendix II.

1.6.2 Attitudes towards human-nature relationship

The New Environmental Paradigm (NEP) believes that human-nature relationships are based on the ‘limit to growth’ concept. NEP reflects environmental values and therefore, is included in the ECCS of this research as ‘humans can continue to produce and consume as usual, no need to change anything since nature will eventually adjust itself to the balance point’ (ECCS5). Roberts (1996) found that consumers who scored high in ECCS also believe in limits to growth concept, and tend to avoid products with excessive use of packaging. People with NEP mindset are also

assumed to be more conscious in their consumption decisions and have higher WTP for green products (Straughan & Roberts, 1999; Tilikidou et al., 2002; Van Dam, 2016). Therefore, these relationships were tested in this section with Pearson correlation test as a statistical tool. The hypothesis testing details can be found in Appendix II.

1.6.3 Conscious consumption

Conscious consumption was assessed through items 'Convenience is the biggest factor in my food ordering decisions' (CFC4) and 'If I crave it, I will get it, other issues can be figured out later' (CFC5). A number of researchers pointed out that people with conscious consumption will have higher willingness to pay for green packaging, as well as expectation towards corporate responsibility. Older people are also assumed to be more conscious in consumption decisions (Gilg et al., 2005; Hallin, 1995; Rokka & Uusitalo, 2008). Therefore, these relationships were tested in this section with Pearson correlation test as a statistical tool. The hypothesis testing details can be found in Appendix II.

1.6.4 Green skepticism

Green skepticism was measured through the item relating to perception towards biodegradable packaging 'not sure about the environmental attributes of biodegradable product' [Biodeg]. Although most research found positive relationship between green skepticism and other environmental psychological attributes, some research found an inverse relationship between green skepticism and green purchase intention and environmental concern (e.g., Albayrak et al., 2011; Goh & Balaji, 2016). This study, therefore, explored the possibility of such a relationship. The statistical tools included Pearson Chi-square test and ANOVA test. The hypothesis testing details can be found in Appendix II.

2. Demand-led Sustainable Consumption: Qualitative analysis

2.1 Demographic profile

In addition to quantitative consumer research, 20 semi-structured in-depth interviews were conducted to improve the research results with the same set of questions. Demographic profiles of the sample are shown in Table 4.32.

Table 4.32: Demographic profile of interview respondents

Variables		Frequency (n=20)	Percent (%)
Gender	Male	8	40
	Female	12	60
Age	18-35	16	80

(x̄=30.70)	36-49	4	20
Education Level	Bachelor's	7	35
	Master's	13	65
Residence	Bangkok and vicinities	20	100
Household Income	Lower middle income (35,000–65,000 THB)	2	10
	Upper middle income (65,000–100,000 THB)	5	25
	High income (>100,000 THB)	13	65
Occupation	State employee/ official	7	35
	Company employee	8	40
	University employee	2	10
	Business owner	1	5
	Self-employed	1	5
	Unemployed	1	5

2.2 Data analysis: thematic analysis

Using thematic analysis, data obtained from in-depth consumer interviews were transcribed and coded according to the keywords and issues that showed a recurring pattern. The processed data can be found in Appendix III. Codes were then grouped into themes as shown in Table 4.33-4.39. For the report, the analysis was divided into four sections according to the interview topics including (1) behavioral profile (2) environmental perception and attitudes, (3) CSR expectations, and (4) acceptance level and willingness to pay towards initiatives

Table 4.33: Themes construction: behavioral profile

1. Behavioral profile	
Themes	**Details**
Theme 1: Prefer dine-in	Love physical experiences at the restaurant and social aspects in dine-in culture.
Theme 2: Food delivery offers convenience and great deals	It always has great promotional discounts and new restaurants. I got familiar with it and now rely on it.

Theme 3: Waste concern	There is lots of excessive packaging. COVID-19 limits the choice to takeaway where SUPs packaging is unavoidable. The information on how to manage packaging waste is not enough. Foam can also be dangerous to health.
Theme 4: Unconcerned	I use SUPs cutlery despite having the metal ones as I do not want to wash them. Do not care and are unaware about cons of using SUP cutlery

Table 4.34: Themes construction: environmental perception and attitudes

2. Environmental perception and attitudes	
Themes	**Details**
Theme 1: Appetizing and convenience are priorities.	The default setting should be the most convenient option. If it comes to appetizing, environmental issues can be secondary. Packaging waste is normal. What can I do ?
Theme 2: Aware of waste but what should I do?	Everyday waste is unavoidable. Alternative is limited. There is nothing we can do more than just rejecting cutlery. I get used to a pile of plastic waste at home.
Theme 3: Do my best with hope.	May be we would have innovative solutions to push changes in the market but I prefer to show personal environmental responsibility to society by doing what I think I should
Theme 4: Frustration and skeptical	With food delivery and lockdown measures, an unreasonable amount of plastics makes me frustrated. I do not know which one can actually degrade. Packagings that are not actually good for the environment should not be available in the market.

Table 4.35: Themes construction: CSR expectations

3. CSR expectations	
Themes	**Details**
Theme 1: Private sector alone can not solve problem	Delivery platforms should be aware of the negative sides of their business to some extent, but it is not their duty to manage plastics. They need government support especially for the cost.

Theme 2: Platforms and restaurants can create impact	platforms can regulate which packaging types should be used by the partner restaurants. They could develop a business model to induce transition for restaurants who want to change.
Theme 3: Consumers-related responsibility	Platforms and restaurants are expected to show responsibilities for its customers before environmental responsibilities.

Table 4.36: Themes construction: No cutlery default

4.1 Initiatives evaluation 1: No cutlery default	
Themes	**Details**
Theme 1: The initiative is not very successful	I received cutlery I did not want. The function needs to be improved.
Theme 2: Did not notice what is the default	I leave it as it is. Sometimes I use what was given when I do not feel like washing the steel one. It is also fine if they do not give one, I often have spares.

Table 4.37: Themes construction: packaging procurement

4.2 Initiatives evaluation 2: Packaging procurement	
Themes	**Details**
Theme 1: Not a good idea to charge customer	It should be optional. Not many customers will be willing to pay. Believe that packaging price is already included in the food price.
Theme 2: Platforms' incentives to the restaurants	It is good that platforms help small restaurants since green packaging is costly.

Table 4.38: Themes construction: eco-labelling

4.3 Initiatives evaluation 3: Eco-labelling	
Themes	**Details**
Theme 1: Incentives for customers	Platforms should consider giving discounts or points for customers who order from green labeled restaurants.

Theme 2: Good guide but not a decision factor	I may become aware of restaurants that use green packaging but that is not what I consider when choosing what to eat.

Table 4.39: Themes construction: deposit-return Scheme

4.4 Initiatives evaluation 4: Deposit-return Scheme	
Themes	**Details**
Theme 1: Operational challenges	For customers, pick-up is more preferable than drop-off. However, washing is challenging. For the restaurants, inventory management is challenging.
Theme 2: Scaling issues	Not sure if there will be a considerable number of participants; both customers and restaurants.
Theme 3: Hygienic issues	Platforms have to show that the cleaning process meets a certain standard that is acceptable.

3. System-led Sustainable Consumption

This section answered research question two, 'what are the high leverage points in the system that can be adjusted to reduce SUPs in the food delivery business?' which was examined through 1) stakeholder analysis, 2) system dynamics analysis, which included the model revision and leverage points identification, and 3) initiatives evaluation through Behavioral-Over-Time (BOT) graph.

3.1 Stakeholder analysis

This section covered semi-structured stakeholder interviews. The stakeholders included four parties (n=14); policy-level stakeholders (n=4), food delivery platforms (n=3), restaurant partners (n=5), and sustainable niches (n=3). All of the interviews were conducted via online channels according to the social-distancing policy. For the report, the data was categorized into six sections according to their similarities in topics including (1) business responsibility, (2) initiatives review, (3) expectation towards the governance agencies, (4) system dynamic analysis, (5) limitations to sustainable consumption, and (6) leverage points. Using thematic analysis, data obtained from semi-structured stakeholder interviews were transcribed and coded according to the keywords and issues that showed a recurring pattern (Appendix III). Codes are then processed into themes as shown in Table 4.40 - 4.48.

Table 4.40: Themes construction: business responsibility

1. Business responsibility	
Themes	**Details**
Theme 1: Have willingness but not equal capacity	Business sector has the willingness to act responsibly but they (especially the restaurants) do not have equal capacity.
Theme 2: Being profit-led, incentives is needed	Being profit-led, incentives are needed. Business can not go on with projects that are not profitable.
Theme 3: Customer-centric	Businesses need to focus on communication/ experience/ impression/ satisfaction.
Theme 4: Expectation on business responsibility (under multi-stakeholders condition)	Business sector is expected to have responsibility. However, business alone can not deliver significant change.

Table 4.41: Themes construction: No cutlery default

2.1 Initiatives review 1: No cutlery default	
Themes	**Details**
Theme 1: Should be an option. High chance of success	Should be an option for the customers. High chance of success. Can also reduce restaurants' cost.
Theme 2: Charges can be apply (on every platform)	Charges can be applied (compulsorily on every platform) as a nudging tool (can be just one baht to).
Theme 3: Need communication	Easy but has practical limitations. Need communication to the customers and (within) the restaurant.
Theme 4: Customer Relationship Management (CRM)	Customer Relationship Management (CRM) through communication and feedback systems.

Table 4.42: Themes construction: Packaging procurement

2.2 Initiatives review 2: Packaging procurement	
Themes	**Details**
Theme 1: Should have options. Should not charge customer	Should have options for customers. Should not charge customers. May offer other incentives instead of disincentives.
Theme 2: Low chance of success, no alternatives, Price barrier, no WTP	Low chance of success. No practical and cheap alternatives. Price barrier for green packaging. Customers have no WTP.

Theme 3: Need government support	Need government support in terms of subsidies and incentives.
Theme 4: Different restaurant types, different values and affordability	Different restaurant types have different values and affordability in terms of packaging choices.

Table 4.43: Themes construction: eco-labelling

2.3 Initiatives review 3: Eco-labelling	
Themes	**Details**
Theme 1: Low impact but easiest to do	May have a low impact but it is the easiest measure to do.
Theme 2: Incentives for restaurants and customers	Incentives for restaurants to get the label and for customers who participate as nudging. However, this measure will not change minds.
Theme 3: Restaurants adoption of green packaging	The challenge is how to promote restaurants' adoption of green packaging.
Theme 4: More customer interest in green choices.	More customer interest in green choices. More demand can be expected.

Table 4.44: Themes construction: Deposit-return scheme

2.4 Initiatives review 4: Deposit-return scheme	
Themes	**Details**
Theme 1: Challenging, not economically viable, area limitation	Challenging, high cost, not economically viable, area limitation, operational heavy.
Theme 2: EPR and waste management system	EPR should be mandatory, need an efficient waste management system.
Theme 3: Hygienic issues	Marketing and communication on hygienic issues to build customers' trust.
Theme 4: Convenience factors, Create new norms	Consumption behavior based on convenience factors. Need to create new norms on household waste management.

Table 4.45: Themes construction: expectation towards the governance agencies

3. Expectation towards the governance agencies	
Themes	**Details**
Theme 1: Standards, frameworks, regulation	Need standards, frameworks, mutual direction, regulation for every stakeholder to conform.
Theme 2: Incentives and disincentives	Internalization concepts should be considered through the provision of incentives and disincentives (tax and non-tax).
Theme 3: Government subsidies	Government subsidies as a pricing mechanism to push down the price and lift the demand of eco packaging.
Theme 4: Post-consumption waste management system	Need an efficient post-consumption waste management system.
Theme 5: Research and development	Research and development at production stage (e.g., no-material packaging and alternative packaging).

Table 4.46: Themes construction: system dynamic analysis

4. System dynamic analysis	
Themes	**Details**
Theme 1: Demand-led, bottom-up approach	Promote awareness and behavioral change. Demand should be created before supply. Should use a bottom-up approach (demand-driven).
Theme 2: Incentives and cost-minimization principle	Incentives should be provided. Every stakeholder works on the cost-minimization principle.
Theme 3: Hard and soft policies	Hard and soft policies need to be simultaneously promoted (Hard: Infrastructure and system/ Soft: regulations).
Theme 4: Platform and restaurant role and relationships	Platform and restaurant roles and relationships need to be clearly addressed.
Theme 5: niches as system disruptors	Sustainable niches can disrupt the system with technologies and flexibility.

Table 4.47: Themes construction: limitations to sustainable consumption

5. Limitations to sustainable consumption	
Themes	**Details**
Theme 1: the system is linear, not circular	The system is linear, not circular. The existing waste management system is not supportive of a circular economy.
Theme 2: Lack of alternatives	Lack of alternatives (not practical, no economies of scale).
Theme 3: WTP and awareness gap	WTP and awareness gap at every level, from suppliers, providers, and consumers.
Theme 4: Voluntary scheme does not work	Voluntary scheme does not work, no significant result, lack regulation. Business fears of losing its competitiveness.

Table 4.48: Themes construction: leverage point(s)

6. Leverage point(s)	
Themes	**Details**
Theme 1: Incentive alignment	Any initiative will be successful if every party satisfies with the benefits received.
Theme 2: Cost and profit	Cost and profit are priorities. Adopt economic measures to make alternative packaging cheaper.
Theme 3: Mandatory responsibility	Mandatory waste management responsibility should be applied at both individual and corporate level. Law and regulations are needed.
Theme 4: Post-consumption system	An efficient post-consumption system is a key to a circular economy.

3.2 System dynamics analysis

3.2.1 System dynamics model revision

System dynamics analysis was adopted as a tool to provide strategic recommendations to reduce SUPs in the food delivery business. The revision of the model relied on data obtained from stakeholders interviews. The original model, as shown in Figure 4.4, was presented during the interviews and the interviewees were asked for their opinions about the model completeness, clarity and exactness. The stakeholders' comments were taken together with the researcher's holistic apprehension of the system. The revised model is shown in Figure 4.5.

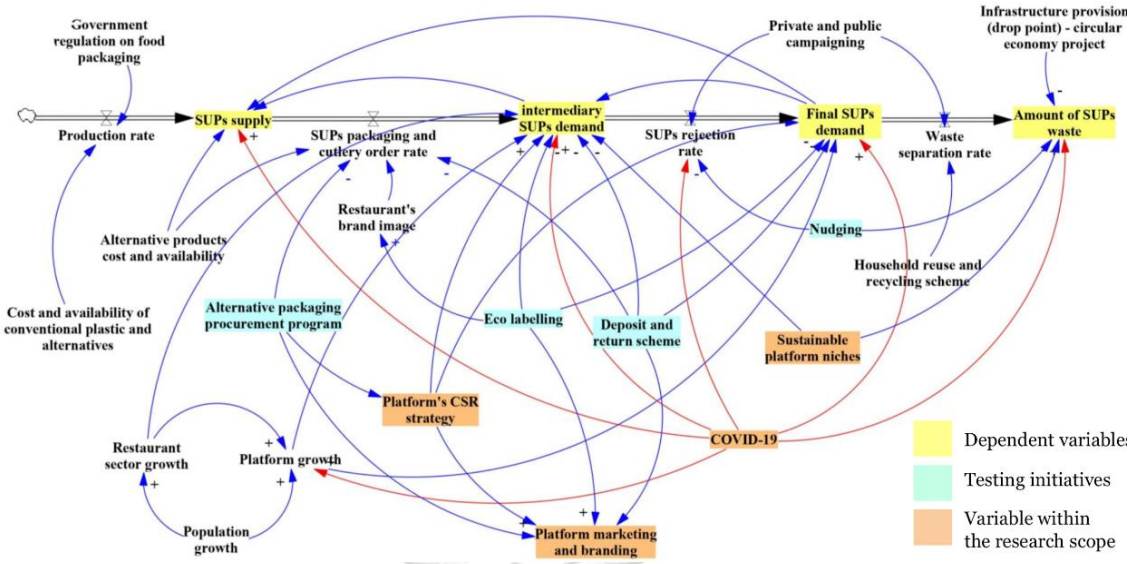

Figure 4.4: The original system dynamics model

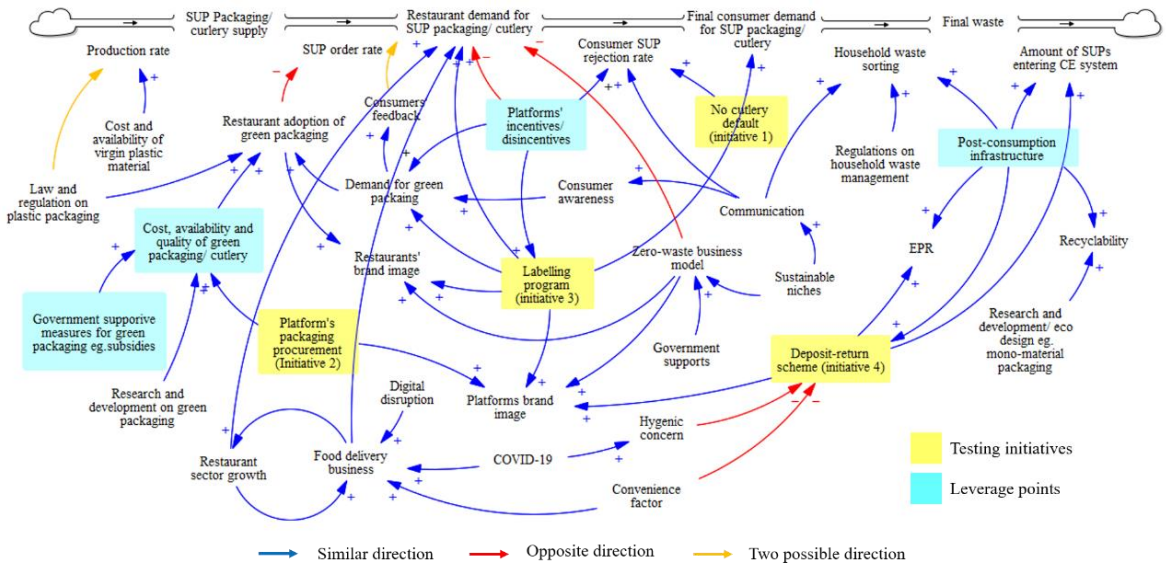

Figure 4.5: The revised system dynamics model

To elaborate, the model expanded to a more comprehensive post-consumption stage of SUPs waste generated from food delivery business. Many variables were added as factors influencing the amount of SUP waste entering the circulatory system. The more waste entering the proper management system, the less waste untreated and discarded into the environment. Moreover, the system needed mandatory responsibility for waste management of both individual consumers and corporate producers. Likewise, technical factors such as research and development on alternative products to improve cost, quality, and recyclability were taken into account in the model. Government regulation was assigned a more important role in steering the system than what was presented in the original model. The importance of subsidies

and incentives were stressed. Communications among the stakeholders turned out to be one of the most important factors in the system. The need for customer incentives were pointed out as a behavioral nudging tool towards pro-environmental behavior in addition to awareness building. Lastly, economic measures can be particularly helpful in gearing behavior as part of a disincentive scheme. The details of each factor were discussed in chapter 5.

3.2.2 Leverage points identification

The high leverage points identification considered the data obtained from thematic analysis and system dynamics analysis. During the interview, the stakeholders from different sectors were asked to identify factors or points in the system that, if being improved, could significantly drive the system closer to the goal. Referring to the revised system dynamic model (Figure 4.5), factors that appeared in blue were factors that link with many other factors; meaning that the adjustment made to such factors can create high impact to the system. From the stakeholder interview, the high leverage points were grouped and described as follows.

1) **Post-consumption system** is the key to a circular economy in terms of the overall waste management system. Waste management infrastructure at the local level needs to be efficient and accessible. Mandatory responsibility at household level needs to be clearly announced. If every household is required to be responsible for their own waste, the consumption decision will be more conscious. CE facilities need to be developed in parallel with behavioral change. Specifically, waste management infrastructure of every type of household waste should be ready to support the sorted waste. The allocation of facilities and infrastructure should be efficient enough to ensure that waste enters the CE as much as possible.

2) **Economic instruments, law and regulations** across the downstream, middle stream and upstream of the supply chain can leverage the system transition at the stage of production, consumption, and post-consumption. Economic instruments such as subsidies and tax incentives can lower the cost of green packaging and influence the production and consumption decisions. Law and regulations can guide the system's direction. It can control what should be available in the market at which price for what amount. For example, the official authorities should regulate eco labels on the packaging. Punishment for deliberate corporate greenwashing needs to be applied. Law and regulations on producer responsibility such as EPR, including deposit-return scheme should be enacted. Also, law and regulations on consumer responsibility should be considered in parallel.

3) **Benefit alignment.** If every party satisfies with the benefits received, any initiative can be carried on under the market system without any intervention. In system thinking, Meadows and Wright (2008) stressed that the unaligned values may produce undesired system behavior. Benefits in forms of incentives can be perceived as behavioral shortcuts that can initially instigate changes

in the system in which each stakeholder makes preferable decisions. However, such benefits need to be sustained in the long term in order to maintain the system.

4) Cost and profit are the key to a greener food delivery system. What we need is any intervention anywhere in the system that can lift the economy of the business, whether it is to drive the sales or lower the cost. The key is to make alternative packaging cheaper or to make profit out of the green initiatives. At the micro level, for-profit restaurants look for cheaper options. Regardless of the intention to adopt green packaging, cheaper packaging of any kind is preferable if the basic attributes are met. If the greener packaging is cheaper and practical, there is no reason one would opt for the traditional SUP packaging. Commercially, business ideas or initiatives that are viable and have high return potential will gain acceptance among the players and will propel the system towards a greener economy.

3.3 Initiatives evaluation

3.3.1 Behavior-Over-Time (BOT) analysis

BOT graph was one of the system thinking tools that elaborated behavioral change over time. The target behavior in this research was 'the generation of SUP waste from food delivery service' which was calculated from behavioral data obtained primarily in this research. The timeframe for this analysis covered the period before, during, and after the dine-in restriction according to the COVID-19 lock-down measures. Five scenarios were analysed. The first scenario represented the current stage of SUPs waste generation in 'Business as Usual (BAU)' condition. The other four scenarios represented the amount of SUPs waste generated under four proposed initiatives. 'No cutlery default', 'eco-labelling', 'packaging procurement', and 'Deposit-Return Scheme (DRS)'. Apart from the aggregated sample analysis, each cluster was analysed separately.

Inputs for BOT analysis included both primary and secondary data. The primary data covered order frequency and acceptance level of each initiative, which were obtained from the consumer research conducted earlier in this research. The secondary data was based on past research which included the minimum and maximum amount of SUPs waste generated in each food delivery order. The calculation was based on the assumption that each initiative could potentially eliminate one piece of SUP per one order. The inputs are detailed as follows

(a) Order frequency ($\bar{x}$) was primarily obtained at three periods, before, during, and after the dine-in restriction, so as to observe behavioral change over time. Mean values at three periods were used for calculation.

(b) The minimum and maximum amount of SUPs waste generated in each food delivery order (4-11 pieces). An estimated amount of SUPs waste per order was assumed according to the relevant research from the private and public sector. The amount per order ranges from 4 -11 pieces (Jitpleecheep, 2019; Pollution Control Department,

2021; Thai Health Promotion Foundation, 2020; Thampanishvong et al., 2020).

(c) Acceptance level of each initiative (percent decimal fraction) was derived from the primary research on acceptance level of each initiative conducted in the first part of this study. The raw data was a five-scale score. After the mean values were derived, they were converted to percentage format in order to calculate the amount of SUPs that each initiative could potentially reduce. For example, if the average score of acceptance level of initiative X of cluster Y was 4.25 out of 5, The percentage is 85 per cent, the decimal fraction is 0.85. The multiplier (1 - c) then represents the amount of remaining SUPs waste generated under each scenario.

(d) The final amount of SUPs waste generated under each scenario. Given the minimum and maximum SUPs per order at 4 and 11 pieces per order, each scenario was calculated as follows. **(1) SUPs waste generated under the BAU scenario** was calculated from (a) multiplied by 4 and 11 to get the minimum and maximum amount of SUPs waste generated under this scenario. **(2) SUPs waste generated under 'no cutlery default', 'eco-labelling', 'packaging procurement', and 'deposit-return scheme' (DRS)** were calculated from (a) multiplied by 4 and 11 and multiplied by one minus the decimal fraction of the average acceptance level of initiative score in order to get the minimum and maximum amount of SUPs waste generated under these scenarios. The equation was presented as follows

$$d = a*b*(1 - c)$$

Given	Minimum SUPs waste generated per order = 4 Maximum SUPs waste generated per order = 11 Each initiative could potentially eliminate one piece of SUP
Remarks	In graphical illustration, the left vertical scale represents BAU scenarios. The right vertical scale represents the other four scenarios.

1) BOT graph of overall SUPs waste generated from food delivery service

Overall sample (n=479) revealed mean values of order frequency before, during, and after the dine-in restriction of 1.32, 2.66, and 1.78 times per week consecutively. The average acceptance level scores of 'no cutlery default', 'eco-labelling', 'packaging procurement', and 'DRS' were 4.70, 4.22, 4.71, and 3.76

out of 5 consecutively. The final amount of SUPs waste generated under each scenario are presented in Table 4.49 below. The graphical illustration appeared in Figure 4.6.

Table 4.49: Overall SUPs waste generated
(piece/ per person/ per week)

Overall sample (n=479)	BAU		No cutlery default (4.70/5)		Packaging procurement (4.22/5)		Eco-labelling (4.71/5)		DRS (3.76/5)	
	min	max	min	max	min	max	min	max	min	max
Before (x̄=1.32)	5.28	14.51	0.32	0.87	0.82	2.26	0.31	0.84	1.31	3.60
During (x̄=2.66)	10.62	29.21	0.64	1.75	1.66	4.56	0.62	1.69	2.63	7.24
After (x̄=1.78)	7.14	19.62	0.43	1.18	1.11	3.06	0.41	1.14	1.77	4.87

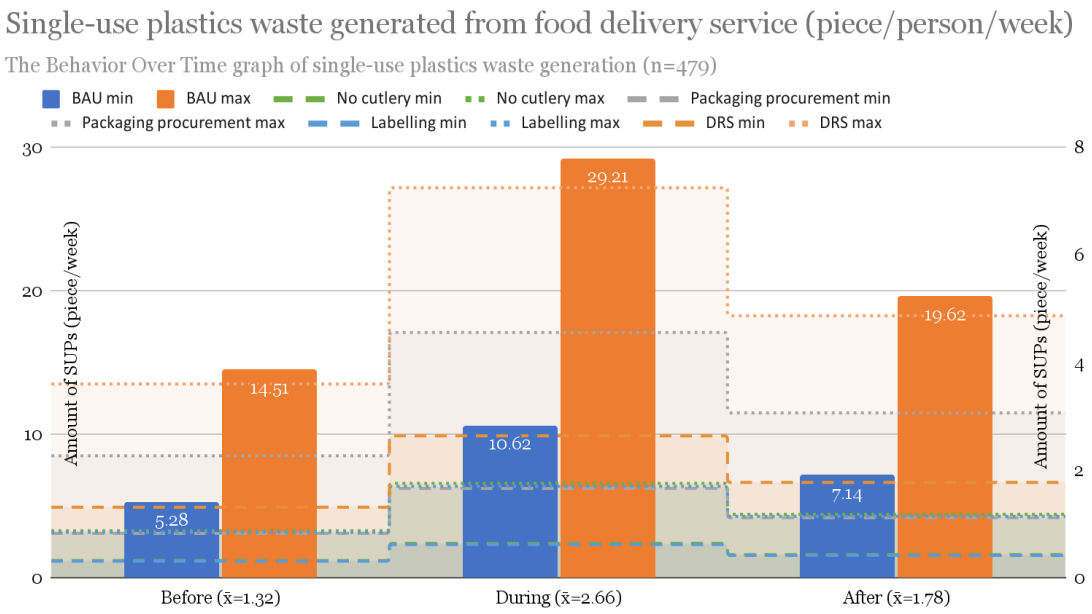

Figure 4.6: BOT graph of overall SUPs waste generated

2) BOT graph of SUPs waste generated from food delivery service - Cluster 1: Moderate environmental attitude cluster.

Cluster 1 (n=317) reported mean values of order frequency before, during, and after the dine-in restriction of 1.30, 2.81, and 1.78 times per week consecutively. The average acceptance level scores of 'no cutlery default', 'eco-labelling', 'packaging procurement', and 'DRS' were 4.75, 4.28, 4.78, and 3.74 out of 5 consecutively. The final amount of SUPs waste generated under each scenario are presented in Table 4.50 below. The graphical illustration appeared in Figure 4.7.

Table 4.50: SUPs waste generated - Cluster 1
(piece/ per person/ per week)

Cluster 1 Moderate (n=317)	BAU		No cutlery default (4.75/5)		Packaging procurement (4.28/5)		Eco-labelling (4.78/5)		DRS (3.74/5)	
	min	max	min	max	min	max	min	max	min	max
Before (x̄=1.30)	5.20	14.30	0.26	0.72	0.75	2.06	0.23	0.63	1.31	3.60
During (x̄=2.81)	11.25	30.94	0.56	1.55	1.62	4.46	0.50	1.36	2.84	7.80
After (x̄=1.78)	7.13	19.61	0.36	0.98	1.03	2.82	0.31	0.86	1.80	4.94

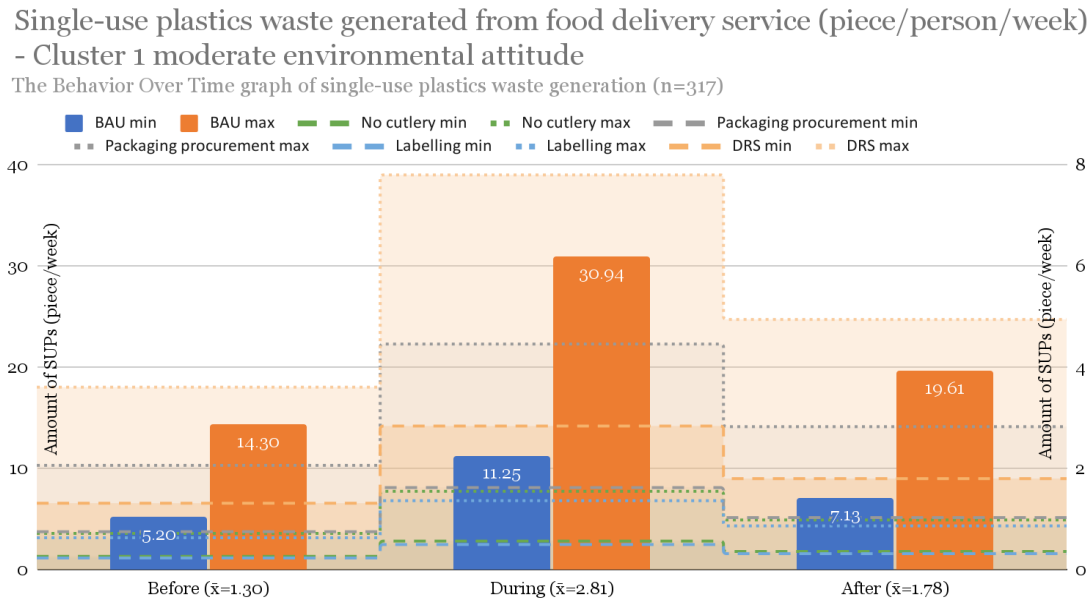

Figure 4.7: BOT graph of SUPs waste generated of cluster 1

3) BOT graph of SUPs waste generated from food delivery service - Cluster 2: Low environmental attitude cluster.

Cluster 2 (n= 91) reported mean values of order frequency before, during, and after the dine-in restriction of 1.78, 2.79, and 2.26 times per week consecutively. The average acceptance level scores of 'no cutlery default', 'eco-labelling', 'packaging procurement', and 'DRS' were 4.40, 4.00, 4.35, and 3.38 out of 5 consecutively. The final amount of SUPs waste generated under each scenario are presented in Table 4.51 below. The graphical illustration appeared in Figure 4.8.

Table 4.51: SUPs waste generated - Cluster 2
(piece/ per person/ per week)

Cluster 2 Low (n=91)	BAU		No cutlery default (4.40/5)		Packaging procurement (4.00/5)		Eco-labelling (4.35/5)		DRS (3.38/5)	
	min	max	min	max	min	max	min	max	min	max
Before (x̄=1.78)	7.11	19.56	0.85	2.35	1.42	3.91	0.92	2.54	2.30	6.34
During (x̄=2.79)	11.17	30.71	1.34	3.69	2.23	6.14	1.45	3.99	3.62	9.95
After (x̄=2.26)	9.06	24.90	1.09	2.99	1.81	4.98	1.18	3.24	2.93	8.07

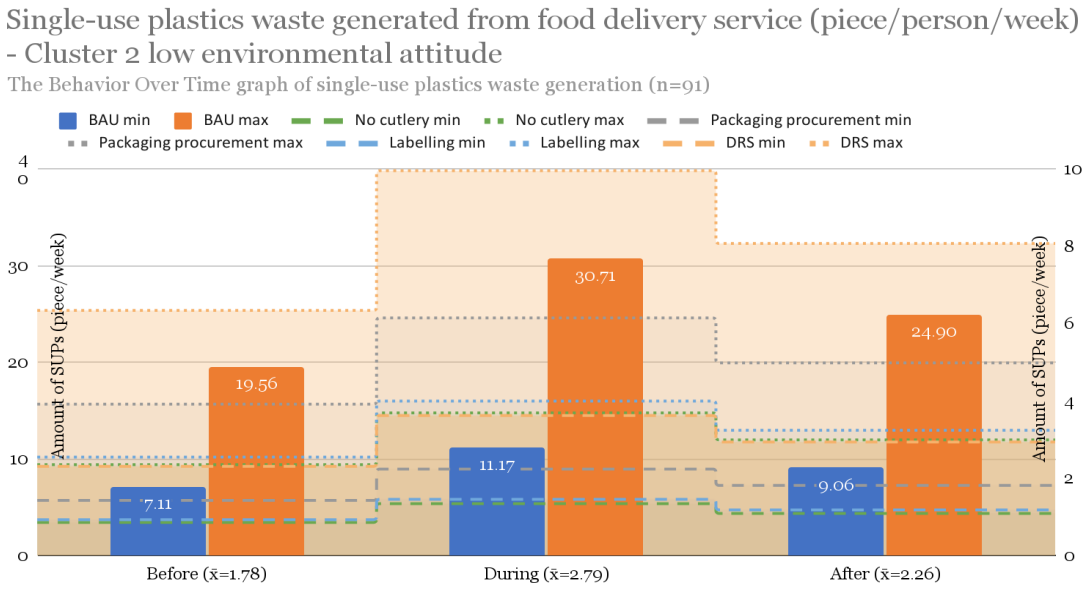

Figure 4.8: BOT graph of SUPs waste of cluster 2

4) BOT graph of SUPs waste generated from food delivery service - Cluster 3: High environmental attitude cluster.

Cluster 3 (n=71) reported mean values of order frequency before, during, and after the dine-in restriction of 1.01, 1.97, and 1.39 times per week consecutively. The average acceptance level scores of 'no cutlery default', 'eco-labelling', 'packaging procurement', and 'DRS' were 4.86, 4.25, 4.85, and 4.30 out of 5 consecutively. The final amount of SUPs waste generated under each scenario are presented in Table 4.52 below. The graphical illustration appeared in Figure 4.9.

Table 4.52: SUPs waste generated - Cluster 3
(piece/ per person/ per week)

Cluster 3 High (n=71)	BAU		No cutlery default (4.86/5)		Packaging procurement (4.25/5)		Eco-labelling (4.85/5)		DRS (4.30/5)	
	min	max	min	max	min	max	min	max	min	max
Before (x̄=1.01)	4.05	11.13	0.11	0.31	0.61	1.67	0.12	0.33	0.57	1.56
During (x̄=1.97)	7.86	21.62	0.22	0.61	1.18	3.24	0.24	0.65	1.10	3.03
After (x̄=1.39)	5.56	15.30	0.16	0.43	0.83	2.29	0.17	0.46	0.78	2.14

Figure 4.9: BOT graph of SUPs waste generated of cluster 3

5) BOT graph of average SUPs waste generated from food delivery service of each cluster

This section reported the amount of SUPs with average value instead of minimum and maximum value for comparison purposes. Waste generated by each cluster was reported individually in the same graph (Figure 4.10). The descriptive results of SUPs waste generated under each scenario of each cluster are presented in Table 4.53.

Due to lower order frequency and overall higher acceptance level towards sustainable initiative, cluster 3 (high environmental attitude) had the lowest SUPs waste (piece/person/week) generation potential among three clusters. On the other hand, cluster 2 (low environmental attitude) ordered most often and had the lowest acceptance level of all sustainable initiatives. Therefore, cluster 2 showed highest SUPs waste (piece/person/week) generation potential among three

clusters. It was also observable that the scenario with lowest waste reduction potential was the ‘DRS’ in cluster 2, the most complex initiative with the lowest environmental attitude group.

When examining waste reduction potential of each initiative, the results showed that the ‘no cutlery default’ initiative can reduce the most SUPs waste in cluster 2 and 3. ‘Eco-labelling’ initiative can reduce the most SUPs waste in cluster 1 and 3. On the other hand, ‘DRS’ initiative can reduce the least SUPs waste in cluster 1 and 2. However, in cluster 3, the ‘deposit-return scheme’ initiative received higher consumer acceptance, making the ‘packaging procurement’ initiative the least effective in reducing waste in cluster 3. The initiatives with highest and lowest waste reduction potential for each cluster are summarized in Table 4.54.

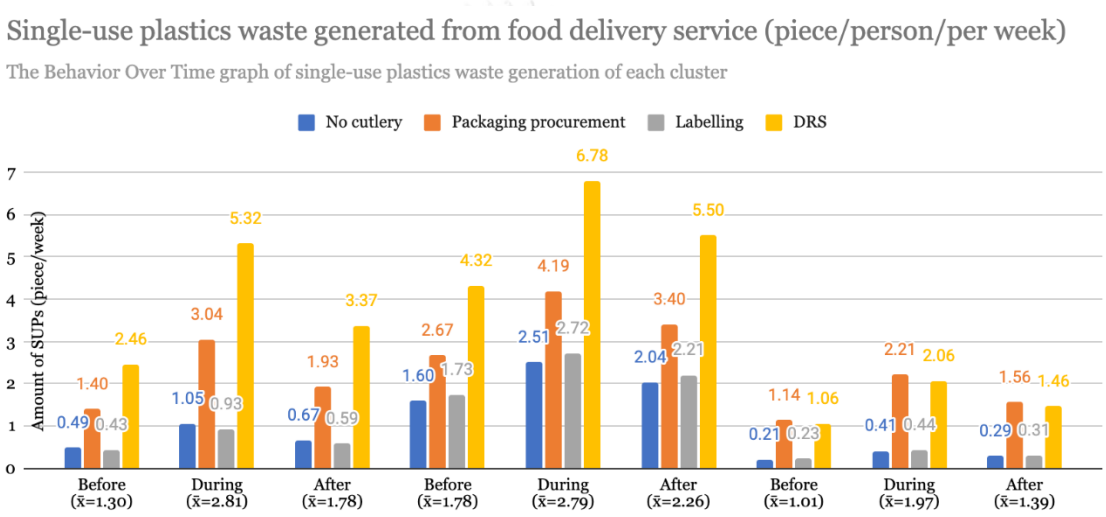

Figure 4.10: BOT graph of SUPs waste generated of each cluster

Table 4.53: SUPs waste generated of each cluster
(piece/ per person/ per week)

Scenarios	Cluster 1 Moderate			Cluster 2 Low			Cluster 3 High		
	Before (x̄=1.30)	During (x̄=2.81)	After (x̄=1.78)	Before (x̄=1.78)	During (x̄=2.79)	After (x̄=2.26)	Before (x̄=1.01)	During (x̄=1.97)	After (x̄=1.39)
No cutlery default	0.49	1.05	0.67	1.60	2.51	2.04	0.21	0.41	0.29
Packaging procurement	1.40	3.04	1.93	2.67	4.19	3.40	1.14	2.21	1.56
Eco-labelling	0.43	0.93	0.59	1.73	2.72	2.21	0.23	0.44	0.31
Deposit-return scheme	2.46	5.32	3.37	4.32	6.78	5.50	1.06	2.06	1.46

Table 4.54: Summary of initiatives' waste reduction potential

Clusters	Initiative with highest waste reduction potential	Initiative with lowest waste reduction potential
Cluster 1: Moderate environmental attitude	Eco-labelling	Deposit-return scheme
Cluster 2: Low environmental attitude	No cutlery default	Deposit-return scheme
Cluster 3: High environmental attitude	No cutlery default / Eco-labelling	Packaging procurement

3.3.2. Stakeholders evaluation

Through semi-structured interviews, stakeholders were asked to rate four proposed sustainable initiatives on three attributes. 1) Expected outcome (EO), 2) Resources required (RR) and 3) Chance of success (CS) on a ten-likert scale. The quantitative results are presented in Table 4.55 below.

Table 4.55: Stakeholders evaluation on proposed sustainable initiatives

		No Cutlery default	Packaging Procurement	Eco-labelling	Deposit-return Scheme
Policy-Level Actors	**EO**	6.5	5.25	8.25	6.75
	RR*	5.5	8	6	8.75
	CS	7.25	6.75	8.75	5.25
Food Delivery Platforms	**EO**	7	4.66	7.33	4.66
	RR*	2.66	7.66	3.66	9.66
	CS	7.33	4.66	6.33	2.33
Restaurant Partners	**EO**	6.8	5.4	6.4	4.8
	RR*	3	9	2.4	8.4
	CS	6.6	4.6	6.4	4.2
Sustainable Niches	**EO**	7.33	6.66	6.66	8.33
	RR*	2.33	7.66	3.33	8.66
	CS	7.66	5.33	7.33	4.33
Total	**EO**	**6.91**	**5.49**	**7.16**	**6.14**

	RR*	**3.37**	**8.08**	**3.85**	**8.87**
	CS	**7.21**	**5.34**	**7.20**	**4.03**

* Resource required (RR) was reversely interpreted.

Table 4.56 showed the summary of initiatives with the highest score in each attribute. The results revealed that the initiatives that received high expected outcome, low resource required, and high chance of success were 'no cutlery default' and 'eco-labelling' initiatives. Table 4.57 showed the summary of initiatives with the highest overall score by stakeholders. 'No cutlery default' and 'eco-labelling' received the highest score from most stakeholders, except for the niches who pointed out that 'deposit-return scheme' would yield a higher expected outcome. These stakeholders' initiative evaluation results were in line with the results from consumer surveys that appeared in BOT analysis where these two initiatives also yielded the highest waste reduction potential.

Table 4.56: Summary of initiatives with highest score in each attribute

Initiative attributes	Initiative(s) that score the best
Expected outcome	Eco-labelling
Resource required	No cutlery default
Chance of success	No cutlery default/ Eco-labelling

Table 4.57: Summary of initiatives with highest overall score by stakeholders

Stakeholders	Initiative(s) that score the best
Policy-Level Actors	No cutlery default/ Eco-labelling
Food Delivery Platforms	No cutlery default/ Eco-labelling
Restaurant Partners	No cutlery default/ Eco-labelling
Sustainable Niches	No cutlery default/ Deposit-return scheme

CHAPTER 5
DISCUSSION AND CONCLUSION

1. Demand-led sustainable consumption

1.1 Summary of the clusters' profile

The demographic, behavioral, and psychological profiles of each cluster were summarized as follows. Demographically, only gender, age, and occupation were statistically different across clusters. The other three testing variables, educational level, residence, and household income were found not to be significant identifiers of the designated clusters. Behaviorally, the group with low environmental attitude (cluster 2) ordered food delivery the most, while the group with high environmental attitude (cluster 3) ordered least frequent. There were statistically significant differences in overall ordering frequency among the three clusters across three periods. All three groups showed significant differences in every psychological attribute, which included concern towards excessive packaging, and perceptions towards foam packaging and biodegradable packaging. All three clusters exhibited a uniform pattern in every viable psychological and initiative-related construct. In rank, cluster 3 scored the highest, cluster 1 scored the second, while cluster 2 scored the least.

1) Cluster 1: Moderate environmental attitude (n=317) (66.18%)

This group can represent the general consumers in the market as it accounted for 66% of the total surveyed sample. It mainly consisted of females (71%), age varies ($\bar{x}$ = 35). Work as company employees and government employees/officials. They frequently used food delivery service during the dine-in restriction period. They had moderate concerns about excessive food delivery packaging. They had moderate concern on the health and environmental impact of foam food containers. They were easily convinced by green labelling as they scored highest in 'the restaurant has environmental responsibility' statement. For the response to initiatives, they had moderate acceptance level in 'no cutlery', 'eco-labelling', and 'deposit-return scheme' initiatives. They had equally high willingness to pay for green packaging as cluster 3 (high environmental attitude). However, they had moderate willingness to pay for returnable food container deposits. Half of them were willing to pay less than 30 THB/piece.

2) Cluster 2: Low environmental attitude (n=91) (19%)

There were less females in cluster 2 when compared to other clusters (53%), age between 18-35 ($\bar{x}$ = 32). Work as company employees, business owner/ self-employed, students, and unemployed. They frequently used food delivery service before and after the dine-in restriction period. They had low concern about excessive food delivery packaging. They believed that using foam packaging is fine and had relatively lower concern on the health and environmental impact of foam food

containers. They possessed the highest ignorant characteristic when it comes to types of food packaging as they, among three groups, most agreed with the statement ‘indifferent. any box is the same’. For the response to initiatives, they had the lowest acceptance level in ‘no cutlery’, ‘eco-labelling’, and ‘deposit-return scheme’ initiatives. They also had the lowest willingness to pay for both green packaging and returnable food container deposit.

3) Cluster 3: High environmental attitude (n=71) (14.82%)

Mostly females (79%), age above 36 ($\bar{x}$ = 38). Work as company employees, business owners/ self-employed, and university employees. They were light users of food delivery services and placed the least orders at all time. They had higher concern about excessive food delivery packaging. They had high concern on the environmental impact of foam food containers and believed that it should be avoided. They were skeptical about green products as they, among three groups, agreed the most with the item ‘not sure about the environmental attributes of biodegradable products’ and tended to have the lowest greenwashing potential. They were highly aware about the differences of each food packaging type. For the response to initiatives, they had the highest acceptance level in ‘no cutlery’, ‘eco-labelling’, and ‘deposit-return scheme’ initiatives. They had the same willingness to pay for green packaging as cluster 1 (moderate environmental attitude). However, they had the highest willingness to pay for returnable food container deposits. Half of them were willing to pay more than 30 THB/piece.

1.2 Socio-demographics attributes

Despite the flaws of using demographic criteria to describe green consumer segmentation pointed out by Roberts (1996), Straughan and Roberts (1999), Rokka and Uusitalo (2008), Albayrak et al. (2010), Annunziata and Vecchio (2013), Jeevan (2014), Trivedi et al. (2015), and Jaeger et al. (2021) there were some interesting points that this research results addressed.

First, females were likely to be in the groups with moderate to high environmental attitudes while a larger proportion of males were found in the group with lower environmental attitudes. Many studies affirmed that females tend to hold greener attitudes than male (Roberts, 1996). Also, ‘in every analysis, females performed more ECCSs’ with the ration that females will 'more carefully consider the impact of their actions on others' (Straughan & Roberts, 1999). In addition, recent research also found that there were more females in the green segment (Gilg et al., 2005; Rokka & Uusitalo, 2008; Sharp et al., 2010).

Second, younger generations were likely to have lower environmental attitudes. This result aligned with past research on socio-demographics attributes of people with different levels of environmental and sustainability concern including research by Hallin (1995) and Gilg et al. (2005) who addressed that older consumers are more likely to commit to sustainable consumption. Furthermore, Straughan and

Roberts (1999) pointed out that the level of environmental concern is influenced by how environmental issues are framed during the time period one has lived. Rokka and Uusitalo (2008) also found that the green segment consists of older respondents. This implication was also supported by the result from in-depth interviews which gave an idea that younger people are attached to the convenience delivered by this business. Globalisation has driven unnecessary consumption of younger generations as they are more exposed to a variety of food, offered with wider consumption choices. However, younger generations actually care, to some extent, but refuse to act. They reported that they have the intention to reject unnecessary SUPs when there is a chance to do so. On the other hand, older respondents perceived that it is the individual responsibility not to trash the planet and to consume responsibly; consuming single-use products are a waste of resources. Also, they were more thoughtful about resource consumption, making them consume more responsibly. In addition, the older generation lived through the development period where the production and consumption of plastic was limited, making it much more valuable than what it is nowadays.

Lastly, students, company employees, and unemployed groups tended to dominate the less green cluster. According to the relationship between 'age' variable and environmental attitude, students could hold a lower level of environmental attitudes. Government employees/officials tended to have moderate environmental attitudes while the university employees possessed high environmental attitudes. These demographic results were partially in accordance with previous green segmentation and sustainable consumption studies by Do Paco et al. (2009), Gilg et al. (2005), Hohmann et al. (2016), and Ottman (2011). However, no conclusive evidence of an occupation variable under a similar context was found.

1.3 Behavioral attributes

1.3.1 The new normal of food consumption

As reported in chapter 4, the cluster analysis pointed out that COVID-19 pandemic potentially led to the 'new normal' stage of food delivery consumption where everyone developed new habits as they became more familiar with the service. All respondents ordered food delivery more often during the dine-in prohibition period. However, after the dine-in service resumed, the order frequency bounced back only slightly to the level above the pre-COVID-19 period in all clusters. This change indicated that the order frequency continued to grow even after the lockdown measure was eased. This finding was corresponding to several research studies, local and global. Chulalongkorn University Transportation Institute (2020) and Thai Health Promotion Foundation (2020) found the same pattern of food delivery ordering of Thai consumers during the pandemic. Kasikorn Research Center (2020b) also expected to see less food delivery transactions when the pandemic is eased. Still, they predicted that the transaction remains higher than the pre-pandemic level. Globally, Boston Consulting Group (2021) revealed the COVID-19-influenced dining pattern of US consumers that the percentages of takeout and delivery at three periods:

before, during, and after the pandemic were 15, 19, and 16, which indicated the long-term shift away from restaurant dining. Likewise, McKinsey & Company found that the post-COVID online consumption in the takeout and delivery in most countries is expected to grow up to 29% compared to the pre-COVID period (Arora et al., 2020). In this case, viewing COVID-19 as a catalyst, the consumption behavior remained changed even after the catalyst was withdrawn. According to the change theory, such behavior was influenced by external stimuli and 'freezed' through the 'new normal' consumption environment. This behavioral change can be referred to as a 'behavioral lock-in' where consumption practices are constrained by limitations in the market. In this case, the pandemic and its lockdown measure limit consumption choices and the convenience offered from this service is compulsive. In order to tackle this shifted food consumption pattern, green marketing and social marketing can be applied as a behavioral tool that 'unfreeze' the existing unsustainable behavior (Edward Maibach, 1993). Environmentally, marketing strategy should stress on the waste situation influenced by the pandemic. Socially, it should emphasize how simply eating at neighbouring local restaurants can help these retailers through disintermediation.

Notably, the ordering frequency of each cluster changed in different degrees over three periods. The implication was that the group with moderate environmental attitudes (cluster 1) tended to be more sensitive to the catalyst (116%, 37%), which was the dine-in restriction, and adjusted their behavior accordingly. This group tended to be flexible and not to stick with a particular set of values. Despite the highest overall order frequency, cluster with low environmental attitudes responded the least to the changing external conditions (57%, 19%). Lastly, high environmental attitudes cluster showed a considerably high rate of behavioral change (95%, 29%), closer to such a rate of cluster 1's and the sample's (101%, 33%). In conclusion, the introduction of the dine-in prohibition measure influenced changes in consumption behavior of cluster 1 the most and cluster 2 the least.

1.3.2 Changing behaviors during COVID-19

Majority of the respondents reported that they always have metal cutlery available at their eating places. Cluster 3 (high environmental attitudes) scored higher than the other two clusters. For the cutlery usage, the result was not very explicit since during the COVID-19 pandemic, people stayed at home, so most of the delivery order occurred at home or office where they usually have reusable metal cutlery available. So, it turned out that, although the respondents ordered food delivery more frequently during the pandemic, they did not use SUPs utensils more often due to change in eating place. By cluster, cluster 3 used the least SUP cutlery with their food delivery orders. Surprisingly, there was no significant difference between SUP cutlery usage of cluster 1 and 2.

Moreover, the interview results revealed that household reuse of SUP bags and food containers were not as high as pre-pandemic level. These were the consequences of more fear in personal health conditions, and less guilt to consume unsustainably.

1.4 Environmental psychological attributes

1) Sustainable consumption dilemma. The cluster analysis revealed that the majority of consumers (86%) experience a dilemma regarding the consumption of SUPs in food delivery service during COVID-19 situation. This finding has led to the implication that consumers largely base their consumption decision on short-term self interest rather than on a collective benefit, especially when the decision involves urgent issues like the pandemic where environmental conditions are perceived as hostility to personal health and hygiene. This finding was supported by the World Bank's concern about the dilemma in plastics consumption during the pandemic (Peszko, 2020). Green consumers, despite the small size (14%), experience less hesitation in plastic consumption, in line with van Dam and van Trijp (2016) who pointed out that green consumers place value on the environment rather than on themselves, and they have a clearer image of environmental issues. This finding was also in line with studies by Van Dam (2016) and van Dam and van Trijp (2016) who suggested that the less-concerned group possesses more diverse consumption motives, which potentially leads to more subjective conflict. Consumption decisions of green consumers are motivated by intrinsic factors while less green consumers are extrinsically motivated (Nordin & Selke, 2010). This assumption was affirmed by the research results on food ordering behavior discussed in section 1.3.1 that cluster 1 exhibited the highest behavioral change under situational changes.

For the cluster characteristics, all three clusters exhibited a uniform pattern of mean scores in most of the constructs. The pattern indicated that the group with high environmental attitude (cluster 3) scored the highest in every viable hypothesis; namely, environmental concern, expectation, acceptance level, intention, and willingness to pay. In rank, the group with moderate environmental attitude (cluster 1) scored the second in those environmental attributes, while the group with low environmental attitude (cluster 2) scored the least. Consumers with higher levels of ECCS and CFC have higher concerns and perceptions towards packaging issues, acceptance level of initiatives, and willingness to pay for green packaging. Likewise, the lower the ECCS and CFC scores, the lower the scores of other environmental psychological constructs. These results were consistent with past research that affirmed the relationship among these environmental constructs (e.g., Albayrak et al., 2010; Chan, 2001; Gilg et al., 2005; Hanss, 2012; Jackson, 2005). Therefore, each cluster required different measures to instigate behavioral change.

2) All except the sixth hypothesis were supported. The result conveyed that three assigned clusters were significantly different in all aspects except the acceptance level of 'packaging procurement' initiative. The potential cause of this

result pertained to the fact that ‘packaging procurement’ initiative is a corporate partnership initiative that has little relevance to the consumers. In this scheme, consumers are merely passive actors not decision makers as their opinion indirectly influences the firm’s decision. Thus, the consumers may possess low involvement in this initiative compared to other initiatives such as setting default, eco-labelling or deposit systems. Therefore, the means among three groups were not statistically distinct.

However, the variables showed different discriminatory power across clusters. Three clusters differ the most in ‘expectation towards businesses’ active role in reducing SUP consumption’, indicating a large gap between such expectation in cluster with low and high environmental attitudes. It can be implied that consumers with high environmental value and construal level expect the businesses to be responsible for their externalities. Specifically, consumers who place their values and concern on SUP waste issue expect the businesses to take active responsibility on plastic waste issue. However, consumers with low environmental attitude do not expect environmental responsibility action from the firms. On the other hand, despite significant different, the ‘intention to support the deposit-return scheme’ was least predictive of environmental attitudes. Consumers are reluctant when it comes to the new model that the means among cluster were only slightly differ.

3) Concerns and perceptions towards food packaging. Overall, consumers were concerned about excessive packaging. They were aware that sometimes they received too much unnecessary packaging when ordering food delivery. Majority of them did not agree that using foam packaging is appropriate because of health and environmental reasons. Negative consequences of foam packaging were well-aware. Consumers were also highly aware about differences in packaging types. They had a positive perception towards biodegradable packaging. Nevertheless, such negative perceptions contributed to higher greenwashing potential. Majority of the consumers believed that the restaurants that use biodegradable packaging have environmental responsibility. As consumers expected the firms to act responsibly, this result confirmed the marketing benefit of green packaging (e.g., Arnaud, 2017; Chen et al., 2017; Isa & Yao, 2013; Magnier et al., 2016; Orzan et al., 2018; Rokka & Uusitalo, 2008; Van Birgelen et al., 2009). Some consumers, however, did not develop the same positive perceptions. They were skeptical about the claimed environmental attributes of biodegradable packaging.

4) Implications on willingness to pay. This research examined willingness to pay more for green food packaging and willingness to pay deposit for returnable food container. Willingness to pay for green packaging was found to have positive correlation with NEP attitudes, conscious consumption, excessive packaging concern, avoidance attitudes, and CER expectation. Likewise, willingness to pay for returnable packaging established positive correlation with green skepticism attitudes, conscious consumption, guilt-related feelings, excessive packaging concern, avoidance attitudes, and CER expectation. This two willingness to pay variables showed positive

associations. These findings were supported by several research (Do Paco et al., 2009; Jeevan, 2014; Park & Lee, 2014; Trivedi et al., 2015; Van Birgelen et al., 2009). In contrast, Isa and Yao (2013) found no significant influence of price towards green packaging purchase intention. Moreover, willingness to pay for green packaging can be discussed with consumer's green packaging adopting intention as it reflects consumer's valuation of cost and benefit in participating in the scheme (Yang, 2020). This research also found positive relationship between willingness to pay and intention to support green restaurant and deposit-return scheme. Another economic implication was built on the theory of endowment effect. Studies in this area pointed out that, despite the debatable gap between two variables, willingness to accept is always higher that willingness to pay according to the loss aversion theory. A popular study on the endowment effect by Kahneman et al. (1990) suggested that willingness to accept is approximately twice willingness to pay. Therefore, with willingness to pay more for green packaging of three THB, we can estimate the willingness to accept of six THB. However, this strategic options of rewards or punishment are subject to the policy design, which is discussed in the recommendation section. This research also affirmed the endowment effect in contingent valuation method as it revealed positive relationship among willingness to pay and environmental value constructs. Furthermore, price sensitivity is one of the major challenges to policy makers (Isa & Yao, 2013; Singh & Pandey, 2018). The rationale is consumers are not willing to pay more if the cheaper choice is available in the market, especially for green packaging products. Measured through elasticity, literatures in sustainable consumption found high price elasticity of green products (Horowitz & McConnell, 2003). This research found similar implications from stakeholder analysis that all actors agreed that green packaging charges should be avoided. Moreover, while the platforms and restaurants are reluctant to absorb additional cost of greener alternatives, they are all aware of high price sensitivity towards green packaging and therefore, do not agree with the charge policy. Still, they see that charges should be considered under command and control approach.

5) Other interesting relationships among variables. Relationships were found between most pairs, namely, New Environmental Paradigm (NEP) attitude, green skepticism, conscious consumption, guilt feelings, excessive packaging concern, avoidance attitude, corporate responsibility expectation, and willingness to pay. The closeness among these environmental-related constructs were affirmed by several literature reviewed in chapter 2 (e.g., Do Paco et al., 2009; Gilg et al., 2005; Joireman et al., 2001; Oliver & Rosen, 2010; Pavalache-Ilie, 2017; Straughan & Roberts, 1999; Thøgersen & Ölander, 2002). Roberts (1996) and Rokka and Uusitalo (2008) affirmed that people who are concerned about excessive packaging tend to be more conscious about what they consume. Van Birgelen et al. (2009) and Trivedi et al. (2015) found that willingness to pay for green products can be predicted by consumers' environmental attitudes, values, and behavior. The results of avoidance attitudes were in accordance with Kotler et al. (2019) and Van Dam (2016) who found that green consumers practice more anti-consumption. However, while Van Dam (2016) found that the light green segment did not believe in green products, this study found that

green consumers were more skeptical about green products, similar to the studies by Cleveland et al. (2005), Albayrak et al. (2011), and Goh and Balaji (2016). The results related to guilt were in line with Chen et al. (2017) who suggested that green consumers tend to feel guilty for excessive use of packaging.

6) Other psychological influences. The result from consumer interviews suggested that, apart from values and construal level, the consumption behavior can be explained by the perceived consumer effectiveness. Jeevan (2014) pointed out that willingness to opt for environmentally friendly products was determined by consumers' feeling of being able to act on these issues. Most consumers believed that their actions would not make much of a difference. To them, avoiding restaurants that use excessive packaging or rejecting SUP cutlery would not significantly improve the plastic waste situations. Furthermore, the spread of COVID-19 legitimized the use of SUP among the consumers as the 'reason to consume'.

2. System-led sustainable consumption

2.1 System analysis

Referring to the revised system dynamic model (Figure 4.5), the details of each factor are discussed based on four main actor groups: the government sector, the business sector, the consumer, and the third sector according to the Department for Environment Food and Rural Affairs (2008).

1) The government sector performs the governance role in regulating the system. Most of the system and infrastructure provision is carried out by the government. First, law and regulation play important roles at many stages. Regulation on food packaging production can shift the production towards green packaging. For example, regulation on recycled material in food containers. At the post-consumption stage, law and regulation on food packaging such as recyclability can be imposed to support the circular economy. The government can also regulate household waste management, as well as EPR implementation. Moreover, incentive and disincentive schemes, including subsidies, can greatly shift demand and supply since 'price' is one among the most important factors when the restaurants choose their packaging. Post-consumption infrastructure is the key to unlock the circularity of the system. However, the regulations should not increase financial burden or constraint the managerial decisions of private actors. The cost of compliance may discourage the companies with limited financial resources from investing in sustainable practices.

2) The business sector

(1) Restaurants are the direct decision makers regarding the packaging and cutlery choices. The more the restaurants adopt green packaging, the less they use SUP packaging and cutlery. Factors that influence the green packaging adoption include the cost, availability and quality of green packaging offered in the market and consumer demand for green packaging. Such factors can be leveraged by

the government's supportive measures, research and development, and platform's packaging procurement initiative. Still, there are many other factors that influence restaurant demand for SUP packaging and cutlery including the growth of the restaurant sector as well as the food delivery business which is becoming more competitive due to digital disruption. Platform's labelling program and other incentives/ disincentives can also influence restaurant packaging decisions. Lastly, if the restaurant adopts the zero-waste business model, demand for SUP packaging and cutlery can greatly be lessened. All of these actions can enhance the restaurants' brand image.

(2) Food delivery platforms act as intermediaries who facilitate transactions between restaurants and consumers. Referring to the proposed initiatives, 'no cutlery default' can increase consumer SUP rejection rate. 'Packaging procurement' can promote green packaging adoption. 'Eco-labelling' can influence demand for green packaging of both the restaurants and consumers. Lastly, 'deposit-return scheme' can support the EPR program and boost the amount of SUPs entering the circular economy system. However, the scheme may be delayed by pandemic-related hygienic concerns and convenience factors which, in turn, are the factors that fuel food delivery business. Platforms can also provide other incentives to both parties in addition to four proposed initiatives that platforms can implement to steer the system towards greener choices. Moreover, communication regarding the packaging should be delivered to both the restaurants and the consumers. Platforms should also take consumers' feedback for further improvement and deliver those feedbacks to the restaurants. All of these actions can enhance the firms' brand image as part of the CER program.

3) The consumers' active roles include SUP packaging and cutlery rejection, feedback submission (to the restaurants and platform), green restaurant choices, and household waste management. For the initiatives, active participation is required in 'no cutlery default', 'eco-labelling', and 'deposit-return scheme'. The consumers' passive roles include being a recipient of information, advertisement, benefits and incentives; with an aim for greater awareness and demand for greener products. For the initiatives, passive consumer participation is required in the 'packaging procurement' program. All consumers' roles are strengthened through information and behavioral mechanisms.

4) The third sector

(1) Niches can play a supportive role as a promoter of sustainable consumption and production. In the food delivery system, niches act as communicators on issues relating to SUPs concerns, awareness of green packaging, and household waste management. With agility and flexibility, niches can experiment new business models that minimize waste while still generating profit and scale them to commercial level. Once the structural limitations are removed and niches gain more support, zero-waste models will be commercially viable.

(2) Research and development on material and production can increase the practicality of alternative packaging and can enhance the possibility of SUPs entering the recycling system. In detail, research and development on green packaging can increase its quality and reduce its cost, which greatly influences the purchasing decision. Research and development can increase recyclability of SUP packaging, for example, packaging that is wholly made from one type of plastic (mono-material packaging) will improve its recyclability rate.

2.2 Leverage points identification

As analysed in chapter 4, system thinking analysis revealed that 'post-consumption system', 'economic instruments, law and regulations', 'benefit alignment' and 'cost and profit' were high leverage points in the system that need to be improved. These high leverage points represented multi-stakeholder challenges towards the reduction of SUPs in the food delivery business that tackled the system of provision of sustainable consumption practices.

First, the improvement of the post-consumption waste management system is a key leverage point towards the circular economy in Thailand. Because deconsumption or 'reduce' can not offer overall benefit to the system, the focus is then shifted towards proper waste management which requires both behavioral and structural adjustment. Second, the promotion of green consumption practices through economic instruments, law and regulations will lead to the improvement of pricing failure in the market. Market-based approach and command and control approach, when integrated, can lead to change in the market system. Third, from the business perspective, benefit alignment is a key towards sustainable transition since voluntary sustainability programs can only be sustained if every party receives enough benefit from the change. However, if prices in the market are corrected, the desirable choices will be choices that are cheaper. In that case, private-sector stakeholders will find themself profitable and will continue such desirable practices. Therefore, benefit alignment in terms of marketing incentives could be provided as part of the short-term strategy, while price correction relies on long-term market-based instruments. Stiglitz (2007), Meadows and Wright (2008) and (Seyfang, 2009) stress the importance of 'price signals' as a leverage point that keeps the balance of demand and supply of the system. Apart from benefit alignment, non-alignment between non-state actors' interest and policy objectives may intensify challenges of voluntary approach to corporate governance. Lastly, for-profit organizations are concerned about minimizing costs and maximizing profits. Economic and market-based instruments can make green alternatives cheaper or make recyclable products more profitable. These pricing mechanisms together with supportive infrastructure, the market system will adjust itself toward the optimum point where prices reflect the true cost of the product.

It can be concluded that actors are influenced by institutional arrangements, socio-economic conditions and physical environment. Behavioral adjustments at the consumption end alone can not deliver significant changes in the system. Theoretically, the systems and infrastructure provision approach is required to steer the system towards a transition where the demand and supply of the system are shifted towards the greener direction until the system reaches the self-organization stage where it can run without interventions. Additionally, the circularity of SUP is as important as the reduction measure. Ultimately, the food delivery business system needs SUPs to run, so the impact of the reduction measure might be limited. The system should, therefore, place more emphasis on post-consumption measures. Specifically, to provide supportive measures, system, infrastructures and regulations to enhance values and recyclability of SUP waste from pre-production to post-consumption stages. Moreover, the demand-led sustainable consumption requires policy intervention to induce demand for alternative packaging. Economic measures are required as another intervention to lower the cost of green practices.

3. Initiative evaluation

3.1 Consumer evaluation

Overall, the descriptive statistics of initiative variables revealed that the sample tended to accept 'no cutlery default' the most ($\bar{x}$=4.71) as this function is currently applicable within key food delivery applications, leading to users' familiarity. It also requires little or no change to existing behavior. Likewise, 'eco-labelling' received the same acceptance level ($\bar{x}$=4.70), the intention to support the program was considerably high ($\bar{x}$=4.64). 'Eco-labelling' requires very little effort and consumers like to be offered new information that could assist them in making consumption decisions (Jackson, 2005; Seyfang, 2009; Van Dam, 2016). 'Packaging procurement' was less accepted ($\bar{x}$=4.22); the samples did not find themselve involved with this corporate partnership program apart from having to pay extra for green packaging. On the other hand, 'deposit-return scheme' received the lowest mean score of both the acceptance level and intention to support the initiative ($\bar{x}$=3.76, 3.70) as it mainly involves structural adjustment which requires a considerable amount of resources and effort, especially new consumption behaviors that need to be implanted. Moreover, this business thrives on a foundation of 'convenience' consumption which tries to minimize steps required; thus, this transition was not yet welcomed by its target consumer group. The overall willingness to pay was 3.20 THB for green packaging and less than 30 THB for returnable food containers.

By cluster, the responses to the proposed initiatives of cluster 1 (moderate environmental attitude) and cluster 3 (high environmental attitude) were found to be statistically indistinguishable in three hypotheses relating to 'no cutlery default', 'packaging procurement' and 'eco-labelling' initiatives. It implied that cluster 1 and 3 have close characteristics regarding acceptance level of initiatives. In addition, a group with moderate environmental attitude scored closer to a group with high

environmental attitude in every hypothesis except the intention to support the ‘deposit-return scheme’. Since the moderate cluster contains the largest number of group members, it could be inferred that in general, the lay population tends to have a higher chance to be converted to the higher environmental attitude group than the lower one. Therefore, small improvements on these initiatives can increase the potential of a moderate environmental attitude cluster converting to a higher environmental attitude cluster. From a green marketing perspective, such conversion is a lucrative opportunity since the moderate cluster represents the largest pool of population.

On the other hand, cluster 1 (moderate environmental attitude) and cluster 2 (low environmental attitude) were found to be statistically indistinguishable in intention to support the ‘deposit-return scheme’. Unlike the other three initiatives where the mean score of cluster 1 clustered closer to the mean score of cluster 3 (high environmental attitude), the mean score of cluster 1 located closer to the mean score of cluster 2 in intention to support the ‘deposit-return scheme’. This was because the deposit-return scheme requires another level of behavioral and structural adjustment, especially new consumption behaviors which requires a certain period of time. So, the group with a moderate environmental attitude was more likely to be demotivated by this scheme.

Behavioral-Over-Time (BOT) analysis revealed that the ‘no cutlery default’ and ‘eco-labelling’ had highest waste reduction potential. Specifically, ‘eco-labelling’ was recommended for cluster 1 (moderate environmental attitude) while ‘no cutlery default’ was recommended for cluster 2 (Low environmental attitude). These two initiatives could be targeted as a short-term plan while ‘packaging procurement’ and ‘deposit-return scheme’ could be targeted as a long-term plan since they need to build acceptance and develop supportive infrastructure and systems.

Qualitatively, most consumers believed that the ‘no cutlery default’ was not very practically successful. Most of the time, they received unwanted cutlery and many condiment sachets. Some of the food delivery customers were not aware of the default option. Moreover, in order to increase usage of green packaging, food delivery platforms should offer incentives to their merchant partners. However, most consumers thought that they should not be charged extra for green packaging since they believed that what they pay should already cover all costs. On the other hand, incentives should be provided for customers who opt for eco-labelled restaurants. Still, eco-label may be an additional factor that enhances green perceptions but it may not influence consumption decisions. Lastly, the deposit-return scheme faces several challenges from consumers' point of view. In this context, operational challenges and project scaling are major issues to be concerned about.

3.2 Stakeholders evaluation

The stakeholder's initiative evaluation was based on four factors: expected outcome, resources required, and chance of success. It revealed that the stakeholders viewed 'no cutlery default' and 'eco-labelling' initiatives as the most effective measures towards the reduction of SUP in food delivery service. By attribute, 'eco-labelling' was perceived to have the highest expected outcome while 'no cutlery default' required the least resources. Both of them had a high chance of success. Notably, the 'deposit-return scheme' received the lowest scores in chance of success from all stakeholders. By stakeholders, policy-level actors are directly responsible for the implementation of market-based and economic instruments. They realized structural limitations and, therefore, perceived that the 'packaging procurement' and 'deposit-return scheme' initiatives were unattainable in a short period of time. Likewise, food delivery platforms, and restaurant partners are key practitioners who are immersed in working conditions that are highly exposed to financial challenges in subsidizing green packaging in 'packaging procurement'. Moreover, the 'deposit-return scheme' seemed to be a heavy burden to them in terms of logistics and operation.

Qualitatively, although 'no cutlery default' requires less resources and is relatively easier to implement, the gap between platforms and the restaurants' practices still remains. In order to operate this initiative while maintaining customer satisfaction, relationships among the platforms, merchant partners, and the customers should be well-managed through cooperation, communication, feedback systems, and incentive schemes. For 'the eco-labelling' program, it is technically easy for the platforms to adjust their in-app features. It also requires little resources and time. However, the key is how to make the restaurants opt for greener packaging when it still costs more. Other issues to be considered include how the label should be communicated and how to design the incentive schemes for both the restaurants and the consumers. Moreover, similar to consumers' opinion, sustainable niches believed that labelling only acts as a signal but will not lead to attitudinal or behavioral outcomes. Additionally, a number of challenges were pointed out regarding the packaging procurement and subsidies. The current price structure limits the platforms and the restaurants to acquire green packaging while maintaining their profitability status.

3.3 Challenges of each initiative

From the qualitative analysis of stakeholders and system, the challenges of each initiative can be discussed as follows.

3.3.1 No cutlery default: Reduce

Acting as a behavioral shortcut, setting default options does not influence attitudes or perceptions of individuals. It tackles change at behavioral end rather than the deliberative end. Therefore, the outcome of this initiative may need to be coupled with long-term information provision to influence consumers' cognitive processing towards SUP cutlery consumption. In addition, this initiative faces practical

limitations. Customers often receive unwanted cutlery. Since customer satisfaction is the most valuable and vulnerable asset to the restaurants, platforms need to reestablish mutual understanding with their merchant partners regarding the compliance of the cutlery request.

However, during the pandemic, policy actors believed that SUP reduction strategy is almost impossible, and it is unavoidable. The current communication message is therefore focused on the promotion of household waste segregation at source and recycling. Moreover, there is not enough incentive to reduce unnecessary SUPs consumption, especially at the consumption end.

3.3.2 Packaging procurement: Replace

Market system makes eco-choice ‘premium’. Currently, green packaging discounts of 15% - 25% offered through partnership between food delivery platforms and packaging suppliers created financial burden to the companies. The remaining price gap means higher cost to be borne by entrepreneurs during the economic crisis. Such private subsidies can not be sustained in the long-term. The more sustainable solution pertains to price correction through government subsidies. The government offers 25% tax exemption on 11 types of green packaging. However, the government’s tax incentive scheme did not receive satisfactory feedback. One of the major discouragements is the government red tape. Not only do the taxpayers need to submit piles of paperwork but the process also takes months to complete. 25% exemption is also not very compelling for the corporation to make an effort into filing the exemption. Only big companies find this incentive worthwhile. The willingness to pay for green packaging also varies across consumer segments.

3.3.3 Eco-labelling: Redirect

Since the financial return on ‘eco-labelling’ is not guaranteed, platforms are reluctant to add another label when there are already many commercial labels presented on their application. Moreover, the process of issuing eco-labels for food packaging has no official standard. The introduction of government-issued labelling systems and guidelines for green merchants will enhance credibility of food delivery platforms and merchants.

3.3.4 Deposit-return scheme: Reuse

The key attribute of a food delivery service is ‘convenience’ which may limit the possibility of the scheme as reported in chapter 4, this initiative receives the lowest acceptance level and intention to support. From the business perspective, high operation and logistics costs make this scheme unprofitable without government support. Regarding the post-consumption practice, SUPs food packages are usually contaminated and thus cannot be properly managed; making them end up in the dumpsite.

4. Strategic recommendations

As addressed in Ketelsen et al. (2020), there are still a limited number of studies that propose measures to overcome barriers to sustainable consumption of SUPs food packaging, especially in this emerging food delivery sector. The quantitative and qualitative analysis of consumer profile together with the evaluation of initiatives were discussed as the foundation of strategic recommendations to reduce SUP in food delivery service. This study suggested measures to reduce SUPs in the food delivery business that integrated nudges, market-based instruments, information instruments, infrastructure and system provision, and green marketing. The recommendations are illustrated through policy and managerial implications.

4.1 Managerial implication

4.1.1 Corporate responsibility

1) Dilemma in corporate responsibility

Similar to individual dilemmas in sustainable consumption, businesses also face difficulties when deciding to act sustainably. With limited resources, businesses may opt to invest in activities that provide immediate financial gains rather than societal or environmental gains. Businesses, therefore, will not jump into projects with an expected low financial return (Orsato, 2006; Van Dam, 2016). For example, small-size packaging producers hesitate to invest in green technology as the return on green investment is not guaranteed and the risk is high. Referring to the construal level theory, companies also face temporal distance tension between their long-term equity and short-term profit maximization goals. The job of the business is to maximize benefit and minimize cost attached to the consumption. For example, both food delivery platforms and restaurant partners rated ‘deposit-return scheme’ as high resource required and low chance of success since they believed that revenue stream generated from this project will not cover resources invested. This has led to another key leverage point which is cost and profit. As long as the project could guarantee compelling return on investment in a considerable period of time, for-profit organizations will voluntarily grab them without being incentivized.

From an environmentalist perspective, globalization is a threat to sustainability. Nonetheless, all stakeholders realize that degrowth or deconsumption is unattainable within the globalized market economy. Each stakeholder, therefore, shares the same vision in greening the economy through various approaches. Despite the debate in deconsumption, consumption reduction of unnecessary plastics presents a gap for improvement. Although food delivery consumers are not directly involved in packaging choice, private organizations rarely promote ‘reduce’ measures towards sustainable consumption. In a green growth economy, consumers are encouraged to consume greener products rather than consume less. Less demand for SUP may be desirable in the cost-saving aspect. However, some

economic value will disappear from the chain, and some actors will be affected by the loss of economic transactions.

2) Corporate responsibility model

From the system perspective, corporate responsibility plays a role as part of the system's self-correction through cost internalization. Systems analysis revealed significant relationships among actors involved in SUP issues in food delivery service. Packaging producers, food delivery platforms, and merchant partners allocate their resources as part of corporate responsibility commitment that focus on SUPs reduction along the pre-consumption stages. Unfortunately, the responsibility of these companies does not extend to the consumption and post-consumption stage. Despite growing consumer demand for corporate responsibility, each organization has a different capacity to implement sustainability programs. As a result of different capacities and the dilemma mentioned in the previous section, different firms deliver different levels of responsibility and take different roles towards environmental sustainability.

The level of corporate responsibility ranges from reactive (responsive, or regulatory) approach to proactive (creative) actions (Bocken, 2017; Hoffman, 2000; Porter & Kramer, 2006; Sen & Bhattacharya, 2001). The CER model illustrated in Figure 5.1 presents the levels of each initiative considering its scope and responsibility levels. The reactive approach is part of the business' minimum economic responsibility to provide food in quality packages at a reasonable price and maintain customer satisfaction in order to keep the revenue stream at a desirable level. In practicing reactive market approach, companies respond to changing market environments such as new technologies, changing consumer preference, changing consumption pattern, and most importantly, what their competitors do. Likewise, corporations practice minimum responsibility to comply with regulations or maintain competitiveness. On another end, proactive market approach is often seen as a voluntary practice where the firms creatively initiate ideas to improve plastic waste situations and advance their competitiveness. The scope of initiatives range from business level to structural level. At the business level, companies can offer greener solutions to their customers without market intervention. Change at business level requires less resources and time. Initiatives at the structural level require multi-stakeholders cooperation and market intervention to enable changes.

However, there are internal and external factors that influence the corporate practices on SUPs reduction in the food delivery business. Internally, all major food delivery platforms in Thailand are subject to their international parent company's policy. However, sustainability policies are applied differently in different countries according to the market conditions. The responsibility level can be seen in alignment with Sindhi and Kumar (2012) who affirm that CER in developing countries is usually based on a minimum, responsive strategy due to weak regulations and standards. Likewise, chain restaurants have their own policy regarding

the types of packaging. Financial capability also limits the companies decision to implement green practices as discussed in ‘dilemma in corporate responsibility’. Externally, the companies have to comply with government policies and regulation, especially the green packaging policy. Green practices are also influenced by market pressure which involves competitors and other stakeholders. Lastly, consumer demand is one of the most influential factors. The firms need to maintain customer satisfaction by responding to increasing demand for green products or offering beyond-expectation solutions.

In this study, the ‘no cutlery default’ is influenced by the platform's parent company policy. Food delivery platforms in other countries also apply this default. There is also a pressure of negative brand perception that may occur if the platforms do not have the function that the competitors have. This is how the platforms respond to internal and external drivers with minimum practice that is not beyond expectation. It can simply be done at the business level. It is technically easy for the food delivery platforms to add ‘eco-label’. However, in order for the restaurants to acquire green packaging, internal and external factors are concerned. Restaurants’ financial capability is a key factor that influences their packaging choice according to the leverage points derived from system analysis. Government regulation on food packaging can also greatly influence packaging choice, especially if the measure leads to the lower cost of green packaging. Market pressure and green consumerism can influence chain restaurants in their packaging decisions. This initiative requires more action from the restaurants and relies on green demand and supply in the market. ‘Packaging procurement’ is limited by the financial capability of platforms and packaging suppliers in helping small restaurants in absorbing the cost of green packaging. Government subsidization policy would greatly influence the firms to scale up this CER practice. This initiative is a voluntary practice that private partnership proactively offers. It involves more stakeholders and relies on improved market structure. ‘Deposit-return scheme’ requires extensive stakeholders cooperation which can not be done at the business level. Due to the fact that Thailand still lacks EPR regulation on food packaging, food delivery providers that adopt the deposit-return scheme are considered using a proactive market approach. This scheme is less likely to be influenced by any drivers except government policies and regulation.

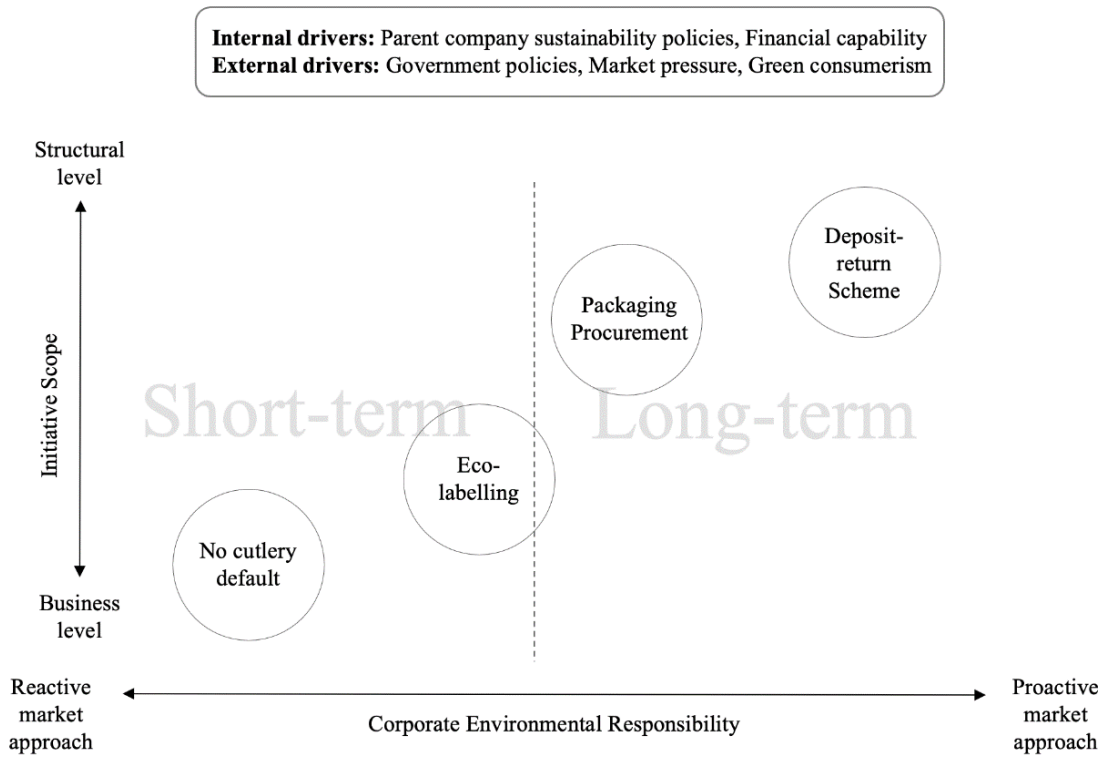

Figure 5.1: CER model for SUPs reduction in food delivery service

From the stakeholder analysis, each corporate actor is assigned to a different role according to Kotler's roles of corporate actors towards environmental sustainability as appeared in Figure 5.2 (Kotler et al., 2019). Green packaging supplier acts as an innovator who provides greener alternatives to the market. The restaurants are the users of green packaging. When adopting green packaging, the restaurants become a green propagator among its own customer base. From a marketing perspective, packaging acts as one of the brand's touchpoints that can communicate values to the customers. Food delivery platforms are large-scale companies that can amplify the adoption of green packaging in the market. With their marketing resources, they can leverage green packaging adoption rate among their partners and, at the same time, promote the use of green packaging among their customers. However, the corporates can perform their best role within supportive market conditions.

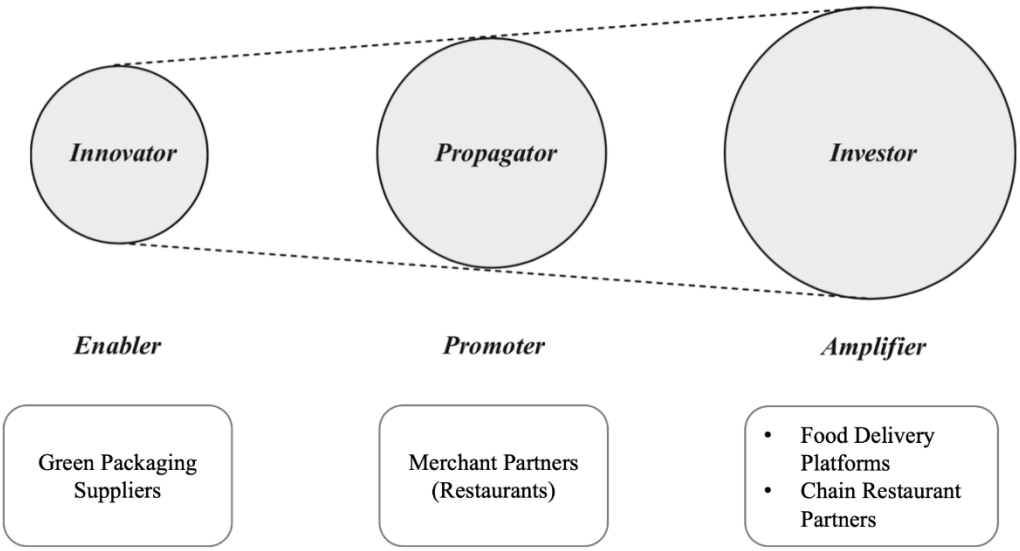

Figure 5.2: Roles of corporate actors towards environmental sustainability
Adapted from (Kotler et al., 2019)

From the consumer analysis, the results suggested that green consumers demand higher levels of environmental responsibility from the corporate, both food delivery platforms and the restaurants. Cluster 3 totally agreed that business in general should play an active role in tackling plastic waste issues ($\bar{x}$=4.99). Moreover, the discriminant analysis suggested that the expectation towards the firms' active responsibility was the most distinct variable across three clusters. Meaning that the green segment can be primarily identified by their level of expectation towards corporate's active responsibility. Likewise, businesses' active role in dealing with plastic waste issues can capture green consumers. The results were in line with Podnar and Golob (2007), Collins et al. (2007), Sen and Bhattacharya (2001), Maignan (2001), and Smith et al. (2010) which affirmed the relationship among CER expectations and attitudinal constructs such as environmental consciousness and individuals positive responses towards the firm's sustainability initiatives.

3) Responsibility of the non-corporate actors

While cost and profit is a priority concern for for-profit companies, non-profit organizations face less conflict of interest in implementing sustainable projects. Non-profit niches often receive funding from the government and large companies. They play more roles at the post-consumption stage where responsibility of the business does not cover. Post-consumption projects mostly target overall plastic waste, not specifically on SUPs from food delivery service. The post-consumption initiatives are often formed through partnership among the private, public, and civil society actors. Non-profit niches also communicate more frequently on plastic consumption issues with more details on how to consume sustainably and manage waste properly; also, because this issue is out of the companies' commercial scope.

Likewise, there are for-profit niches that are ‘green to the core’. They have their business model developed on a sustainability basis. Every element is designed to be optimized in green business development. Unlike traditional for-profit businesses, sustainable niches proactively offer green value to the customers. In this context, sustainable niches include the restaurants and food delivery service providers that focus on delivering waste-free service. Their green practices framework covers the avoidance of excessive and unnecessary packaging, the use of alternatives packaging, and the development of reuse systems. However, these for-profit sustainable niches face difficulties in scaling because the demand for green products and services are still small. At the same time, the existing market system makes green practices unprofitable.

Key success factors of these niches can be discussed as follows. Due to the unique point of differentiation, these niches received extensive free media, which led to enhanced brand recognition. Being niches, they have flexibility in improving and developing strategies to capture ever-changing demand and market conditions. They are also able to play the role of ‘green promoter’ to communicate green value to green and non-green customers through mass media and through their own communication channels. For example, Rise cafe, which adopted a reuse system in its delivery service, despite being able to operate within a limited area, received much media attention and promotion from many opinion leaders. KeawKeaw catering expanded their service to food delivery during COVID-19 which focuses on the ‘zero waste’ concept. Part of their mission is to promote sustainable consumption through mediums such as eco-tag, social media, mass media, and environmental working groups. Their agility enabled them to go through a trial-and-error process and improve their strategies based on customer feedback.

4.1.2 Green marketing: targeting and communication

1) Targeting green consumers: Convert, Nudge, Retain

The cluster analysis revealed that, overall, cluster 2 (low environmental attitude) showed low interest and concern about green products, services, and initiatives. They had distinctively low expectation of CER. Despite the known marketing benefits of ‘beyond expectation’ offering, cluster 2 do not expect environmental responsibility actions from the firms. Likewise, it is relatively difficult to influence their consumption attitudes. Thus, nudging is proposed as an instrument to capture cluster 2 since it aims to tackle the act, not altering the mind. However, organizations may choose to allocate marketing resources to capture the general consumers who have moderate environmental attitude (cluster 1) and the green consumers with high environmental attitude (cluster 3) in order to optimize the outcomes of measures and initiatives. Specifically, the greenies can be targeted as a beachhead market or the primary target (Park & Lee, 2014). Alternatively, to enlarge the green consumer pool, green marketers may focus on strategies to convert cluster 1, which lucratively contains the largest members, to cluster 3, which is the green group.

For effective communication, green communication strategy should be tailored to clusters. Cluster 1, despite some doubt, tended to be impressed by the firm's green actions. Communicators should maintain their impression through emotional marketing. Additionally, construal-level based communication can improve the construal level of the general consumers with moderate environmental attitude by turning the abstraction of sustainability into a more concrete and proximal image (Ibrahim & Al-Ajlouni, 2018; van Dam & van Trijp, 2016). Likewise, as cluster 1 lacked self-efficacy, communication should enhance intrinsic perception towards individuals' ability to make change. For cluster 2, only light content and green branding should be communicated to avoid potential adverse effects. In contrast, the green segment (cluster 3) possessed lower construal levels and high skepticism. Therefore, communication for this cluster should be concrete, clear, and precise. The content should cover deliverable commitments to green attributes. This strategy is supported by Cleveland et al. (2005), who suggest that superficial communication is not enough to capture green consumers. However, green communicators should avoid 'green hype' or repetitive green messages in all clusters since they can cause green fatigue among the cluster 1 and 2; and can dilute company's credibility and increase skepticism among cluster 3 (Jeevan, 2014; Ottman, 2011).

Green marketing communication strategies can be applied not only as part of corporate marketing but also as part of the public communication schemes by the government and civil society as green promoters. However, as discussed in the dilemma in the corporate responsibility section, non-corporate actors can also apply 'demarketing' in their communication strategies to promote the deconsumption of SUPs in food delivery business. For corporate actors, such as the food delivery platforms and the restaurants, demarketing messages can also be communicated through 'no cutlery default' function together with other empowerment and self-efficacy messages such as 'thanks for helping us reduce waste', 'we will try our best to reduce plastic waste', and 'thank you for reducing single-use plastics'.

2) Targeting the top '20%' merchants: Partnership towards sustainability

From the provision point of view, only few restaurants can afford green packaging and platforms' subsidies are not sustainable. According to the information provided by the food delivery platform, the revenue stream of food delivery business in Thailand follows the Pareto principle as shown in Figure 5.3; 80% of platforms' revenue comes from 20% of the restaurants they partnered with. To implement initiatives to reduce SUP in food delivery service, the proposed strategy is to form a partnership between the food delivery platform and the top 20% restaurant. For the 'packaging procurement' initiative, packaging suppliers should also join the partnership. These large chain restaurants usually have business relationships with green packaging suppliers and high ability to absorb green packaging costs. Therefore, targeting transition at these top 20% restaurants could lead to an impactful outcome for

the overall plastic waste situation in the food delivery industry, in line with the pareto principle. In the first phrase, the efforts and resources should be put into forming corporations with these large chain restaurants through the existing official working group panel. This strategy can alleviate the concerns of many stakeholders that were concerned about the gap in the restaurants' financial capabilities to change to greener packaging as a number of small-size restaurants and street vendors are listed on food delivery platforms. These SMEs earn low margins and operate on the cost-saving principle.

From a marketing perspective, these chain restaurants value brand image and perception and realize that voluntary green corporate practices are one of the factors that could enhance brand salience among every consumer group. So, the platforms could provide marketing incentives via the promotion of the restaurants' brand greenness through owned media such as banners in application. By doing so, it can capture cluster 1, the general consumers, who tend to be impressed by the brand's green practices. Platforms can develop mutual agreements with chained restaurants in strict compliance with 'no cutlery' requests. Moreover, platforms should communicate the 'excessive packaging' issue and provide guidelines on how to properly prepare food with minimum packaging. In the next phase, the restaurants should be encouraged to partner with green packaging suppliers to procure green packaging at lower cost. The partnership for green procurement can deliver marketing value to both the restaurant and the supplier. Platforms can also play a role in this partnership through partial subsidization. However, the major concern of private partnership campaigns is that, once return on investment in forms of marketing benefits are realized, the campaign will fade as the firms can not absorb the cost forever. Government subsidies are therefore needed to adjust the market.

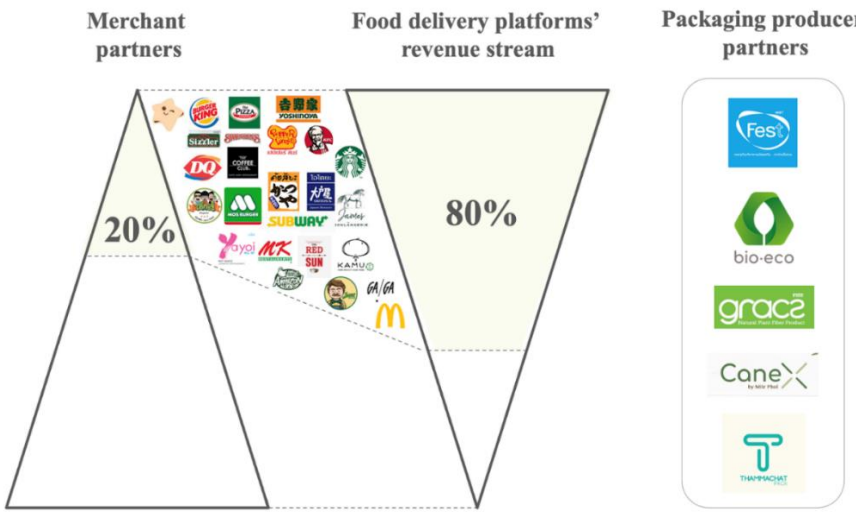

Figure 5.3: Merchant partners targeting strategy

4.1.3 Market-based instruments

Subsidies from business partnerships between food delivery platforms and packaging suppliers can influence restaurants' packaging choices. Unfortunately, the price gap has not yet been fulfilled. Consumer charges were therefore being considered. Cluster 1 and 3 have a willingness to pay 3.42 THB. However, actual willingness to pay might be slightly lower than stated. Therefore, these two clusters should not be charged more than 3 THB for an eco food container.

However, while charging policy can contribute to the companies' return on sustainable initiative or an addition to other environmental management budgets, the punishment scheme may not be the most appropriate strategies during the initiation phase of sustainable consumption transition taken into account high price sensitivity. To initiate green consumption patterns, companies may consider adopting reward strategies through the provision of marketing incentives and may expect returns in forms of marketing benefit rather than monetary profits. Then, consumer charges may be considered when the new consumption pattern is established, and the market is govern by solid regulatory framework. As a result, some incentives, such as discount codes or point systems, should be developed alongside every green initiative. Several affirmations point toward the effectiveness of the incentive provision strategy among cluster 1 (moderate environmental attitude). First, the mean scores of cluster 1 and cluster 3 were found to be statistically indistinguishable in several variables indicating cluster 1's positive attitudinal and behavioral tendency. Second, the largest behavioral change was detected in cluster 1 in response to situational factors as found in the food ordering behavior result. Third, because of their moderate construal level and environmental value, cluster 1 lacks intrinsic control and are aroused by extrinsic motivations such as economic incentives that overshadow intrinsic values. Lastly, they already feel impressed by the green image but need some stimulus to act. This implication is in line with Van Birgelen et al. (2009), which suggests adding positive reinforcement to enhance environmental consciousness. Hanss (2012) also stressed that packaging consumption is based on a non-deliberate habitual decision which is automatically stimulated by external factors. Therefore, incentive provision, as a behavioral catalyst, can increase the potential of the general consumer (cluster 1) to convert to the greener segment (cluster 3). According to the evaluation of willingness to accept, an incentive value equivalent to 6 THB is proposed.

4.1.4 Behavioral instrument

Nudges target behavioral change through choice architecture. Cluster 1 and 3 have a considerably high tendency to avoid SUPs and a high acceptance level of 'no cutlery default'. Likewise, nudges can lead to behavioral change among inattentive consumers or cluster 2, who base their decisions on heuristics and have limited self-control (Alpizar et al., 2020). Referring to systems of mind functioning, nudges fall into system one, which involves automatic decision with little cognitive effort (Kahneman, 2011). Therefore, despite the lower acceptance rate, default options

can act as a behavioral shortcut for cluster 2. Considering Thai gastronomy, this function can be extended to cover condiment sachets since they come in small packages that add up to SUP waste. Pizza (as well as other fast food meals), and noodles are among the menus that come with excessive tiny pieces of SUP packages.

Eco-labelling acts as an information instrument which not only reduces skepticism among cluster 3 but also prevents cluster 1 and 2 from being greenwashed (Albayrak et al., 2010; Cleveland et al., 2005; Nordin & Selke, 2010; Ottman, 2011). Several studies identified information instruments, such as labeling, as the most influential factors on both general pro-environmental behavior and green packaging consumption (Grönman et al., 2013; Isa & Yao, 2013; Jeevan, 2014; Ketelsen et al., 2020; Ottman, 2011). For green consumers, this information can influence consumption decisions based on rational choice theory. Apart from redirecting consumption choices of conscious consumers, labelling also delivers 'salience' that psychologically captures inattentive consumption decisions (Alpizar et al., 2020). It is also worth discussing that negative labelling acts as extrinsic motivation, which is claimed to be more effective among the less green clusters, while positive labelling acts as intrinsic motivation, which is more suitable for greener clusters (van Dam & van Trijp, 2016).

4.2 Policy implications

4.2.1 Governance towards sustainability

The more the focus moves further from individuals, closer to the system of provision, the higher degree of government role is required. The role of governing bodies in the system is to keep externalities at minimum. When dealing with environmental responsibility of the business, the effectiveness of voluntary approach towards sustainability remains debatable due to 'self-regulation failures'. Change at business level still largely requires official direction, especially change that would have an impact on customer satisfaction. This study found that none of the companies wanted to be the first mover in applying plastic charges on consumers. Likewise, reduced packaging could affect food presentation and spillage during transportation; the risks they would not want to take. Ideally, in order to instigate sustainable transition, a command and control from the officials is needed so that every player in the market has to comply with the same regulation. However, the command and control approach takes time and the transition gap is huge. In Thailand, existing laws and regulations on plastic waste face implementation challenges especially when it comes to food packaging that involves small street vendors. EPR for plastic waste can only be implemented voluntarily. Therefore, while working on developing laws and regulations, market-based instruments should be applied to encourage voluntary actions. At the same time, system analysis revealed that research and development should be promoted to encourage greener production and consumption. To improve the effectiveness of behavioral instruments, the governance actors should also target attitudinal change through information provision strategy such as awareness campaigns based on

proposed green marketing strategies.

4.2.2 Market-based instruments

Two levels of green packaging subsidization are currently present in Thailand's food delivery industry. Government subsidies can influence the market through the lowered cost of preferable alternatives. 25% corporate tax exemption is offered for income spending on 11 types of compostable plastic products which include food packaging, straw and cutlery. However, the research results revealed that this tax incentive scheme did not receive as much participation as expected due to the government red tape. The exemption amount is also not compelling. The pollution control department and fiscal policy office acknowledge this limitation and therefore consider increasing the exemption to 30% and expanding the list of eligible compostable plastic types. Meanwhile, civil society organizations play a role in researching and collecting feedback from the producers in bio packaging industries regarding tax exemption schemes. Alternatively, the policy makers should actively push the tax penalty scheme into implementation, especially on unnecessary SUP products, which can accelerate the transition towards a green economy.

4.2.3 Infrastructure and systems provision

The provision of post-consumption waste management infrastructure and systems is a key leverage point in the system that would increase the rate of proper plastic waste treatment. Proper and adequate waste facilities at household level as well as at the disposal level will enable the system to achieve circularity. However, infrastructure provision needs to be coupled with attitudinal and behavioral change at individual level in order to produce desirable practices.

Specifically, the deposit-return scheme may not be the best solution to the problems of SUPs in Thailand, particularly in convenience-based businesses such as food delivery services. From consumers' perspective, this initiative received a low acceptance rate and willingness to pay in all clusters. The intention to support this initiative was not very distinct across clusters, indicating consumers' reluctant to participate in the scheme. From stakeholders' perspective, this initiative requires a lot of resources but if successful (low chance), would create an impactful outcome. However, the pilot project could target cluster 3 as its primary market, as they have the highest acceptance level and willingness to pay a deposit. Additionally, this initiative requires action from extensive stakeholders, with cooperation from food delivery platforms and other civil society actors such as the niche projects formed through partnership.

5. Conclusions

In the context of SUP consumption in food delivery service, time perspective and environmental values representing socio-temporal dilemmas in sustainable consumption were found to have relationships with both behavioral and psychological constructs. The measurement scale, ECCS and CFC were found to be significant identifiers of green segmentation. General consumers with moderate green attitudes were extrinsically motivated and made decisions based on short-term personal interest. On the other hand, green consumers were intrinsically motivated and focused on the future consequences of their action to others, and therefore facing less dilemma in consuming sustainably. In addition, most sustainable consumption decisions were discouraged by perceived behavioral control or self-efficacy that deflated the individuals' ability to create change. This study also found that COVID-19, as a behavioral catalyst, had a long-term influence on food delivery consumption behavior. Pertaining to the dine-in restriction measure, every cluster exhibited the same behavioral pattern of food delivery ordering where post-lockdown consumption is higher than pre-lockdown consumption. General consumers, with moderate environmental attitudes, responded the most to the measure.

The strategic recommendation framework is presented in Figure 5.4. The strategic priorities were highlighted in red with stars. It suggested prioritizing strategies that require less resource, have high expected impact, are ready to be rolled out, and are important to initial transition towards sustainable consumption. The SUP reduction initiatives require partnership between food delivery platforms and the 'top 20% merchants' that yield the highest transactions. Short-term initiatives involve behavioral instruments, which is the 'no cutlery default', and information instruments, which is the 'eco-labelling', because they can yield high expected outcomes with minimum resources within a short period of time. They also require less government support and involve less stakeholders when compared to the long-term initiatives. Despite being a business-led initiative, 'eco-labelling' can be leveraged through the government-issued eco labelling and official guidelines for green restaurants as a labelling criteria. Long-term strategies involve market-based instruments, which is the 'packaging procurement' or subsidization, and infrastructure and system provision, which is the 'deposit-return scheme'. These two multi-stakeholders initiatives require more support from the government in terms of green packaging subsidization policies and the provision or facilitation of deposit-return systems.

Green marketing and communication are proposed as part of the corporate short-term strategies. Food delivery platforms can apply different green marketing strategies to each cluster. To be specific, convert cluster 1, nudge cluster 2, and retain cluster 3. Green marketers may consider putting less resource on the inattentive non-green consumers and targeting the green consumers and general consumers with different incentive schemes. As part of information provision and marketing incentives, food delivery platforms can tailor communication campaigns and promotional codes

for each consumer group. Likewise, communication messages can be designed differently when communicating with the ‘20%’ and the rest ‘80%’ restaurant partners. Marketing incentives provided to the large chain restaurants should focus on the ‘branding’ aspect. Likewise, messages about ‘cost-saving’ should be communicated to the small, low-margin restaurants. Also, the government and civil society can act as green promoters by relying on the proposed segment-specific communication strategies.

Additionally, the measures require a supportive market environment that promotes sustainable consumption practices. While food delivery platforms have agility in adjusting their services, the government has the ability, authority, and responsibility to unlock structural barriers towards green growth. Therefore, in the long-term the government should improve leverage points in the system. First, cost minimization and profit maximization are the key concerns of most stakeholders. As long as the sustainable practices are profitable, the private sector will be willing to invest in them. The government needs to ensure benefit alignment among all stakeholders. It should support research and development, technology, and innovation, especially in the production stage. Moreover, information provision from the policy-level actors is needed in order to promote public awareness and mutual understanding among stakeholders. At the post-consumption stage, an efficient waste management system should be developed as part of the circular economy policy. To improve pricing failure, the government should adopt market-based instruments as part of the market price correction effort. Lastly, the policy makers should impose packaging law and regulations at the production, consumption, and post-consumption stages. For example, recycled content policy on food packaging, reduced packaging policy, food packaging waste directive, eco-labelling standards, household waste management regulation, and most importantly, the EPR policy.

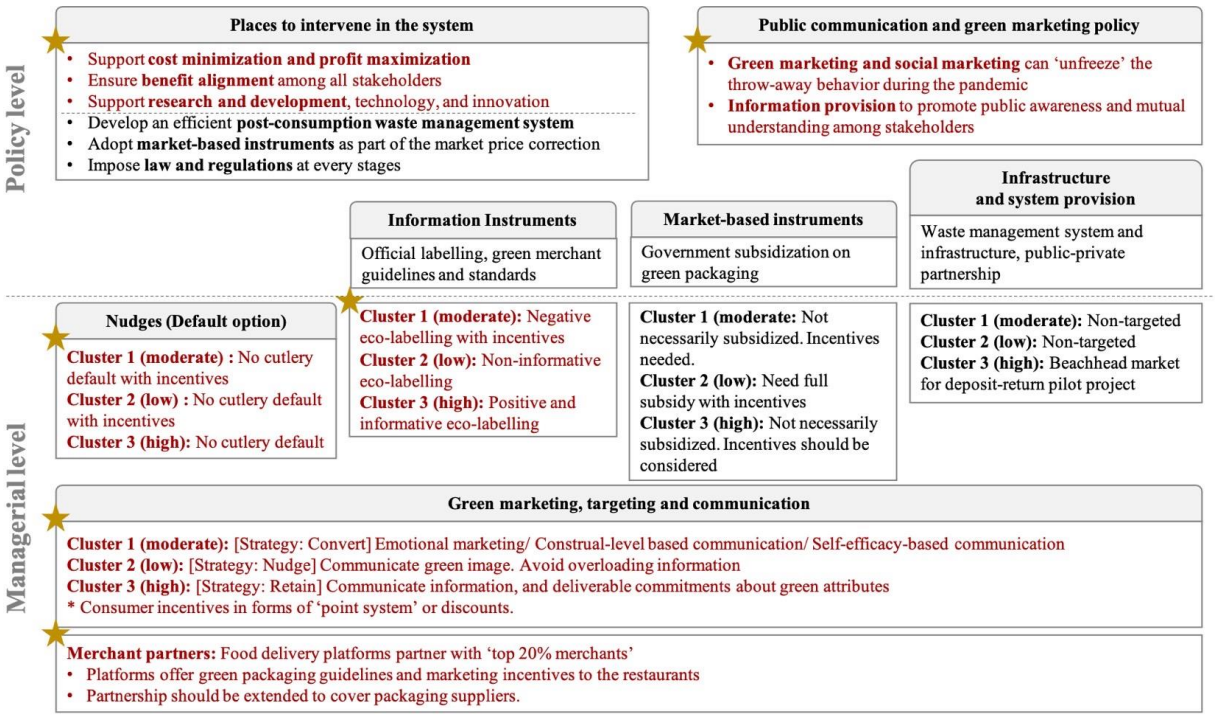

Figure 5.4: Strategic recommendation framework

This study contributed to the novelty in the research area of sustainable consumption of packaging in food delivery sector. The existing research pool has extensively studied environmental impact of SUP food packaging, technologies, and innovation in alternative food packaging materials as well as waste management practices. However, the understanding of sustainable consumption dynamics in food delivery sector, especially on the consumer side, was not yet well-establish. This research, therefore, adds knowledge to the field regarding consumer segments in sustainable consumption of packaging in food delivery business context. The consumer understanding and insights are beneficial for policy design and implementation. At the policy level, several policy recommendations have been proposed globally as SUP reduction efforts, especially during the COVID-19 pandemic where plastic waste from food delivery is evident. This study adds values to existing policy research in Thailand through systematic approach. The research finding has contributed to a more solid comprehension of consumption attitudes and practices as well as the dynamics in the system. It has assisted policy directions through the official working group and other national and international development organizations.

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APPENDIX

I. Questionnaire and interview guidance

a. Pretest Feedback

Feedbacks from pretest

**Pretested in Thai language*

Overview

1. The current language used seems to be straightforwardly translated from English, making it hard to be interpreted. It could be toned down to more informal language so that it becomes easier to understand.
2. The length and complexity of questions may turn down the respondents before they complete the questionnaire
3. Some parts (eg. part two: attitudes and awareness) require more effort to understand. Some have to be read twice.
4. Both the questions and the whole questionnaire are too long. Yet, more examples should be provided in each question (eg. question 2.7). Try replacing long words or phrases with their shorter synonyms or abbreviations.
5. The word 'Single-Use Plastic' could be replaced with the word 'plastic' or 'plastic packaging' throughout the questionnaire since the context had already been established.
6. The lay public may not be familiar with the word 'platform'. The pretest reveals that the word 'application' or 'app' in short should replace the word 'platform' throughout the questionnaire..
7. Some questions (eg. question 2.1) in session two are double negative, and thus require more attention and time.
8. There should be one question asking about the degree of attention paid to the type of packaging received.
9. The opening phrase 'If you never order food delivery via Grab, LINEMAN, Food Panda, Gojek (Get) from your personal mobile phone, please leave this survey page' should be changed to a positive phrase.

Section 1

10. Question 1.1 - 1.3 should be grouped under one section that consists of three sub questions as they have the same pattern, asking about behaviour at different time periods.
11. Question 1.2 should replace the word 'restaurant closure' with words that refers to 'temporary dine-in prohibition'
12. Question 1.2 and 1.6 can be well-understood without the parenthesis. Also, should reduce redundancy and make it more precise.
13. Question 1.4 should state more clearly about which situation or context it refers to, restaurant eat-in, take-out, or delivery. The question should also add 'how often ?'.
14. Question 1.4 should be designed to detect change in SUP cutlery usage behavior between pre and post COVID-19 situations.
15. Question 1.9. The lay public may find it hard to relate themselves to 'oxo-degradable plastic' but rather be more familiar with the term 'biodegradable plastic'. They absolutely have no idea about oxo-degradable plastic. The pretest result also shows that most of the respondents are not aware of the impacts that oxo-degradable plastic can cause.

Section 2

16. Question 2.1 and 2.9 seem to ask the same thing, with very little difference, thus it is possible that the response will be in the same direction.
17. Question 2.2 and 2.10 should be more precise and clear. An example could be provided.
18. Question 2.7 could give an example of possible environmental information provided
19. Question 2.10 should specify 'impact' as environmental impact. "Product/service" should be specifically stated. Also, more context specific since some respondents put themselves in a 'food delivery' context making it hard to imagine what the product and service are.

Section 3

20. Question 3.1.4 should mention alternatives to plastic packaging since it talks about increasing cost.

Section 4

21. Question 4.2 should be revised for more clarification and better understanding, especially description about how the program works. The part asking about willingness to pay should have room for ones who are not willing to pay at all. The respondent may not think about the option of answering 'zero Baht'. Thus, more instruction could be given.
22. Sub questions in question 4.3 - 4.4 should be separated as individual questions for better presentation and ease of viewing/responding.
23. Question 4.4, add 'zero baht' option to the willingness to pay for returnable containers.

Pretest result analysis

24. All respondents answer '5' (strongly agree) in question 2.2. So, the sentence could be restructured since the main idea of the question is in the latter part. The first part is a general statement that everyone agrees.
25. Question 2.7 receives diverse responses which may not be statistically significant. So, more explanation could be added, examples to the question as suggested by the pretest respondents.
26. Question 2.9 and 2.10 receive responses that cluster in '3' which can be implied that the questions are unclear or the respondents could not relate themself to what is being asked.
27. Sub questions under question 3.1 receive responses that exhibit the same pattern. So, some sub questions could be cut.

b. Consumer Survey

Behavior and perception on plastics waste from online food delivery

This survey is a part of Ph.D. thesis of Miss Boonchanit Wongprapinkul
Environment, Development and Sustainability program, Chulalongkorn University
Contact: +6681 208 6619, E-mail: Boonchanit.chula@gmail.com
Advisor: Dr. Sujitra Vassanadumrongdee

* Data given will be used solely for academic purpose and only aggregated results will be reported *

Only for users who placed order(s)
from Grab, LINE MAN, Food Panda, Gojek (Get) on your own smartphone

Part 1: Behavior and perception towards online food ordering

1.1 How many times per week do you place order(s) via Grab, LINEMAN, Gojek or Foodpanda application on your own smartphone at these following periods

	Less than 1 time/ week	1-2 time(s)/ week	3-4 times/ week	5-6 times/ week	7 times/ week	More than 7 times/ week
Before COVID-19	☐	☐	☐	☐	☐	☐
during the restaurants dine-in closure	☐	☐	☐	☐	☐	☐
After the restaurants reopened	☐	☐	☐	☐	☐	☐

1.2 Do you use SUPs cutlery more often during COVID-19 ?

	1	2	3	4	5	
Very less	☐	☐	☐	☐	☐	Very often

1.3 I think most of my food delivery orders have excessive and unnecessary packaging

	1	2	3	4	5	
Strongly disagree	☐	☐	☐	☐	☐	Strongly agree

1.4 How often do you have metal cutlery available at your eating place?

	1	2	3	4	5	
Never	☐	☐	☐	☐	☐	Always

1.5 What do you think about a restaurant that uses Styrofoam containers?

☐ Foam is fine. No problem

☐ The restaurant should change to other materials for health reasons

☐ The restaurant should change to other materials for environmental reasons

1.6 What do you think about restaurants that use containers labelled 'Biodegradable' ?

☐ Indifferent. Any box is the same

☐ The restaurant has environmental responsibility

☐ Not sure about the environmental attributes of biodegradable product

Part 2: Environmental Attitudes and Perception

Please choose the options that best describe your attitudes and perception
(1= Strongly disagree, 5=Strongly agree)
*This is an anonymous survey

How much do you agree with the following statements?

		Strongly disagree				Strongly agree
		1	2	3	4	5
2.1	I think that using fewer SUPs is usually unnecessary now because future consequences can eventually be dealt with at a later time	☐	☐	☐	☐	☐
2.2	Even if the negative consequences of SUPs waste will not result in these few years, I think it is important to take serious warnings about them.	☐	☐	☐	☐	☐
2.3	I consider how the plastics waste situation might be in the future and try to reduce the use of SUPs in my everyday life.	☐	☐	☐	☐	☐
2.4	Convenience is the biggest factor in my food ordering decisions.	☐	☐	☐	☐	☐
2.5	If I crave it, I will get it. Other issues can be figured out later	☐	☐	☐	☐	☐
2.6	It's time to avoid products that have excessive packaging	☐	☐	☐	☐	☐
2.7	It's time to buy products that use environmentally-friendly containers	☐	☐	☐	☐	☐
2.8	It's time to start bringing reusable container to buy food	☐	☐	☐	☐	☐
2.9	Using SUPs during COVID-19 is acceptable because it can reduce the chance of virus transmission	☐	☐	☐	☐	☐
2.10	Humans can continue to produce and consume as usual, no need to change anything since nature will eventually adjust itself to the balance point	☐	☐	☐	☐	☐

Part 3: Corporate Social Responsibility expectation

Please choose the options that best describe your attitudes and perception
(1= Strongly disagree, 5=Strongly agree)
*This is an anonymous survey

How much do you agree with the following statements?

		Strongly disagree 1	2	3	4	Strongly agree 5
3.1	I think that food delivery platforms should provide options for customers to reduce SUPs from food delivery orders.	☐	☐	☐	☐	☐
3.2	I think that food delivery platforms should encourage their restaurant partners to reduce unnecessary plastic packaging or change to environmentally-friendly packaging even if it involves higher cost.	☐	☐	☐	☐	☐
3.3	I believe that business must actively reduce SUP consumption to prevent plastic pollution.	☐	☐	☐	☐	☐

Part 4: Attitudes towards Single-Use Plastics reduction initiatives in food delivery business

Please choose the options that best describe your attitudes and perception

4.1

"No cutlery default"

Platforms set 'no cutlery' as a default option on their application. Plastic cutlery is on request.

4.1.1 How much do you agree with the following initiatives

Strongly disagree 1 2 3 4 Strongly agree 5
☐ ☐ ☐ ☐ ☐

4.2

"Green Packaging Procurement"

Platforms partner with packaging suppliers and offer discounts to merchant partners. Consumer charges are considered in parallel.

4.2.1 How much do you agree with the following initiatives

Strongly disagree 1 2 3 4 Strongly agree 5
☐ ☐ ☐ ☐ ☐

4.2.2 How much will you pay extra for green packaging
(..... THB / Piece)

☐ 0 THB/Piece ☐ 1 THB/Piece ☐ 2 THB/Piece
☐ 3 THB/Piece ☐ 4 THB/Piece ☐ 5 THB/Piece
☐ 6 THB/Piece ☐ 7 THB/Piece ☐ 8 THB/Piece
☐ 9 THB/Piece ☐ 10 THB/Piece ☐ > 10 THB/Piece

4.3	**"Eco-Labelling"**  	**Platforms provide in-app labelling for merchants that use green packaging.** 4.3.1 How much do you agree with the following initiatives Strongly disagree Strongly agree 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐ 4.3.2 How much do you want to support the initiatives Strongly does not want to support Strongly want to support 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐
4.4	**"Deposit-Return Scheme"**  	**Platforms develop a deposit-return system for returnable food packaging. Government provides support on systems and infrastructure.** 4.4.1 How much do you agree with the following initiatives Strongly disagree Strongly agree 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐ 4.4.2 How much do you want to support the initiatives Strongly does not want to support Strongly want to support 1 2 3 4 5 ☐ ☐ ☐ ☐ ☐ 4.4.3 How much are you willing to pay a deposit for one returnable container? (the deposit will be reimbursed once returned) □ 0 THB/ Piece □ < 30 THB/ Piece □ 31-50 THB/ Piece □ 51-70 THB/ Piece □ 71-100 THB/ Piece □ 101-150 THB/ Piece □ > 50 THB/ Piece

Part 5: Demographic information

5.1 Gender
□ Female □ Male □ Others

5.2 Age ……

5.3 Highest level of educational
□ Primary School □ Junior High School
□ Senior High School □ Vocational School
□ Bachelor's Degree □ Master's Degree
□ Doctoral Degree □ Others, please specify……

5.4 In which province do you live? ……

5.5 Average monthly household income (for statistical analysis only)
□ 0 - 15,000 THB □ 15,001 - 25,000 THB □ 25,001 – 35,000 THB
□ 35,001 - 45,000 THB □ 45,001 – 55,000 THB □ 55,001 – 65,000 THB
□ 65,001 –75,000 THB □ 75,001 – 100,000 THB □ Above 100,001 THB

5.6 what is your occupation?
□ Student □ State employee/ official
□ Company employee □ University employee
□ Business owner □ Self-employed
□ Unemployed □ Others

c. Stakeholder Interview

A record of interview schedule (n=14)

Organization name		Interview date and time
Policy-level stakeholders		
1.	Pollution Control Department (PCD)	17 June 2021 (01.30 PM)
2.	Environmental Quality Promotion (DEQP)	22 July 2021 (01.30 PM)
3.	Plastic Institute of Thailand	16 June 2021 (01.30 PM)
4.	Institute of Public Policy and Development (IPPD)	28 June 2021 (10.00 AM)
Food delivery platforms		
5.	LINE MAN Wongnai	18 June 2021 (02.00 PM)
6.	GrabFood Thailand	18 June 2021 (11.00 AM)
7.	Delivery Hero (Foodpanda)	9 July 2021 (01.00 PM)
Restaurant partners		
8.	Grandpa's Kitchen	20 June 2021 (03.00PM)
9	De Tum	25 June 2021 (11.00 AM)
10.	Tia Heng Food	7 July 2021 (06.00 PM)
11.	Por Pochaya	19 June 2021 (04.00 PM)
12.	Triple S	19 July 2021 (03.00 PM)
Sustainable niches		
13.	KeawKeaw Wasteless Catering	19 July 2021 (02.00 PM)
14.	'3-Wheels Uncle' Facebook Page	16 July 2021 (10.00 AM)

(1) Food delivery platform

Food delivery platform interview questions

As part of a Ph.D. research on Sustainable Consumption Practices:
a case of Single-Use Plastics in Online Food Delivery Market, Thailand

Miss Boonchanit Wongprapinkul, Environment, Development and Sustainability Program, Chulalongkorn University
Contact: 081 208 6619 E-mail: Boonchanit.chula@gmail.com
Advisor: Dr. Sujittra Vassanadumrongdee

** The information provided will be used solely for academic purpose and only aggregated results will be reported**

Research objectives

1. To identify platform food delivery consumer clusters based on their environmental psychology characteristics, as well as to investigate the differences in expectation and response to sustainable initiatives
2. To identify leverage points in the system in order to propose strategic recommendations that could lead to Single-Use Plastics consumption reduction in online food delivery market.

Interview objectives

To collect data for the analysis under research objective two which involves sustainable initiative review and System Dynamic Model review. The interview target includes public, private, and civil society stakeholders in the system. Ultimately, strategies and measures to reduce Single-Use Plastics (SUPs) consumption in online food delivery market will be suggested.

---

1. Information about overall orders and order categories (food and drink) for SUPs waste estimation.
2. What are the company's measures to support the reduction of SUPs packaging in food delivery business (if any)?
3. What has been/ will be done to improve the cutlery 'opt-in' measure at both customer and merchant ends?
4. Comments, suggestion, and expectation towards the Memorandum of Understanding (MOU) signed among 15 agencies in August 2020 to reduce SUPs waste from food delivery.
5. Is there any promotion/ incentive for the merchant partners who want to take part in SUPs packaging reduction effort?
6. What has been/ will be communicated to the public, merchant partners, drivers and other relevant parties regarding SUPs issues?

7. Evaluate four proposed initiatives according to their expected impact, resource required, and chances of success.

1) **No cutlery defaults.** Platforms set cutlery 'opt-in' function as a default setting for every order throughout the platforms. The cutlery can be requested when needed. This function can extend to cover seasoning, spices, and sauce sachets. However, platforms need to communicate with their drivers and restaurant partners to comply with the cutlery request to reduce unwanted SUPs.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

2) **Packaging procurement**. Platforms procure greener packaging (through strategies such as partnership with packaging suppliers) and offer 10-20% discount to the restaurant in order to absorb additional cost and to promote the use of alternative packaging.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

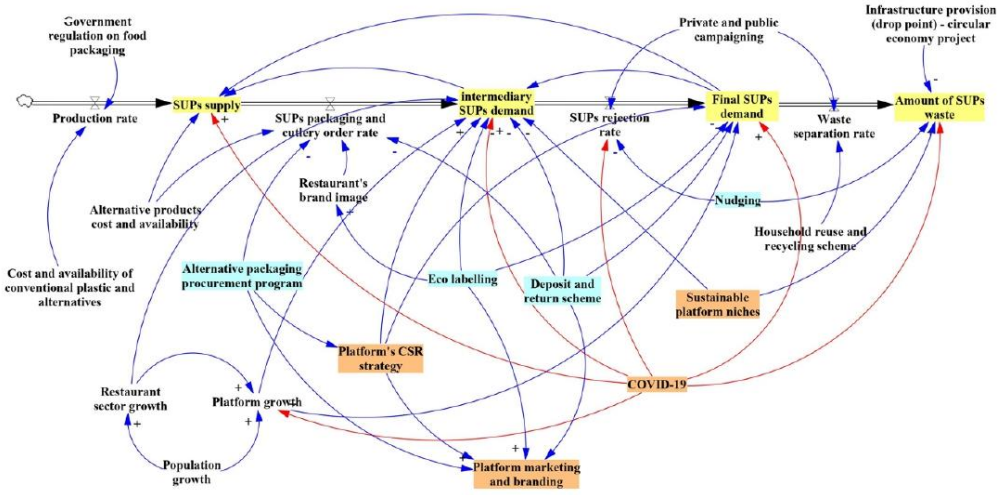
3) **Labelling program** Platforms provide in-app labelling for the restaurants that use environmentally-friendly packaging with a 'green certified' label. Such restaurants can be categorized for promotional purpose and ease of search.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

4) **Deposit-return scheme.** The deposit-return scheme requires the platforms to develop a packaging return system. Customers are required to pay deposit. After use, they are required to roughly rinse their containers and return at the drop sites located in different areas. Alternatively, they can make a pick-up appointment via application. The platforms will then take back the containers to properly clean and reallocate back to the restaurants.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

8. The potentials of platforms' kitchen to help reducing SUPs in the system.
9. System Dynamic Model review



10. Where in the system should be improved the most with the goal to reduce SUP packaging?
11. What kind of support from the government is needed to achieve SUPs reduction in the system?

Thank you for your time

(2) Food retailer (merchant partner)

Merchant partners (restaurants) interview questions

As part of a Ph.D. research on Sustainable Consumption Practices:
a case of Single-Use Plastics in Online Food Delivery Market, Thailand

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Interview objectives

To collect data for the analysis under research objective two which involves sustainable initiative review and System Dynamic Model review. The interview target includes public, private, and civil society stakeholders in the system. Ultimately, strategies and measures to reduce Single-Use Plastics (SUPs) consumption in online food delivery market will be suggested.

---

1. Information about online orders via delivery platforms and order categories (food and drink) (for waste calculation purpose).
2. What types of packaging are used? What are packaging components in one order ?
3. Is there any measure at your retail to support the reduction of SUPs packaging in the delivery orders ?
4. What are the challenges in reducing SUP in the food delivery sector?
5. What are the restaurant's guidelines towards 'no cutlery' orders?

6. Evaluate four proposed initiatives according to their expected impact, resource required, and chances of success.

1) **No cutlery defaults.** Platforms set cutlery 'opt-in' function as a default setting for every order throughout the platforms. The cutlery can be requested when needed. This function can extend to cover seasoning, spices, and sauce sachets. However, platforms need to communicate with their drivers and restaurant partners to comply with the cutlery request to reduce unwanted SUPs.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

2) **Packaging procurement**. Platforms procure greener packaging (through strategies such as partnership with packaging suppliers) and offer 10-20% discount to the restaurant in order to absorb additional cost and to promote the use of alternative packaging.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

3) **Labelling program** Platforms provide in-app labelling for the restaurants that use environmentally-friendly packaging with a 'green certified' label. Such restaurants can be categorized for promotional purpose and ease of search.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

4) **Deposit-return scheme.** The deposit-return scheme requires the platforms to develop a packaging return system. Customers are required to pay deposit. After use, they are required to roughly rinse their containers and return at the drop sites located in different areas. Alternatively, they can make a pick-up appointment via application. The platforms will then take back the containers to properly clean and reallocate back to the restaurants.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

7. Where in the system should be improved the most with the goal to reduce SUP packaging?

(3) Sustainable niche

Sustainable niches interview questions

As part of a Ph.D. research on Sustainable Consumption Practices:
a case of Single-Use Plastics in Online Food Delivery Market, Thailand

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---

1. What are the challenges in operating sustainable niches?

2. What kinds of messages about plastic waste do you communicate to which group of audience ?

3. Evaluate four proposed initiatives according to their expected impact, resource required, and chances of success.

   1) **No cutlery defaults.** Platforms set cutlery 'opt-in' function as a default setting for every order throughout the platforms. The cutlery can be requested when needed. This function can extend to cover seasoning, spices, and sauce sachets. However, platforms need to communicate with their drivers and restaurant partners to comply with the cutlery request to reduce unwanted SUPs.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

   2) **Packaging procurement**. Platforms procure greener packaging (through strategies such as partnership with packaging suppliers) and offer 10-20% discount to the restaurant in order to absorb additional cost and to promote the use of alternative packaging.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

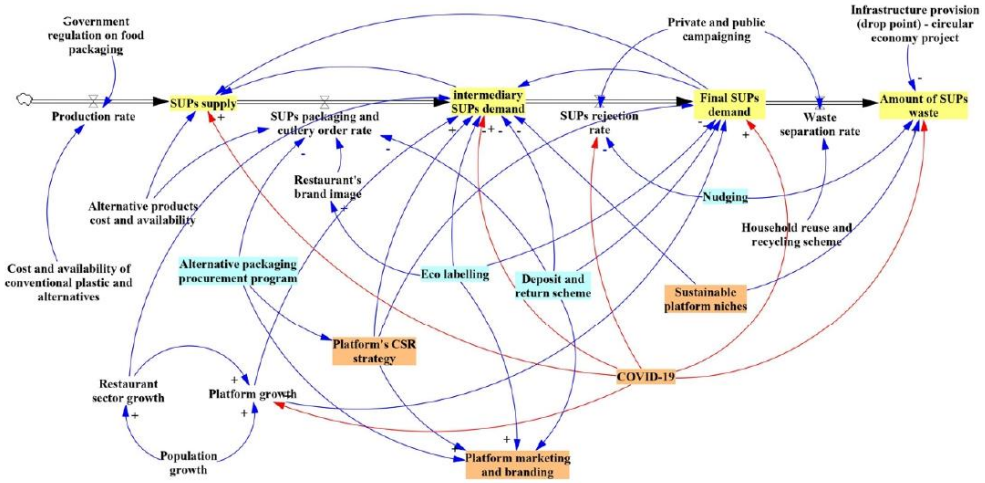
   3) **Labelling program** Platforms provide in-app labelling for the restaurants that use environmentally-friendly packaging with a 'green certified' label. Such restaurants can be categorized for promotional purpose and ease of search.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

4) **Deposit-return scheme.** The deposit-return scheme requires the platforms to develop a packaging return system. Customers are required to pay deposit. After use, they are required to roughly rinse their containers and return at the drop sites located in different areas. Alternatively, they can make a pick-up appointment via application. The platforms will then take back the containers to properly clean and reallocate back to the restaurants.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

4. What are your expectations towards each actor in the system?
5. System Dynamic Model review



6. Where in the system should be improved the most with the goal to reduce SUP packaging?

Thank you for your time

(4) Policy-level agency

Policy-level stakeholders interview questions

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---

1. What should be the role and responsibility of the business sector in being a change-maker?

2. What roles could the government and civil society play in order to overcome structural limitations?

3. What are the most important SUP waste management policies that should be a priority?

4. Evaluate four proposed initiatives according to their expected impact, resource required, and chances of success.

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	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

2) **Packaging procurement**. Platforms procure greener packaging (through strategies such as partnership with packaging suppliers) and offer 10-20% discount to the restaurant in order to absorb additional cost and to promote the use of alternative packaging.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

3) **Labelling program** Platforms provide in-app labelling for the restaurants that use environmentally-friendly packaging with a 'green certified' label. Such restaurants can be categorized for promotional purpose and ease of search.

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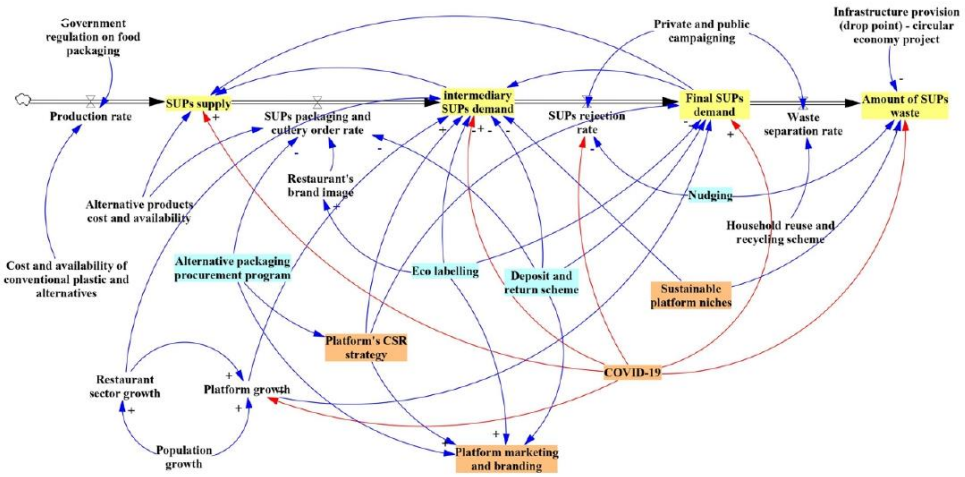
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

4) **Deposit-return scheme.** The deposit-return scheme requires the platforms to develop a packaging return system. Customers are required to pay deposit. After use, they are required to roughly rinse their containers and return at the drop sites located in different areas. Alternatively, they can make a pick-up appointment via application. The platforms will then take back the containers to properly clean and reallocate back to the restaurants.

	The least									The most
	1	2	3	4	5	6	7	8	9	10
Expected impact	O	O	O	O	O	O	O	O	O	O
Resource required	O	O	O	O	O	O	O	O	O	O
Chances of success	O	O	O	O	O	O	O	O	O	O

5. System Dynamic Model review



6. Where in the system should be improved the most with the goal to reduce SUP packaging?

Thank you for your time

II. Statistic report

a. Cluster Analysis

(1) Demographic profile of clusters

1. Gender

Chi-square tests of gender differences across three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.796[a]	4	.019
Likelihood Ratio	11.150	4	.025
Linear-by-Linear Association	.016	1	.899
N of Valid Cases	479		

a. 3 cells (33.3%) have expected count less than 5. The minimum expected count is .30.

Cross-tabulation of gender differences across three clusters

Gender * Ward Method Crosstabulation

			Ward Method			Total
			Cluster 1 - Moderate	Cluster 2 - Low	Cluster 3 - High	
Gender	Male	Count	91	42	15	148
		% within Ward Method	28.7%	46.2%	21.1%	30.9%
	Female	Count	225	48	56	329
		% within Ward Method	71.0%	52.7%	78.9%	68.7%
	Others	Count	1	1	0	2
		% within Ward Method	0.3%	1.1%	0.0%	0.4%
Total		Count	317	91	71	479
		% within Ward Method	100.0%	100.0%	100.0%	100.0%

2. Age

ANOVA test of differences in age among three clusters

ANOVA

Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1291.290	2	645.645	6.497	.002
Within Groups	47301.775	476	99.373		
Total	48593.065	478			

Post Hoc comparison of age among three clusters

Dependent Variable: Age
Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.
Cluster 1 - Moderate	Cluster 2 - Low	3.086*	1.300	.047
	Cluster 3 - High	-2.639	1.205	.074
Cluster 2 - Low	Cluster 1 - Moderate	-3.086*	1.300	.047
	Cluster 3 - High	-5.725*	1.588	.001
Cluster 3 - High	Cluster 1 - Moderate	2.639	1.205	.074
	Cluster 2 - Low	5.725*	1.588	.001

*. The mean difference is significant at the 0.05 level.

Cross-tabulation of age range differences across three clusters

Age * Ward Method Crosstabulation

			Ward Method			Total
			Cluster 1 - Moderate	Cluster 2 - Low	Cluster 3 - High	
Age	18-35	Count	181	64	32	277
		% within Ward Method	57.1%	70.3%	45.1%	57.8%
	36-49	Count	101	24	23	148
		% within Ward Method	31.9%	26.4%	32.4%	30.9%
	50-65	Count	35	3	16	54
		% within Ward Method	11.0%	3.3%	22.5%	11.3%
Total		Count	317	91	71	479
		% within Ward Method	100.0%	100.0%	100.0%	100.0%

3. Educational level

Chi-square tests of educational level among three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.089[a]	14	.825
Likelihood Ratio	11.941	14	.611
Linear-by-Linear Association	.008	1	.930
N of Valid Cases	479		

a. 14 cells (58.3%) have expected count less than 5. The minimum expected count is .15.

Cross-tabulation of educational differences across three clusters

Education * Ward Method Crosstabulation

			Ward Method			
			Cluster 1 - Moderate	Cluster 2 - Low	Cluster 3 - High	Total
Education	Lower than bachelor's	Count	8	6	0	14
		% within Ward Method	2.5%	6.6%	0.0%	2.9%
	Vocational school	Count	2	1	0	3
		% within Ward Method	0.6%	1.1%	0.0%	0.6%
	Bachelor's degree	Count	167	51	42	260
		% within Ward Method	52.7%	56.0%	59.2%	54.3%
	Master's degree	Count	115	28	22	165
		% within Ward Method	36.3%	30.8%	31.0%	34.5%
	Doctoral degree	Count	24	5	7	36
		% within Ward Method	7.6%	5.5%	9.9%	7.5%
	Others	Count	1	0	0	1
		% within Ward Method	0.3%	0.0%	0.0%	0.2%
Total		Count	317	91	71	479
		% within Ward Method	100.0%	100.0%	100.0%	100.0%

4. Residence

Chi-square tests of residence among three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	45.381[a]	58	.886
Likelihood Ratio	50.273	58	.755
Linear-by-Linear Association	.535	1	.465
N of Valid Cases	479		

a. 81 cells (90.0%) have expected count less than 5. The minimum expected count is .15.

Cross-tabulation of residence differences across three clusters

Residence * Ward Method Crosstabulation

			Ward Method			
			Cluster 1 – Moderate	Cluster 2 – Low	Cluster 3 – High	Total
Residence	Bangkok and vicinities	Count	272	72	62	406
		% within Ward Method	85.8%	79.1%	87.3%	84.8%
	Others	Count	45	19	9	73
		% within Ward Method	14.2%	20.9%	12.7%	15.2%
Total		Count	317	91	71	479
		% within Ward Method	100.0%	100.0%	100.0%	100.0%

5. Household income

Chi-square tests of household income among three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.354[a]	16	.647
Likelihood Ratio	13.985	16	.600
Linear-by-Linear Association	.111	1	.739
N of Valid Cases	479		

a. 3 cells (11.1%) have expected count less than 5. The minimum expected count is 4.21.

Cross-tabulation of household income differences across three clusters

Income * Ward Method Crosstabulation

			Ward Method			
			Cluster 1 – Moderate	Cluster 2 – Low	Cluster 3 – High	Total
Income	0 – 15,000THB	Count	20	10	7	37
		% within Ward Method	6.3%	11.1%	9.2%	7.5%
	15,001 – 25,000THB	Count	29	14	10	53
		% within Ward Method	9.1%	15.3%	13.8%	10.9%
	25,001 – 35,000THB	Count	34	9	5	48
		% within Ward Method	10.7%	9.7%	6.9%	9.8%
	35,001 – 45,000THB	Count	30	6	5	41
		% within Ward Method	9.5%	6.9%	6.9%	8.6%
	45,001 – 55,000THB	Count	25	3	4	32
		% within Ward Method	7.9%	2.8%	5.7%	6.7%
	55,001 – 65,000THB	Count	20	4	4	28
		% within Ward Method	6.3%	4.2%	5.7%	5.8%
	65,001 – 75,000THB	Count	26	4	2	32
		% within Ward Method	8.2%	4.2%	3.4%	6.7%
	75,001 – 100,000THB	Count	43	13	11	66
		% within Ward Method	13.6%	13.9%	14.9%	13.8%
	more than 100,001THB	Count	90	29	24	145
		% within Ward Method	28.4%	31.9%	33.3%	30.3%
Total		Count	317	91	71	479
		% within Ward Method	100.0%	100.0%	100.0%	100.0%

6. Occupation

Chi-square tests of occupation among three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.778[a]	16	.014
Likelihood Ratio	31.217	16	.013
Linear-by-Linear Association	7.589	1	.006
N of Valid Cases	479		

a. 9 cells (33.3%) have expected count less than 5. The minimum expected count is 1.35.

Cross-tabulation of occupation differences across three clusters

Occupation * Ward Method Crosstabulation

			Ward Method			
			Cluster 1 – Moderate	Cluster 2 – Low	Cluster 3 – High	Total
Occupation	students	Count	25	9	4	38
		% within Ward Method	7.9%	9.9%	5.6%	7.9%
	government employees/ officials	Count	69	12	8	89
		% within Ward Method	21.8%	13.2%	11.3%	18.6%
	company employees	Count	129	33	32	194
		% within Ward Method	40.3%	45.8%	36.8%	40.5%
	university employees	Count	20	3	7	30
		% within Ward Method	6.3%	3.3%	9.9%	6.3%
	business owner	Count	50	13	11	74
		% within Ward Method	15.8%	14.3%	15.5%	15.5%
	self-employed	Count	8	8	5	21
		% within Ward Method	2.5%	8.8%	7.0%	4.4%
	unemployed	Count	10	10	4	24
		% within Ward Method	3.2%	11.0%	5.6%	5.0%
	others	Count	6	3	0	9
		% within Ward Method	1.9%	3.3%	0.0%	1.9%
Total		Count	317	91	71	479
		% within Ward Method	100.0%	100.0%	100.0%	100.0%

(2) Behavioral differences

1. Ordering behavior

ANOVA test of differences in ordering behavior among three clusters

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Before	Between Groups	10.300	2	5.150	5.580	.004
	Within Groups	439.316	476	.923		
	Total	449.616	478			
During	Between Groups	19.533	2	9.766	6.817	.001
	Within Groups	681.891	476	1.433		
	Total	701.424	478			
After	Between Groups	15.907	2	7.954	6.971	.001
	Within Groups	543.086	476	1.141		
	Total	558.994	478			

Post Hoc comparison of ordering behavior among three clusters

Tukey HSD

Dependent Variable	(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.
Before	Cluster 1 – Moderate	Cluster 2 – Low	-.305*	.125	.041
		Cluster 3 – High	.205	.116	.182
	Cluster 2 – Low	Cluster 1 – Moderate	.305*	.125	.041
		Cluster 3 – High	.510*	.153	.003
	Cluster 3 – High	Cluster 1 – Moderate	-.205	.116	.182
		Cluster 2 – Low	-.510*	.153	.003
During	Cluster 1 – Moderate	Cluster 2 – Low	.033	.156	.975
		Cluster 3 – High	.529*	.145	.001
	Cluster 2 – Low	Cluster 1 – Moderate	-.033	.156	.975
		Cluster 3 – High	.496*	.191	.026
	Cluster 3 – High	Cluster 1 – Moderate	-.529*	.145	.001
		Cluster 2 – Low	-.496*	.191	.026
After	Cluster 1 – Moderate	Cluster 2 – Low	-.280	.139	.111
		Cluster 3 – High	.347*	.129	.020
	Cluster 2 – Low	Cluster 1 – Moderate	.280	.139	.111
		Cluster 3 – High	.627*	.170	.001
	Cluster 3 – High	Cluster 1 – Moderate	-.347*	.129	.020
		Cluster 2 – Low	-.627*	.170	.001

2. Cutlery availability

ANOVA test of differences in cutlery availability among three clusters

ANOVA

Cut_avai

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	32.802	2	16.401	9.550	.000
Within Groups	817.478	476	1.717		
Total	850.280	478			

Post Hoc comparison of cutlery availability among three clusters

Dependent Variable: Cut_avai

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.
Cluster 1 – Moderate	Cluster 2 – Low	.355	.171	.096
	Cluster 3 – High	-.532*	.158	.002
Cluster 2 – Low	Cluster 1 – Moderate	-.355	.171	.096
	Cluster 3 – High	-.887*	.209	.000
Cluster 3 – High	Cluster 1 – Moderate	.532*	.158	.002
	Cluster 2 – Low	.887*	.209	.000

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' cutlery availability

Cut_avai

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	3.74	1.361	.076
Cluster 2 - Low	91	3.39	1.306	.154
Cluster 3 - High	71	4.28	1.107	.119
Total	479	3.79	1.334	.061

3. Cutlery usage

ANOVA test of differences in cutlery usage among three clusters

ANOVA

Usage

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.522	2	5.261	3.611	.028
Within Groups	693.457	476	1.457		
Total	703.979	478			

Post Hoc comparison of cutlery usage among three clusters

Dependent Variable: Usage

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.
Cluster 1 - Moderate	Cluster 2 - Low	-.044	.157	.957
	Cluster 3 - High	.374*	.146	.029
Cluster 2 - Low	Cluster 1 - Moderate	.044	.157	.957
	Cluster 3 - High	.419	.192	.076
Cluster 3 - High	Cluster 1 - Moderate	-.374*	.146	.029
	Cluster 2 - Low	-.419	.192	.076

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' cutlery usage

Usage

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	2.65	1.199	.067
Cluster 2 - Low	91	2.69	1.218	.144
Cluster 3 - High	71	2.28	1.227	.131
Total	479	2.59	1.214	.055

(3) Psychological differences

1. Hypothesis 1 (H1): There are differences in concern about excessive packaging among three groups.

ANOVA test of differences in concern about excessive packaging among three clusters

ANOVA

Concern

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	38.662	2	19.331	17.299	.000
Within Groups	531.927	476	1.117		
Total	570.589	478			

Post Hoc comparison of concern about excessive packaging among three clusters

Dependent Variable: Concern

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.
Cluster 1 – Moderate	Cluster 2 – Low	.566*	.126	.000
	Cluster 3 – High	-.389*	.139	.015
Cluster 2 – Low	Cluster 1 – Moderate	-.566*	.126	.000
	Cluster 3 – High	-.954*	.167	.000
Cluster 3 – High	Cluster 1 – Moderate	.389*	.139	.015
	Cluster 2 – Low	.954*	.167	.000

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' concern about excessive packaging

Concern

	N	Mean	Std. Deviation	Std. Error
Cluster 1 – Moderate	317	4.10	1.055	.059
Cluster 2 – Low	91	3.54	1.158	.121
Cluster 3 – High	71	4.49	.924	.110
Total	479	4.05	1.093	.050

2. Hypothesis 2 (H2): There are differences in perception towards foam packaging among three groups.

Cross-tabulation of perception towards foam packaging of each cluster

Crosstab

			Ward Method			Total
			Cluster 1 - Moderate	Cluster 2 - Low	Cluster 3 - High	
Foam	Foam is fine. no problem.	Count	25	21	2	48
		% within clusters	7.9%	23.1%	2.8%	10.0%
	the restaurant should change to other materials for health reason.	Count	117	31	17	165
		% within clusters	36.9%	34.1%	23.9%	34.4%
	the restaurant should change to other materials for environmental reason.	Count	175	39	52	266
		% within clusters	55.2%	42.9%	73.2%	55.5%
Total		Count	317	91	71	479
		% within clusters	100.0%	100.0%	100.0%	100.0%

Chi-square tests of perception towards foam packaging among three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.081[a]	4	.000
Likelihood Ratio	27.585	4	.000
Linear-by-Linear Association	1.216	1	.270
N of Valid Cases	479		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.11.

3. Hypothesis 3 (H3): There are differences in perception towards biodegradable packaging among three groups.

Cross-tabulation of perception towards biodegradable packaging of each cluster

Crosstab

			Ward Method			Total
			Cluster 1 - Moderate	Cluster 2 - Low	Cluster 3 - High	
Biodeg	indifferent. any box is the same.	Count	6	4	1	11
		% within clusters	1.9%	4.4%	1.4%	2.3%
	the retaurant has environmental responsibility	Count	230	61	38	329
		% within clusters	72.6%	67.0%	53.5%	68.7%
	not sure about the environmental attributes of biodegradable product	Count	81	26	32	139
		% within clusters	25.6%	28.6%	45.1%	29.0%
Total		Count	317	91	71	479
		% within clusters	100.0%	100.0%	100.0%	100.0%

Chi-square (with Fisher's exact) tests of perception towards biodegradable packaging among three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	12.942[a]	4	.012	.012		
Likelihood Ratio	11.945	4	.018	.020		
Fisher's Exact Test	12.222			.011		
Linear-by-Linear Association	7.454[b]	1	.006	.007	.004	.001
N of Valid Cases	479					

a. 2 cells (22.2%) have expected count less than 5. The minimum expected count is 1.63.

b. The standardized statistic is 2.730.

4. Hypothesis 4 (H4): There are differences in CSR expectation among three groups.

ANOVA test of differences in CSR expectation among three clusters

ANOVA

EXP

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	26.032	2	13.016	51.362	.000
Within Groups	120.625	476	.253		
Total	146.657	478			

Post Hoc comparison of CSR expectation among three clusters

Dependent Variable: EXP

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.
Cluster 1 - Moderate	Cluster 2 - Low	.54074*	.05987	.000
	Cluster 3 - High	-.17706*	.06610	.021
Cluster 2 - Low	Cluster 1 - Moderate	-.54074*	.05987	.000
	Cluster 3 - High	-.71779*	.07971	.000
Cluster 3 - High	Cluster 1 - Moderate	.17706*	.06610	.021
	Cluster 2 - Low	.71779*	.07971	.000

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' CSR expectation

EXP

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	4.71	.472	.026
Cluster 2 - Low	91	4.16	.710	.074
Cluster 3 - High	71	4.88	.265	.031
Total	479	4.63	.554	.025

5. Hypothesis 5 (H5): There are differences in acceptance level of 'no cutlery default' initiative among three groups.

ANOVA test of differences in acceptance level of 'no cutlery default' initiative among three clusters

ANOVA

PREF1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.946	2	5.473	13.700	.000
Within Groups	190.161	476	.399		
Total	201.106	478			

Post Hoc comparison of acceptance level of 'no cutlery default' initiative among three clusters

Dependent Variable: PREF1

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.
Cluster 1 - Moderate	Cluster 2 - Low	.352*	.075	.000
	Cluster 3 - High	-.112	.083	.372
Cluster 2 - Low	Cluster 1 - Moderate	-.352*	.075	.000
	Cluster 3 - High	-.464*	.100	.000
Cluster 3 - High	Cluster 1 - Moderate	.112	.083	.372
	Cluster 2 - Low	.464*	.100	.000

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' acceptance level of 'no cutlery default' initiative

PREF1

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	4.75	.605	.034
Cluster 2 - Low	91	4.40	.815	.085
Cluster 3 - High	71	4.86	.457	.054
Total	479	4.70	.649	.030

6. Hypothesis 6 (H6): There are differences in acceptance level of 'packaging procurement' initiative among three groups.

ANOVA test of differences in acceptance level of 'packaging procurement' initiative among three clusters

ANOVA

PREF2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.535	2	2.768	2.509	.082
Within Groups	525.008	476	1.103		
Total	530.543	478			

Post Hoc comparison of acceptance level of 'packaging procurement' initiative among three clusters

Dependent Variable: PREF2

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.
Cluster 1 - Moderate	Cluster 2 - Low	.278	.125	.068
	Cluster 3 - High	.024	.138	.983
Cluster 2 - Low	Cluster 1 - Moderate	-.278	.125	.068
	Cluster 3 - High	-.254	.166	.280
Cluster 3 - High	Cluster 1 - Moderate	-.024	.138	.983
	Cluster 2 - Low	.254	.166	.280

Descriptive statistic of each clusters' acceptance level of 'packaging procurement' initiative

PREF2

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	4.28	1.018	.057
Cluster 2 - Low	91	4.00	1.054	.110
Cluster 3 - High	71	4.25	1.180	.140
Total	479	4.22	1.054	.048

7. Hypothesis 7 (H7): There are differences in willingness to pay for green packaging among three groups.

ANOVA test of differences in willingness to pay for green packaging among three clusters

ANOVA

WTM2

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	98.567	2	49.283	10.085	.000
Within Groups	2326.193	476	4.887		
Total	2424.760	478			

Post Hoc comparison of willingness to pay for green packaging among three clusters

Dependent Variable: WTM2
Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.
Cluster 1 – Moderate	Cluster 2 – Low	1.156*	.263	.000
	Cluster 3 – High	–.003	.290	1.000
Cluster 2 – Low	Cluster 1 – Moderate	–1.156*	.263	.000
	Cluster 3 – High	–1.159*	.350	.003
Cluster 3 – High	Cluster 1 – Moderate	.003	.290	1.000
	Cluster 2 – Low	1.159*	.350	.003

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' willingness to pay for green packaging

WTM2

	N	Mean	Std. Deviation	Std. Error
Cluster 1 – Moderate	317	3.42	2.203	.124
Cluster 2 – Low	91	2.26	1.943	.204
Cluster 3 – High	71	3.42	2.545	.302
Total	479	3.20	2.252	.103

8. Hypothesis 8 (H8): There are differences in acceptance level of 'eco-labelling' initiative among three groups.

ANOVA test of differences in acceptance level of 'eco-labelling' initiative among three clusters

ANOVA

PREF3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.496	2	7.248	22.318	.000
Within Groups	154.586	476	.325		
Total	169.081	478			

Post Hoc comparison of acceptance level of 'eco-labelling' initiative among three clusters

Dependent Variable: PREF3
Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.
Cluster 1 – Moderate	Cluster 2 – Low	.428*	.068	.000
	Cluster 3 – High	–.066	.075	.653
Cluster 2 – Low	Cluster 1 – Moderate	–.428*	.068	.000
	Cluster 3 – High	–.493*	.090	.000
Cluster 3 – High	Cluster 1 – Moderate	.066	.075	.653
	Cluster 2 – Low	.493*	.090	.000

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' acceptance level of 'eco-labelling' initiative

PREF3

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	4.78	.517	.029
Cluster 2 - Low	91	4.35	.794	.083
Cluster 3 - High	71	4.85	.436	.052
Total	479	4.71	.595	.027

9. Hypothesis 9 (H9): There are differences in intention to support the 'eco-labelling' initiative among three groups.

ANOVA test of differences in intention to support 'eco-labelling' initiative among three clusters

ANOVA

SUPPORT3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.672	2	5.336	14.123	.000
Within Groups	179.845	476	.378		
Total	190.518	478			

Post Hoc comparison of intention to support 'eco-labelling' initiative among three clusters

Dependent Variable: SUPPORT3

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.
Cluster 1 - Moderate	Cluster 2 - Low	.306*	.073	.000
	Cluster 3 - High	-.190*	.081	.049
Cluster 2 - Low	Cluster 1 - Moderate	-.306*	.073	.000
	Cluster 3 - High	-.497*	.097	.000
Cluster 3 - High	Cluster 1 - Moderate	.190*	.081	.049
	Cluster 2 - Low	.497*	.097	.000

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' intention to support 'eco-labelling' initiative

SUPPORT3

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	4.67	.601	.034
Cluster 2 - Low	91	4.36	.782	.082
Cluster 3 - High	71	4.86	.389	.046
Total	479	4.64	.631	.029

10. Hypothesis 10 (H10): There are differences in acceptance level of 'deposit-return scheme' initiative among three groups.

ANOVA test of differences in acceptance level of 'deposit-return scheme' initiative among three clusters

ANOVA

PREF4

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.278	2	16.639	10.723	.000
Within Groups	738.630	476	1.552		
Total	771.908	478			

Post Hoc comparison of acceptance level of 'deposit-return scheme' initiative among three clusters

Dependent Variable: PREF4

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.
Cluster 1 - Moderate	Cluster 2 - Low	.360*	.148	.041
	Cluster 3 - High	-.551*	.164	.002
Cluster 2 - Low	Cluster 1 - Moderate	-.360*	.148	.041
	Cluster 3 - High	-.911*	.197	.000
Cluster 3 - High	Cluster 1 - Moderate	.551*	.164	.002
	Cluster 2 - Low	.911*	.197	.000

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters' acceptance level of 'deposit-return scheme' initiative

PREF4

	N	Mean	Std. Deviation	Std. Error
Cluster 1 - Moderate	317	3.74	1.248	.070
Cluster 2 - Low	91	3.38	1.315	.138
Cluster 3 - High	71	4.30	1.139	.135
Total	479	3.76	1.271	.058

11. Hypothesis 11 (H11): There are differences in intention to support the 'deposit-return scheme' initiative among three groups.

ANOVA test of differences in intention to support the ‘deposit-return scheme’ initiative among three clusters

ANOVA

SUPPORT4

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	27.157	2	13.578	8.194	.000
Within Groups	788.747	476	1.657		
Total	815.904	478			

Post Hoc comparison of intention to support the ‘deposit-return scheme’ initiative among three clusters

Dependent Variable: SUPPORT4

Tukey HSD

(I) Ward Method	(J) Ward Method	Mean Difference (I–J)	Std. Error	Sig.
Cluster 1 – Moderate	Cluster 2 – Low	.251	.153	.23
	Cluster 3 – High	-.557*	.169	.00
Cluster 2 – Low	Cluster 1 – Moderate	-.251	.153	.23
	Cluster 3 – High	-.808*	.204	.00
Cluster 3 – High	Cluster 1 – Moderate	.557*	.169	.00
	Cluster 2 – Low	.808*	.204	.00

*. The mean difference is significant at the 0.05 level.

Descriptive statistic of each clusters’ intention to support the ‘deposit-return scheme’ initiative

SUPPORT4

	N	Mean	Std. Deviation	Std. Error
Cluster 1 – Moderate	317	3.67	1.310	.074
Cluster 2 – Low	91	3.42	1.300	.136
Cluster 3 – High	71	4.23	1.161	.138
Total	479	3.70	1.306	.060

12. Hypothesis 12 (H12): There are differences in willingness to pay deposit for returnable food container among three groups.

Cross-tabulation of willingness to pay deposit for returnable food container of each cluster

WTP4 * Ward Method Crosstabulation

			Ward Method			Total
			1	2	3	
WTP4	not willing to pay	Count	67	28	12	107
		% within Ward Method	20.9%	38.9%	13.8%	22.3%
	less than 30THB/piece	Count	127	24	31	182
		% within Ward Method	39.7%	33.3%	35.6%	38.0%
	31-50THB/piece	Count	83	13	29	125
		% within Ward Method	25.9%	18.1%	33.3%	26.1%
	51-70THB/piece	Count	21	0	6	27
		% within Ward Method	6.6%	0.0%	6.9%	5.6%
	71-100THB/piece	Count	16	3	3	22
		% within Ward Method	5.0%	4.2%	3.4%	4.6%
	101-150THB/piece	Count	4	2	5	11
		% within Ward Method	1.3%	2.8%	5.7%	2.3%
	more than 150THB/piece	Count	2	2	1	5
		% within Ward Method	0.6%	2.8%	1.1%	1.0%
Total		Count	320	72	87	479
		% within Ward Method	100.0%	100.0%	100.0%	100.0%

Chi-square (with Fisher's exact) tests of willingness to pay deposit for returnable food container among three clusters

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.180[a]	12	.003
Likelihood Ratio	31.551	12	.002
Linear-by-Linear Association	2.181	1	.140
N of Valid Cases	479		

a. 9 cells (42.9%) have expected count less than 5. The minimum expected count is .75.

b. Other assumed Relationship among Variables

(1) Guilt-related feelings

Hypothesis testing on the relationship between guilt-related feelings and other constructs		
Hypothesis	**Test results**	**Implication**
H1: There is a relationship between guilt feeling and concern about the excessiveness of food delivery packaging [Concern]	Supported (Pearson correlation =0.206, *p*=0.000)	Guilt feelings and concern about the excessiveness of food delivery packaging showed small positive correlation.
H2: There is a relationship between guilt feeling and avoidance attitude [ECCS1], [Foam]	Supported (Pearson correlation =0.248, *p*=0.000) (ANOVA F=16.733, *p*=0.000)	Guilt feelings and avoidance attitude towards excessive packaging had small positive correlation. In addition, people who would avoid foam packaging tended to have higher guilt feelings ($\bar{x}$=2.24, 2.67). Where people who do not have an avoidance attitude had lower guilt feelings ($\bar{x}$=1.79).
H3: There is a relationship between guilt feeling and green skepticism attitudes [Biodeg]	Not supported (ANOVA F=2.294, *p*=0.102)	There was no relationship between guilt feeling and green skepticism attitudes
H4: There is a relationship between guilt feeling and environmental values [EV]	Supported (Pearson correlation =0.630, *p*=0.000)	Guilt feelings and environmental values had a large positive correlation.
H5: There is a relationship between guilt feeling and New Environmental Paradigm (NEP) [ECCS5]	Supported (Pearson correlation =0.192, *p*=0.000)	Guilt feeling and New Environmental Paradigm (NEP) had small positive correlation.
H6: There is a relationship between guilt feeling and consideration of SUP consumption in daily life [CFC3]	Supported (Pearson correlation =0.166, *p*=0.000)	Guilt feelings and consideration of SUP consumption in daily life showed small positive correlation.
H7: There is a relationship between guilt feeling and conscious consumption [CFC4], [CFC5]	Supported (Pearson correlation =0.267,0.301, *p*=0.000,0.000)	Guilt feeling and non-convenience-based attitudes had small positive correlation. Guilt feelings and conscious consumption decisions had a medium positive correlation.
H8: There is a relationship between guilt feeling and CSR expectations [Exp]	Supported (Pearson correlation =0.150, *p*=0.001)	Guilt feeling and CSR expectations had small positive correlation.

(2) Attitudes towards human-nature relationship

Hypothesis testing on the relationship between NEP attitudes and other constructs		
Hypothesis	**Test results**	**Implication**
H1: There is a relationship between NEP attitudes and concern about the excessiveness of food delivery packaging [Concern]	Supported (Pearson correlation =0.207, *p*=0.000)	NEP attitudes and concern about the excessiveness of food delivery packaging had small positive correlation.
H2: There is a relationship between NEP attitudes and avoidance attitudes [ECCS1], [Foam]	Supported (Pearson correlation =0.241, *p*=0.000) (ANOVA F=4.094, *p*=0.017)	NEP attitudes and avoidance attitudes had small positive correlation.
H3: There is a relationship between NEP attitudes and conscious consumption [CFC4], [CFC5]	Supported (Pearson correlation =0.093/0.250, *p*=0.042/0.000)	NEP attitudes and conscious consumption had small positive correlation.
H4: There is a relationship between NEP attitudes and willingness to pay for green packaging [WTM 2], [WTP 4]	Partially supported (Pearson correlation =0.126, *p*=0.006) (ANOVA F=1.536, *p*=0.165)	NEP attitudes and willingness to pay for single-use green packaging had small positive correlation. However, there was no relationship between NEP attitudes and willingness to pay for returnable container

(3) Conscious consumption

Hypothesis testing on the relationship between conscious consumption and other constructs		
Hypothesis	**Test results**	**Implication**
H1: There is a relationship between conscious consumption and CSR expectations [Exp]	Partially supported (Pearson correlation =0.066/0.171, *p*=0.151/0.000)	Non-impulsive conscious consumption and CSR expectation showed small positive correlation. However, there was no relationship between non-convenience-based conscious consumption and CSR expectations
H2: There is a relationship between conscious consumption and willingness to pay for green packaging [WTM 2], [WTP 4]	Supported (Pearson correlation =0.099/0.149, *p*=0.030/0.001) (ANOVA F=2.185/3.482,	Conscious consumption and willingness to pay for green packaging showed small positive correlations. The relationship between conscious consumption and willingness to pay for returnable

	p=0.043/0.002)	container was confirmed
H3: There is a relationship between conscious consumption and avoidance attitudes [ECCS1], [Foam]	Supported (Pearson correlation =0.127/0.277, *p*=0.005/0.000) (ANOVA F=10.188/16.391, *p*=0.000/0.000)	Conscious consumption and avoidance attitudes had positive correlation. Groups that avoid foam packaging scored higher in conscious consumption statements.
H4: There is a relationship between conscious consumption and age [Age]	Supported (Pearson correlation =0.149/0.242, *p*=0.001/0.000)	Conscious consumption and age had small positive correlation.

(4) Green skepticism

Hypothesis testing on the relationship between green skepticism and other constructs		
Hypothesis	**Test results**	**Implication**
H1: There is a relationship between green skepticism and concern about the excessiveness of food delivery packaging [Concern]	Supported (ANOVA F=4.779, *p*=0.009)	Green skeptic group had higher concern about the excessiveness of food delivery packaging
H2: There is a relationship between green skepticism and consideration of SUP consumption in daily life [CFC3]	Supported (ANOVA F=6.588, *p*=0.002)	Green skeptic group had higher consideration on SUPs consumption in their daily life
H3: There is a relationship between green skepticism and conscious consumption [CFC4], [CFC5]	Supported (ANOVA F=5.635/4.327, *p*=0.004/0.014)	Green skeptic group had lower convenience-based consumption and impulse purchase attitude (the scale was reversed).
H4: There is a relationship between green skepticism and intention to support sustainable initiatives [Support 3], [Support 4]	Supported (ANOVA F=7.561/9.476, *p*=0.001/0.000)	Green skeptic group had higher intention to support the 'deposit-return scheme' (reuse) but the greenwashed (non-skeptic) group had higher intention to support the 'eco-labelling' program because the skeptics doubted eco labels.
H5: There is a relationship between green skepticism and	Partially supported (ANOVA F=1.246, *p*=0.289)	Half of the sample with willingness to pay for returnable container above 50

willingness to pay for green packaging [WTM 2], [WTP 4]	(Likelihood ratio* = 40.96, p=0.000)	THB/piece fell into the green skeptic group. However, no relationship between green skepticism and willingness to pay for single-use green packaging was found
H6: There is a relationship between green skepticism and CSR expectation [EXP]	Not supported (ANOVA F=2.853, p=0.059)	Although the green skeptic group scored higher in CSR expectation, the association was not statistically significant.
H7: There is a relationship between green skepticism and avoidance attitudes [ECCS1], [Foam]	Supported (ANOVA F=7.872, p=0.000) (Likelihood ratio* = 30.01, p=0.000)	Green skeptic group had higher avoidance attitude towards excessive packaging. 94.2% of the green skeptic group hade an avoidance attitude towards foam packaging.
*more than 20% of cells have expected count less than 5. Therefore, Likelihood Ratio is used instead of Pearson Chi-Square value.		

III. Interview coding

a. Thematic Analysis of In-depth Consumer Interviews: Coding

	Consumers interviews codings
1. Behavioural profile	• **Prefer dine-in (when possible).** It is not just about food, it is also about **physical experiences at the restaurant**. The food can be indistinguishable across the brands but what enhances the experience are other elements; **the service, the store design**, the utensil used can be the differentiation points. There is also some **social aspect in dine-in culture** when we share food or involve ourselves in cooking it, especially hotpot and shabu shabu. Moreover, the taste and quality of delivery food drop sometimes. **Some kinds of food are not made to deliver.** • **Food delivery offers convenience and great deals.** Addicted to the convenience of ordering food delivery. Making me **lazy to go out** and dine at the restaurants. Moreover, the platform often offers **great promotional discounts**, special menus and special bundle meal sets from the restaurant. Delivery is sometimes free. It offers chances to discover **new restaurant** choices. Order mistakes are alway reasonably **compensated.** • **New adopter.** I barely use food delivery before the lockdown. The adoption starts when no one wants to eat out anymore due to the **spread of the COVID-19**, then lunch time needs delivery services, break time becomes bubble tea, pastries, dimsum, and frappe. I learned how to use the service, **get familiar** with it, and now **rely on it**. • **Waste watcher.** I occasionally use food delivery services. There are lots of **excessive packaging that are single-use**. I **try not to receive** what I do not need, as well as to minimize **food waste**. Unused plastic cutlery are kept for other occasions. However, during the spread of COVID-19, the **choice is limited** to takeaway food where SUPs packaging is **unavoidable**. **The information** on how to manage packaging waste **is also not enough.** • **Concern about chemical contamination from food packaging. Avoid foam** packaging if possible. **Good to know beforehand** if the restaurant uses foam packaging or not. **Environmental concern is second to health concern.** • **Occasionally use SUP cutlery despite having the steel cutlery that is ready to use.** On different occasions, **SUPs cutlery is preferable over steel cutlery** because it (SUP cutlery) has already been given, therefore I use it, why not ? I **do not want to wash** the metal ones. Especially in **events or parties** where convenience is the priority. Mostly **do not care and are unaware about cons** of using SUP cutlery.

	Consumers interviews codings
2. Environmental perception and attitudes	• **Convenience is a priority**. Convenience is a core value offered by this business model, w**hy make it even more complicated** ? The default setting should be the most convenient option, not the one that causes more dissatisfaction or one with many actions required. • **Superficial lay consumers.** Aware that plastic is not good but **lacks supportive information**. I know that it is not good but not sure I understand the process of how plastic can harm the environment and **what can I do** about it after use. To what extent I need to separate household waste and where would it go? I do not have a rational or reason to support what is bad about plastic. I am not interested in how biodegradable packaging is better for the environment. Most of the time, I **do not pay attention to what is written on the packaging**. • **If it comes to appetizing, environmental issues can be secondary.** Food delivery service offers a number of **new, trending restaurants** both local and chained. **Cloud kitchens** allow us to have local heroes dishes which are located at a far distance. The chances to have these popular dishes comes with some plastic waste generated which is **normal**. **Environmentally-friendly packaging comes second to food quality, taste, price and the portion size**. • **Aware of excessive packaging but think that there is nothing we can do more than just rejecting cutlery.** Food delivery is **inevitable** during the lockdown. It is difficult to take our own container to buy food. So, everyday waste is **unavoidable**. **Alternative is limited.** • **The guilt fades as months pass.** A number of SUPs waste is generated everyday. Day by day, I trash a **pile of plastics** and soon enough it **becomes normal**. I do not feel anything about my household waste situation anymore. SUPs can be seen more **in everyday life** as one of virus prevention measures. What you do everyday becomes a **habit**. • **Believe in more sustainable alternatives in the future.** Believe that the world will come up with **innovative solutions** that will eventually solve the waste problem. • **Sacrifice convenience for emotional pleasantness.** A little **trade off between convenience and emotional pleasantness** is acceptable. By performing PEB, **I feel better.** I feel that at least **I have done what I should do**. Also, if I choose a sustainable choice, it is also a reflection of **personal environmental responsibility to society**. • **Do our best for now, we do not know what the future holds.** We should do what we can now. Do not yet think about what the future will be. I consider **holistic/public benefits before personal interest.** • **Believe that behavioural change will be enacted externally rather than internally.** Product-led behavioural change rather than mindset change. **Innovations will have to be developed and implemented first**, then purchasing and consumption behaviour will automatically adjust accordingly. • **Skeptical about green packaging.** "Green packaging" should not be something ambiguous and questionable. **Ones that are not actually good for the environment should be regulated, and thus should not be available in the market.** Consumers **lack information**; it is challenging for them to be aware of **the actual impact** of each green-labelled product. The **issuing organizations** are not trustworthy and not reliable. Green labels are **only marketing**. Consumers **can not prove** if it is compostable as claimed. As long as it is single-use, **it becomes waste anyway.** • **More guilt and frustration.** A lot of SUPs were **used unreasonably** during the pandemic. The lock-down makes take-away compulsory. Plastic use in everyday life is **unavoidable.** Receiving unwanted plastics from take-away food makes me **frustrated. I do not want to just throw it away** but I already have piles of plastic bags, cutlery and condiment sachets.

	Consumers interviews codings
3. CSR expectations	• **Delivery platforms should be aware to some extent, but it is not their duty to manage plastics.** They make money from restaurants and customers, so they **should be aware of the negative sides of their business**. However, only they can not solve the problem. • **Restaurants also benefit from this business model, they should be responsible.** With their size, financial capability and power; **platforms can regulate what should be used** by the partner restaurants. They could offer some **help to induce transition for restaurants** who want to change. • **Government policies lead to solid implications.** Government should develop policies to help retailers since they will not change if it involves **greater cost** plus the risk of getting **customer complaints.** However, although the government can help in terms of law and regulations, **they are not direct stakeholders and might not understand business operations.** • **Consumers-related responsibility.** Customers expected responsibilities in terms of customer feedback and complaint management. We **expect good quality products and services.** Social responsibility is expected during the emergence of societal problems. **Environmental responsibility is not much expected.**
4.1 Initiatives evaluation 1: No cutlery default	• **Does not work.** I received cutlery I did not want. I did not get one when I needed it. However, only the latter case was feedback but not often. **The function needs to be improved.** • **Did not notice the default setting.** I leave it as it is. I sometimes use the given plastic cutlery when **I do not feel like washing the steel one**. It is also fine if they do not give one, **I often have spares** at my house and workplace.
4.2 Initiatives evaluation 2: Packaging procurement	• **It is good that platforms help small restaurants.** Shifting to eco-packaging can be **costly.** Platform can offer some **promotions** to encourage restaurants to join the green program. • **Reasonableness to charge customers.** If it is necessary, the charge should be less than ten baht per order. But the decision must be made cautiously because **charging customers can have pros and cons. For now, it should be an option.** Also, I will be willing to pay if it involves **safer and chemical-free packaging.** • **Packaging price is already included in the food price regardless of the type.** For example, the mall's food court charges five to ten baths extra for every takeaway order. **Restaurant sector already earns enough margin** to absorb the additional cost. Therefore, if there is any option, **I will choose one that is free of charge.**
4.3 Initiatives evaluation 3: Labelling Program	• **More rewards for the customers.** May consider restaurants with green labels if there is any **incentive offered.** • **Should be permanent. Not just campaigns.** Green labels **should be permanent**. • **Good guide but not a decision factor.** I may become **aware** of restaurants that use green packaging but that is **not what I consider** when choosing what to eat.

	Consumers interviews codings
4.4 Initiatives evaluation 4: Deposit-return Scheme	• **Pick-up is more preferable than drop-off. Might pay a little bit more** but **do not think that I would bring all the containers to drop** somewhere, even somewhere near. Next-time pick up sounds more possible. But **having to wash all the containers is another challenge.** • **Platforms have potential. Would be too challenging for the restaurants.** If platforms can manage to do this, the restaurants may face **difficulty managing the number of their packaging inventory.** • **Initial stage is crucial. Large pool of users are needed to run the system.** This model will not work unless there are a **considerable number of participants; both customers and restaurants.** But I am not sure that a lot of customers, especially the general customers, would be interested in participating in this program. • **Reusable but do not have to return.** May not have to return but design the packaging for reusable purpose (optional). Such as tupperware or tiffin **with additional charge**. • **Hygiene is a key.** Platforms have to show that the cleaning process meets **a certain standard** that is acceptable.

b. Thematic Analysis of Semi-structured Stakeholder Interviews: Coding

	Policy-Level Actors	Food Delivery Platforms	Restaurant Partners	Sustainable Niches
1. Business responsibility	- The current business responsibility scheme is **voluntary** - Policy-makers need to know the **capacity and limitations of every stakeholder** first - **Active cooperation from the restaurants** is required - Expect to see more responsibility projects resume after COVID-19 situation - **Businesses can stop using SUPs** that are unnecessary or ones that have practical alternatives - Business sector needs to be responsible for what they produce - **Business sector is expected to actively** engage, communicate, and provide options to its customers. **Commercial incentives** will not only build loyalty and satisfaction but also can lead to behavioral change.	- Not only environmental responsibility. The companies extend their responsibility to **societal justice and welfare aspects** especially during the pandemic and economic downturn - **Profit-led** company. Every party is willing to change as long as the change can be translated into monetary gains. - **Multi-stakeholder.** Platform alone can not absorb every cost of every initiative. The restaurant and consumers directly influence the market while platform facilitates and encourages sustainable choices - **Previous sustainable efforts failed.** Food handling without plastic bag during the pandemic is impossible. Cutlery charge did not work well. Platform subsidy was not sustained.	- When packaging leads to an **impression.** Damaged products are not worth trading off with less packaging - Receive **complaints** at the beginning about food spilled due to poor packaging - Choose **packaging that is better (and look better)** for the environment - **Incentive for Bring-Your-Own**. Offering a discount for customers who bring their own container is a win-win strategy - Green packaging is very welcomed if the **cost stream** remains the same - Active green restaurants with their **own initiative.** Some restaurants create their own in-app packaging options for customers - **Green communication** is a key to preventing customer dissatisfaction - **The attitude towards SUP** packaging varies across restaurant types	- Packaging becomes valuable. **Packaging as a service.** - **Flexibility** is a key for niches to move closer to a sustainable transition model - **Product and service as a communication channel** - Niches **communication strategies: inside-out and outside-in**. Niches' role in the system has been increasingly highlighted - Deliver impressive **user experiences** to provoke pro-environmental behaviour

	Policy-Level Actors	Food Delivery Platforms	Restaurant Partners	Sustainable Niches
2.1 Initiatives review 1: No Cutlery default	- Opt-in, opt-out **should be clear.** - Anything related to customer usage experience **should be optional** - Platforms and the government should **communicate to the restaurant** about the opt-in system in order to limit unwanted SUP cutlery. - **Restaurants' service mindset** needs to be re-communicated.	- Technically **easy**, requires less resources and effort - **practical limitations** as the restaurant often ignores the request. - Platform regularly **communicates** this issue to the restaurants. - **Customer feedback** can help the platforms and restaurants to adjust their policy - **Platform evaluate** its partner restaurants on food quality, hygiene, order accuracy, preparation time and staff training, but not on how much plastics are used	- This initiative can **reduce cost** but also poses risk for customer **complaints.** - See more notes about customers not wanting cutlery and condiments.	- In order to see a significant impact, **charges** for cutlery should be considered - Require less effort, **save cost**, and a **high chance of success**
2.2 Initiatives review 2: Packaging Procurement	- **Should have options** for consumers, especially when they need to pay more - As long as the **price** of environmentally-friendly products is higher, **the chance of success is low**. - Some packaging **do not have alternatives.**	- Platform procurement and subsidy alone can not sustain the program and **long-term incentive is not yet available**. - **Government subsidy** at the macro level is needed - **Willingness to pay** for alternative packaging at individual level, both the consumer and the restaurants, are vary	- The restaurants are **not aware of platforms' green packaging discount campaigns.** Maybe the platforms need more marketing and promotions. - Still a **price barrier.** - Never receive complaints about not using eco-packaging.	- Platform subsidies are designed to be **voluntary.** Eco packaging should be **optional** for consumers if they need to pay more. - Should be coupled with the labelling program - **Only value-added restaurants** would opt for eco-packaging
2.3 Initiatives review 3: Labelling Program	- Can be done **easily** - **Platform supports** green restaurants - The key is how to **make the restaurants opt for greener packaging** because labelling alone is not enough to influence the restaurant decision - It is scalable but **takes time**	- May have a **low impact**. - Adding labels will only cause an **overloaded information**. - Adding eco-label will lessen the visibility of **other labels**	- If the incentives are **profitable enough,** the restaurants would join the campaign more. - Interesting because **consumers seem to care more** about SUP packaging.	- Easy to do but **will not change minds or behaviour** - Platforms should consider giving out **discounts** for customers who engage in this program

	Policy-Level Actors	Food Delivery Platforms	Restaurant Partners	Sustainable Niches
2.4 Initiatives review 4: Deposit-return Scheme	- Reuse system during COVID-19 is **challenging** - **High cost** and may be applicable to **limited areas** - Take-back system and EPR **should be mandatory** - **Only some** SUPs packaging **can be returned** - **Hygienic issues** need to be cautiously addressed	- Nearly **impossible** - Consumption behaviour of the Thais is still based on **convenience factors** - The size of participants may **not be lucrative enough** for a company to invest - Very operational heavy. adding another round for pick-up is **not economically viable** - Setting up drop point facilities is not enough - The market needs an **efficient central waste management system** and infrastructure that supports this reuse scheme	- Only causes delay and **complications.** Both restaurant and customer want fast and **convenient service**. - The outer bags can be returned. Most of the time they are in good condition.	- Platforms can not find this model **profitable** - Platform can gain **loyalty** and customer retention through this model - Platform as a system driver. Having platforms as the intermediaries, it can **overcome the limitation** of the scattered restaurants - **Norms** need to be established. Normalizing the system takes time as it requires **societal change** - The ideal concept is no extra km to do - Need to validated **hygiene** concept
3. Expectation towards the governance agencies	- Government agencies need to **work together** integratedly - Improve the current **tax incentive scheme** - Seriously enforce a **tax disincentive scheme.** Environmental costs of SUP should be **internalized** - Government should regulate **standards on eco-labelling** - Government can develop policies and measures that tackle **every stage in the system** - Setting up **mutual understanding** and communicating to all stakeholders	- **Mutual direction** as a guideline for platforms and restaurants to follow - **Post-consumption waste management system** will make business models and individual consumption behaviour adjusted accordingly - Clear **packaging regulation** - MOU is a good start but we need more than that - **Government subsidies** could help tackle the structural problem especially during the economic downturns. The subsidy of alternative packaging at the initial stage can create **demand.**	- Government needs to have **clear and solid practices** for us (the restaurants) to conform. - Government should promote **alternative packaging** through a **pricing** mechanism. **Costs** of alternative packaging should be lower. - Government should develop an effective **waste management system**.	- Promote **mono-material packaging** for ease of post-consumption management - Government should set a **framework** for every stakeholder to follow - Promote environmental **awareness and understanding among the government** sector - **Government should support** all sustainable actions with knowhow, communication and regulation

	Policy-Level Actors	Food Delivery Platforms	Restaurant Partners	Sustainable Niches
4. System dynamic analysis	- **Digital economy and urbanization** are among the key drivers of unsustainable consumption. It produces a lazy-economy and convenience-based lifestyle - **Hard and soft policies** need to complement one another - **Tax and non-tax incentives** are what the government can offer at this time - **Awareness and behavioural change** need to be coupled with supportive **infrastructure** - Consider **new players** in the market. - Raise **awareness** in the long term, provide **incentives** along the way, and introduce **regulations** - Platforms' **monetary measures** can be **compulsorily** applied - **Incentives** as marketing and behavioural nudging	- **Contribution from every stakeholder** is needed. While packaging suppliers, platforms, and restaurants absorb additional cost of alternative packaging or reduce unnecessary packaging, Consumers also have to put more effort into rejecting unwanted plastics and post-consumption responsibility - The restaurants can be the real changemakers. They are the **decision maker** regarding packaging choice. - **Demand-led** sustainable packaging transition. Alternative packaging should be promoted and supported to create initial demand which will then accelerate supply and lower the price according to the rule of economics.	- **Cost minimization** principle of small-size restaurants - Restaurant **branding and positioning** matters - Platforms' social responsibility can be **spilled over** to their restaurant partners. - Currently, the restaurants feel that they have **not received enough solid support** from the platforms.	- In order to adopt greener packaging, the system needs to shift from industrial suppliers where there are only few producers to **local suppliers** that use local materials - Disrupt the system even if the structure is unchanged. While the government slowly implements its policies and measures, sustainable niches can **disrupt the system with technologies**. - **Bottom-up approach** works. Starts from individual voice - Customers are willing and ready to support responsible business when **incentives** are offered - Platform companies are also willing and ready to change if considerable **incentives** are offered - Eco-packaging **suppliers can act as promoters** in the system - The ideal role of niches is to **disrupt the system** by making the restaurants benefit with low investment and system cost

	Policy-Level Actors	Food Delivery Platforms	Restaurant Partners	Sustainable Niches
5. Limitations to sustainable consumption	- The existing system does not lean towards circularity but rather **linear** - **Reduce alone is not possible** in this capitalized economy. What remains necessary should be well-managed	- **Willingness to Pay gap** of both the restaurants and the customers - **Awareness gap** across individuals. System, infrastructure, measures and regulations need to be improved in parallel - There is **no practical alternative**. The 'reduce' and 'replace' may not be the best solution. We should also focus on '**recycling**' - Lack of **regulation** on green production and consumption - **Voluntary measures** will not take us anywhere	- Some green packaging is **not practical** - Communication and **differences in concern** level - High **price sensitivity**. Charging more is the last thing to do - BYO policies cannot be applied to most of these scenarios.	- We can not make every stakeholder **understand and engage** in Thailand's waste management system - Inefficient **waste management systems** limit behavioural change - **Demand-driven** to gain **economies of scale** for eco-packaging. - **The pandemic** delayed the promotion of zero waste behaviour - When sustainable consumption is not aligned with **human's convenience-based intuition**. New mindset needs to be implanted
6. Leverage Point(s)	- **Post-consumption system** is a key to a circular economy - Economic measures, law and regulations to support the stakeholders' sustainable initiatives across the downstream, middle stream and upstream of the supply chain	- **Incentive alignment.** If every party satisfies with the benefits received, any initiative can be carried on under the market system without any intervention - **Cost and profit** are the key. Any intervention anywhere in the system that can lift the economy of the business, whether it is to drive the sales or lower the cost - Only intervention from the **government** can sustain the greener market system.	- **Support from the government and platforms** can greatly influence the restaurants' decision	- **Mandatory responsibility for individual waste management.** If every individual is required to be responsible for his/her own waste, the consumption decision will be more conscious - Key is to **make alternative packaging cheaper.** Involve tax and non-tax incentives.

VITA

NAME	Boonchanit Wongprapinkul
DATE OF BIRTH	26 January 1993
PLACE OF BIRTH	Bangkok, Thailand
INSTITUTIONS ATTENDED	University of East Anglia, Thammasat University
HOME ADDRESS	99/263 Bang Kraui Sai Noi, Nonthaburi, Thailand 11130
PUBLICATION	No
AWARD RECEIVED	Chulalongkorn's graduate school thesis grant, The 100th Anniversary Chulalongkorn University Fund for Doctoral Scholarship