SERVICE DESIGN GUIDELINE TO ACHIEVE THE REDUCTION OF FOOD WASTE IN INDEPENDENT JAPANESE RESTAURANTS BUSINESS IN THAILAND

BY

MR. BANCHA CHAWPRAKNOI

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE
DESIGN, BUSINESS AND TECHNOLOGY MANAGEMENT
FACULTY OF ARCHITECTURE AND PLANNING
THAMMASAT UNIVERSITY
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ENTITLED

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ABSTRACT

Food waste, recently, has become a more relevant issue on a global scale. In Thailand, there are collaborations between government and the public sector to tackle this problem. In this research, the main focus is the limited explored area of food waste management in order to create a new business model practice, both of financial and non-financial values in independent private Japanese restaurants in Bangkok. Five family-run Japanese restaurants were chosen as case studies to examine three key factors in a widely received Business Model Canvas (BMC) namely Key Resource, Key Activities, and Key partnership to practically reduce food waste. Moreover, qualitative analysis of data collected from field observations, interviews with key persons, waste measurement on sites. To be concluded as a Service Design Blueprint (SDB) and Material Flow Analysis (MFA) and to show how each variable connects to the food waste problem in Japanese restaurants.

The outcomes reveal the chef's skill and creativity to cook dishes made from every part of salmon is the Key Resource. Production plan and inventive menu that satisfy customer satisfaction and keep customers coming back are two of the Key Activities, which are the most significant of all three factors. They are relatively hard to

manage due to the fluctuating numbers of customers, and Waste sorting as historical data for prediction are helping. Suppliers who deliver raw materials and improve the restaurants' fresh inventory management are parts of the Key Partnership. Eventually, the combination of both BMC, SDB and MFA creates a guideline for independent Japanese restaurants to reduce food waste. By the all guideline has been tested through Important Performance Analysis (IPA) and show as 2X2 grid of important and satisfaction and result in the final guideline for real implementation to the restaurant. This research aims to reduce food waste at the back-end and want the user to apply this to the business practice and adapt it as their style and limitation.

Keywords: Food Waste Management, Independent Japanese Restaurant, Business Model Canvas, Service Design Blueprint

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CHAPTER 1
INTRODUCTION

Food waste is becoming a more relevant issue on a global scale due to the dietary transitions of customer behaviour to more perishable types of food as well as eating culture shifts brought about by the rise of middle-income class in developing countries and a worldwide trend of urbanization. And if food waste were the country, it would be the third country largest emitter after America and China by total carbon footprint polluted. Food waste is a complex and global scale problem that influences each of the triple bottom line of sustainable development: economic, environment, and social (FAO, 2013). A food secure country is considered when all its people have physical, social and economic access to enough food, safe and nutritious food that meet certain dietary needs and food preferences (FAO, 2006).

At least 300 million barrels of oil every year are used to cook food that will never be consumed, which calculated approximately 4 per cent of total U.S. oil consumption (Hall et al. 2009, 2). Additionally, over than one-quarter of our total freshwater consumption is attributed to food product that never gets eaten (Hall, 2009). Farming, shipping, and selling food that is destined to be thrown away uses more energy than is recently produced by offshore oil drilling (Humes, 2012). Despite the amount loss of the valuable resources that are needed to produce food, more than 6 billion pounds of food are leftover in the field or unsold by the producer every year (Gunders, 2012). The huge of the problem becomes apparent also as High-Level Panel of Experts on Food Security and Nutrition (HLPE, 2014) appraised that out of the total food produced, 28 to 36% go wasted depending on the country. Moreover, food waste mostly causes a waste of resources and significant economic loss and more. In the developing world, it affects the essential accessibility of food for the hunger of the populations. According to the Waste and Resources Action Programme or WRAP in 2008, estimated that one-third of food where growth from farm to fork is wasted by consumers which corresponds to about 1.3 billion tons of food per year (Gustavsson,

2011). According to the United Nations, there are around 1 billion people in the world who chronically suffer hunger at the same time.

Food loss and food waste are intimately involved with food security to reduce it will help feed more people. Relieving the pressure on natural resources and alleviate the negative impact on the environment from greenhouse gas emissions (GHG) of the food industry and loss of biodiversity due to the agricultural industry. When it comes to reducing food waste, there is a pronounced need for action. In 2012, the European Union (EU) accepted the scale of this issue and called for urgent action in order to reduce food waste at half or 50% by 2025.

Reducing food waste and food loss is one of the United Nations' sustainable development goals; the United Nations Development Programme (UNDP) has an aimed a 50% cut off by the year 2030. Its first objective is to measure exactly how much food we waste and lose since most countries – Thailand included. Organic waste accounted for 64% by municipalities across the country in 2017, or about 17.56 tons, of the country's garbage. This number did not include trash from the private sector that was managed by private waste management suppliers. (Pollution Control Department, 2017) Thailand can look abroad to learn optional ways to reduce food loss and waste though it lacks an efficient waste categorising and recycling system. Many countries reduce waste by sorting the safe past-date food in a grocery store and overflow food from hotels buffet and donating it instead of throwing it away. Thailand is leaving far behind, and only a tiny amount has been recycled from 64% of our total garbage is food waste. The main reason is the lack of a waste collecting system. As a result, the Bangkok Metropolitan Administration can recycle only 2% of all food waste. And the rest goes to landfills, where hygiene is not the first priority.

This thesis is going to adopt a restaurant service blueprint at the problem from the back-end to front-end. Because the restaurant can be seen as key players of the foodservice industry, that are ability to perform an important change within their own operations and stakeholder with this is a significant market power over large numbers of suppliers and customer. Moreover, the restaurant is consumers' main

touchpoints where the food industry and thus restaurant are able to effectively reach out to consumers and influence to change their behaviour.

1.1 Food supply chain

Manzini (2014) described that the food industry is the largest one in Europe by turnover and is consists of over 300,000 companies, 99% of which are small to medium-sized enterprises or SME. The food supply chain consists of manufacturing, processing and transformation of raw materials or semi-finished products where related to agriculture, forestry, farming and fishing. Logistics and distribution are also part of the food supply chain. The network structure of food supply chains is complexed as it includes many types of players such as supplier cooperatives, food traders, packaging companies, inspection and certification organizations, and food labs. The nature of products that it processes is often highly perishable, and this requires the use of unmistakable inventory planning models. And the natural factors affecting agriculture the supply might be pretty unstable. Also, the food supply chain is subject to certain safety and sustainability standard that might vary between legislations (Verdouw et al., 2016).

The main players that are present in the food supply chain: input suppliers, processors, producers, distributors, retailers, hospitality sector, and, finally, consumers. (Dani, 2015) Matopoulos et al. (2007) took a wider and a more detailed on the food supply chain by adding farmer cooperatives and research centers, breaking down distributors into exporters, transporters and importers as well as separating input suppliers and chemical industry. At the upstream of the food supply chain are the producers who supply raw food, such as fruit, vegetables, fish, meat and grains. Dani (2015) also explains the so-called ‘input suppliers’ that are intensive international corporations providing producers with seeds, fertilizers, pesticides and machinery. Next, when the raw food has been grown, it is sold to food processors who transform the raw food into products that can be stored in inventory for a longer period and are better befitted to consumer preferences (Dani, 2015).

According to Matopoulos's visualization, farmers' activities are enabled by the research centers as well as research centers that develop new varieties of products, and farmers part into cooperatives. Input suppliers allocate both farmers cooperatives and food processors, however it is highly likely that input suppliers might allocate farmers directly. In this case the input suppliers imply companies that supply machinery for agriculture and processing as the research centers and chemical industry have been splited into their own entities.

After the processor stage comes to the distribution stage that connects between processors, producers, hospitality sector and consumers. Some distributors, such as trading companies, perform purely as links between different non-consumer entities, while others, such as retailers, showcase the products of the food industry to consumers. Previously, retailers were mostly small family-owned stores. However, nowadays, there is a global shift towards large international retail chains. The hospitality sector (caterers) also acts as a middle-man between food producers, processors and final consumers by providing customized and ready products (Dani, 2015).

The distributors are isolated into exporters, transporters, shippers, wholesalers and retailers. Likewise, the distribution network may acquire the items from farmers, cooperatives or manufacturer/processor's levels the same. In many cases, one or several of these stages is overlooked. At last, customers are the ones that procure the products of the activities that other food supply chain actors undertake. Customers supply the upstream actors with incomes and decide the improvement of food supply chains. For example, there is a current trend towards more organic and healthy foods, and along with these lines food producers, processors, retailers and caterers need to consider when planning and building up their operational activities in order to better suit consumer needs (Dani, 2015).

Generally speaking, the food supply chain can be described as a rather intricate system with the nonlinear stream, a large variety of production and processing methods just as the final products. Food supply chains are especially challenging to manage because unpredictable external components, for example, climate and

natural phenomena having a large effect on the supply, high perishability of took care of products and furthermore the strict and various legislative requirements that may change essentially from region to region.

1.2 Thailand foodservice industry and Japanese restaurant market growth

Thailand foodservice market is forecasted to reach over USD 676.04 million by 2024, witnessing a CAGR of 16.8% while the forecast period (2019 - 2024). And only Japanese restaurant has over 1,500 restaurants. Thailand is one of the significant actors to the consumer foodservice industry among Southeast Asian regions. The main factors of growth for the foodservice industry are the tourism industry. Tourists from China, India, Laos, and Malaysia have been grown continuously in the country economics over the recent past. Japanese food has become the second local food next to Thai food. We can see a shopping mall, restaurant and many placed decorate as a Japanese style and all that located in Bangkok. High quality and great variety of Japanese food are highly available. So why it was so popular. Thailand has the third-largest number of Japanese long-term residents according to the statistics from Foreign affairs of Japan. Which has a large Japanese community demanding authentic Japanese food. That why Japanese food is become like a second choice food against of Thai food. Otherwise, the development of economic cost airlines, and considerable boost tourism and support to find an authentic material to make Japanese food easier. Social networking platform, such as Instagram, Facebook, and Twitter played an important role in increasing the Thai foodservice market's growth. And Celebrities or net idol industry posted images and provided feedback about their premium lifestyles, were boosted the health, wellness and even lead others to try to be like them. So, eating Japanese food become a trend in Thailand.

1.3 Overview of food waste

This section will give an all-encompassing review of the issue of food waste based on the existing literature other relevant sources. This section aims to shape a strong reason for creating the evaluation framework that will later be used to assess the variety of Thai restaurants' practices aimed at reducing food waste. The topic of food waste is not directly covered in research on supply chain management. Therefore, the resources the assets used in this section are taken from comprehensive reports and scientific papers that are explicitly related to food waste.

This distinction between food waste and food loss is also recognized by Parfitt et al. (2010). FAO include that non-edible parts of food products as well as feed for animals cannot be considered as food loss or waste since they were not originally proposed for human consumption. However, the report considers the food that was lastly used for non-food purposes (feed for animals, compost, biofuels) as food loss/waste due to the unplanned feature of its non-food use (FAO, 2011).

"Food Loss and Waste refer to the decrease in mass (quantitative) or nutritional value (qualitative) of food - edible parts - throughout the supply chain that was intended for human consumption". The differentiation between food loss and food waste characterized to lie in different stages of production: while food loss happens before reaching the final product stage (during production and distribution), food waste usually takes place in retail and consumption (Bagherzadeh et al., 2014).

Smil (2004) goes further into the nutrition efficiency indicators and considers that there is a growing discrepancy between food creation and consumption. Not only does it include food thrown away, but also food consumed in excess of the per capita nutritional requirement of an average of 2000 kcal per capita each day. It is mentioned that overconsumption of food can be viewed as a significant aspect of the extravagant consumption culture in the developed countries and among the more wealthy segments of the population in developing countries. In the long-term, it causes high levels of obesity and other medical issues, and thus calories overconsumption

cannot be regarded as a sustainable practice. Therefore, he regards it to be part of the larger issue of food waste and loss. (Smil, 2004)

1.4 Problem definitions

All parties in the food supply chain need to be involved in preventing food waste effectively. However, given the high proportion of food that is lost in the food supply chain in industrialised, countries, manufacturers, foodservice operators and household customers potentially have the most significant potential for food waste reduction in Thailand. Households, wholesale/retail and food service/catering together contribute towards nearly 60 per cent of all food waste produced (excluding agricultural production) (Monier et al., 2010). Further, it is important to tackle food waste that occurs at the later stages of the food supply chain given the potential for life-cycle savings is much higher than food that is lost early on.

So far, the majority of the previous study of food waste prevention has focused on households and retail rather than foodservice and hospitality (Nordic Council of Ministers, 2012). Many studies and initiatives have already focused on the prevention of food waste in households, which makes sense given that households contribute most to EU food waste–42% (Monier et al., 2010). The UK-based Waste Resources Action Plan (WRAP), for example, has done a lot of research on the causes of food waste in households in the UK and how food waste at the household level can be prevented (WRAP, 2009), with a particular focus on increasing consumer awareness about use-by and expiry dates of retail food purchases and the environmental and social implications of food waste.

Nonetheless, other studies indicate the source of food waste is reasonably significant (BCFN, 2012; Gustavsson et al., 2011), the UNFAO food waste report did not accurately quantify the amount of food waste produced globally by the foodservice sector. For example, the foodservice and catering sector in the EU contributes to 14% of all food waste generated, up to 12.3 million tons of food waste each year. In the UK, restaurants throw out four times the amount of food waste per meal than the

average household (SRA, 2010). A Swedish study estimated that restaurants produce 10 per cent of all food waste in the country, equaling 99,000 tons of food waste each year (Jensen et al., 2011). In China alone, it as been estimated that restaurants throw out enough food to feed 200 million people each year, while 128 million people live below the poverty line.

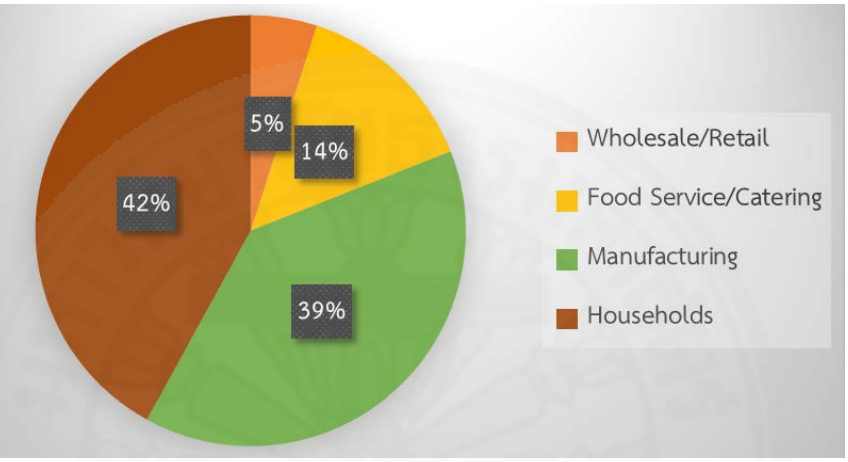

Figure 1.1 Food waste in the EU27 by source, excluding agricultural production
Source: Monier et al., (2010)

Food waste prevention should be a major concern for individual restaurants as well as society. Food waste is costing restaurants a lot of money. When restaurants waste food, they are also wasting the money spent on purchasing the food; energy, water and labour for processing, preparing and cooking the food; and disposing of the food. In this sense, reducing food waste could be seen as a "trigger point" for reducing energy and water consumption onsite, thus making the entire restaurant operations more efficient and therefore more competitive. It has been estimated that restaurants pay around £2 per kg of food waste produced and spend around 2-10 per cent of turnover on food that's wasted (Environmental Protection Agency Ireland, 2010), it is estimated that the hospitality industry could save around £720 million a year by preventing avoidable food waste and diverting unavoidable food waste to anaerobic digestion (WRAP, 2011). Restaurants should also be concerned about food

waste as consumers get more and more interested in sustainability generally and making more sustainable choices. Food waste is becoming a significant issue in the sustainability debate. Reducing food waste can also reduce restaurants' GHG emissions and carbon footprint, as well as their entire water and ecological footprint.

Restaurants are gradually moving towards more of a preventative approach to food waste, with organisations and industry publishing guidelines around how restaurants can avoid food being wasted in the first place, and restaurants implementing a more efficient way to prevent food waste that happens. Organisations, such as Unilever, are also trying to help restaurants understand the financial benefits involved in reducing food waste and how to save money by reducing food waste, as an incentive for action (Unilever Food Solutions, 2013). However, this movement has been slow, and there continues to be a real need for research into food waste prevention and particularly the quality, source, costs and cause of food waste and setting benchmarks for food waste minimisation. A UK-study identified that two options for reducing food waste in restaurants include spreading best practice and developing campaigns that highlight the extent of waste and the financial benefits of reducing it (Foresight, 2011). Studies that can assist with either of these measures could further encourage restaurants to implement preventative strategies and contribute towards overall knowledge on food waste prevention in restaurants.

1.5 Research purpose and hypothesis

The purpose of this study is to collect data from 5 Japanese restaurants in Bangkok Metropolitan area to investigate the food waste generation inside the restaurant under the control variable of

1) The restaurant has to be independent or family-owned, not a franchise.
2) The staffs who work in the restaurant are between 5-7 people.
3) Salmon menu is based and has to cut fish by themselves
4) Located in the Bangkok metropolitan region including Bangkok, Pathumthani, Nonthaburi and Samutprakan.

This study using three tools to analyse the data

1) Service Design Blueprint to see the overall process of working from the back-end through front-end

2) Material Flow Analysis to see where waste is generated and how different each restaurant manages Salmon fish (Secret source are provided here)

3) In-depth interview to see how manager or chef think of which are the key for reducing the food waste in a restaurant.

In order to collect data, analyse data and shown result, I bring out the infrastructure from every restaurant based on business model canvas to become a hypothesis to collecting, analysing and resulting. So, I processed with the study based on the following hypothesis.

1) Key Resources
2) Key Activities
3) Key Partnership

Where this three create a research question the which one is the key to reduce food waste/loss in the Japanese restaurant. So, this study is going to show the result as a guideline for business best practice to apply in order to reduce food waste and transform it into a financial and non-financial benefit. I stated the Research scope in the following.

1.6 Research questions and research objectives

1.6.1 The research questions of this thesis are the following

1) What is the key reducing factors of food waste in the Japanese restaurant?

2) What are the major sources and causes of food waste in Japanese restaurant?

3) How can Japanese restaurant benefit financially and non-financially by minimizing and preventing on-site food waste?

1.6.2 The research objectives of this thesis are the following

1) Understand the business operation and food waste generating of the independent Japanese restaurant in Thailand by using Service design blueprint, Business Model Canvas and Material Flow Analysis as the main tool to study.

2) Find out key reducing food waste through the infrastructure of Business Model Canvas (BMC); Key Activity, Key Resources or Key Partnership.

3) Introduce the Design guideline and testing by 2X2 grid of possibility and productivity and using an Important Performance Analysis (IPA) to scoop down the business practice for the newcomer Japanese restaurant to adopt food waste reduction practices.

4) Design Guideline on business operation practice to implement to the real-life case.

1.7 Boundaries of the thesis

This thesis targets the Japanese restaurants where the foods are unique and have specific characteristics. Moreover, due to the data collection problem, the researcher decides to use purposeful sampling of selecting the restaurant were meant the specific criteria and with the allowance of the restaurant agreement. The overall motivation for choosing this segmentation it from the market explanation of Japanese food industry in Thailand that rising 21% last year and expect to rise more on the following year and it was the great possibilities for food waste-reduction implementing now before it grows. The data had been collected in the period of COVID-19 Pandemic. There is the limitation of a face-to-face interview and consult, that makes the data collection in some part new to be an online meeting and testing.

CHAPTER 2
REVIEW OF LITERATURE

Food waste is a single most significant component of the waste stream by weight generate in the USA. According to the report by the U.S. Environmental Protection Agency, an estimated 32 million tons of food waste was produced annually. The food being wasted cannot be well-defined through any individual behaviour, but rather through the integration of multiple behaviours that can maximize or minimize the probability of food being wasted. Food waste has the highest economic, social and environmental impacts at the end-consumer. Because of the opportunity cost of not feeding other people who might be living in hunger, its value-added lost, and the loss of biodiversity, natural resources, and other resources such as energy and labour. We need to understand the factors involved with food waste behaviour to reduce food waste.

The terms food, inedible food, food loss and food waste need to be contextualised both geographically and within the food chain. For the purpose of this literature, 'food' is defined as any substance, whether processed, semi-processed or raw material, that is provided for human consumption as well as the 'inedible parts' associated with food that is not intended to be consumed by humans. For example, pineapple is a food; its skin is inedible.

'Food loss' refers to food that unintentionally undergoes deterioration in quality or quantity as a result of food spills, spoils, bruising, wilting or other such damage as a result of infrastructure limitations at the production, storage, processing and distribution stages of the food lifecycle.

In this report, 'food waste' means any food and inedible parts of food, removed from the food supply chain where can be recovered or disposed of. This includes food waste that is to be composted, spread to land, treated through anaerobic digestion, combusted for bio-energy production, incinerated, disposed to sewer, sent to landfill, dumped in open dumps, or discarded to sea (EU FUSIONS, 2016). The rationale behind this choice of food waste definition is that from a resource

efficiency perspective, any parts of food that are not consumed are still rich in carbon, water and nutrients. By collecting and recycling this food waste, nutrients and water can be recovered and recirculated, and renewable energy from the carbon harvested to substitute fossil fuels.

2.1 Type of food wasted

A typology of food waste is suggested by WRAP in 2008 and synthesised by Kelleher and Robins (2013). Food waste by avoidability is divided into the following categories (Kelleher & Robins, 2013).

2.1.1 Avoidable – food that is appropriate for consumption at some time before the disposal.

2.1.2 Possibly avoidable – food that is eaten by part of the people and not ate by others (bread crust), or that is eatable when prepared in a certain way and not eatable when prepared in other ways (potato skins).

2.1.3 Unavoidable – parts of food products that are inedible, or waste that originates from food preparation and that is not usually proper for human consumption (bones, tea bags, eggshells).

This thesis will not determine unavoidable food waste explained above to be part of the food waste based on Bagherzadeh's definition since it does not fulfil the "edible parts" description. Thus, the concept of food waste used in this thesis will only include avoidable and possibly avoidable food waste.

There are valuable contrasts between types of foods as far as waste rates. FAO (2011) gave assessments of what rates of different foods were lost in each region of the world at different stages of production, distribution and consumption. Despite there were recognisable regional differences, fruit and vegetables (37-55%), grains (20-35%), as well as roots and tubers (33-60%) were reliably the most wasted foods in practically all of the regions in retail and consumption. Large proportions of fish and seafood (30-50%) were additionally shown to be wasted across all regions.

Parfitt et al. (2010) explained a separation of food products into perishable and non-perishable, i.e. based on the projected storage time and moisture content (short-term storage and very high moisture content for perishables vs a couple of years of storage and a low level of moisture for non-perishables.). Expectedly, most perishable foods are the ones that comprise the amount proportions of food waste (Parfitt et al., 2010).

In the food industry, a food product becomes waste when it failed to be consumed by a customer or an employee of a food service restaurant operation. Food waste includes both food and drinks for customer's consumption and kitchen waste such as fresh food trimming waste, oils, spoiled, eggshells or expired products. Pre-consumer food waste and post-consumer were described food waste categories: Pre-consumer food waste includes expiration, overproduction, spoilage, and trimming waste (Shakman, 2013). Post-consumer food waste often meant as plate waste is the food items leftover by the end-customers. These often consist of food left on the plates or unused decorating part (Baldwin & Shakman, 2012).

In a similar vein, Constello divides food waste into two types. The first type is food waste before its consumption (any organic material that is thrown away during food preparation, like peels, grease, fruit and vegetable parts; it is considered inedible). And food which has rotten (either the shelf-life has expired, or it is decomposing; it is considered inedible). The other type is food waste after consumption which is the food served to the guests that have not been eaten.

Avoidable food waste consists of food prepared or served in an enormous amount, food that has been damaged during the cooking such as burnt food or unqualified food from the wrong volume or wrong recipe, as well as food which has not been consumed until they get expired. Most avoidable food wastes are not poison, and they should be fertilizer properly. They should be separated to be sent to different waste treatment programs (Ilakovac, 2018).

2.2 Cause of food waste

This section identified the main reason for food waste in the food industry. Food waste occurs at different stages of the food chain from the farm to fork. It is impossible for a restaurant not to create any waste at all costs. Food waste generation does not show poor operating practices, since it takes place due to various understandable and sometimes, definite reasons. As food waste is sorted into two groups: pre-consumer and post-consumer food waste, the root of them are from different way and form (Baldwin & Shakman, 2012, 57-59).

According to (Baldwin & Shakman, 2012), pre-consumer food waste is caused by the reasons mentioned in Table 1. This table below is the summary of the main causes of food waste in the food industry wrote by Baldwin and Shakman in the book named "Greening Food and Beverage Services". The causes are separated into two types: pre-consumer and post-consumer.

The first and most norma cause of food waste is unidentified demand. Kitchen operators perhaps have problems to predict the number of customers. They are going to serve and estimate what meal will be the most suitable and cost-effective. If the restaurant offers various menu and changes them very often, this can be a problem. In order to improve the forecast and predictive, understand the customers' preferences and other factors such as seasonality, weather patterns, and local competition is very needed (Baldwin & Shakman, 2012).

Overstocking is another caused why restaurant points have to put food into waste form. Some food services did not want to deny their customers that they cannot prepare an order, as a result, they end up preparing too much than they actually sell out. This margin of error method would work in many situations but too large margin estimation can conduct to waste (Baldwin & Shakman, 2012).

Besides, inefficient production processes also create a large amount of food waste in restaurants. Chefs always refer batch cooking to a method to food waste dwindling. However, it consists of the time of the day as well as the portion of the batch. Such as the schedule for the breakfast line is from 7 am to 10 am, and the

hotel wants to offer food remain to 10 am every day. Yet, the demand is lower when it near closing time.And it can create a huge amount of leftover if the hotel still keeps the nature of batch cooking. To avoid creating an unwanted waste, they might offer a cook-to-order model or present their food in smaller containers and change the display (Baldwin & Shakman, 2012).

Additionally, poor communication among restaurant employees can conduct to food waste generation. Communication is very significant on operating between the front and the back of the restaurant because when miscommunication happens, such as the language or culture shock or limited time, the physical layout of the operation. All the thing can lead to failure in controlling food production (Baldwin & Shakman, 2012).

Staff behaviour also plays a crucial role in food wastage regulate. Staff behaviours can either cut or contribute to food waste. For example, if an ingredient requires four and a half kilograms of beef and the beef box just comes in 5 kilograms, the chef cannot separate the box and leave the rest unused but use up the whole package of meat. This operation does not come with bad intention. However, it has led to an unwanted amount of food waste (Baldwin & Shakman, 2012).

Unskilled trimming is another staff-related reason for food waste. Vegetables, fresh fruits, and animal product need to go through preparing and trimming section to be ready for use. Staff members should acquire proper kitchen skills training and anticipate skills to produce food without generating so much waste (Baldwin & Shakman, 2012).

Furthermore, over-prioritizing merchandising generates an enormous amount of food waste. It is acceptable that operators want their merchandising products to stay fresh, beautiful, and abundant on the shelves. Nevertheless, this can result in an redundant amount of products wasted by the end of the day (Baldwin & Shakman, 2012).

Despite the fact, food safety comes as the first priority at any food service point, it contributes immensely to the discard of food. Food with any issues regarding timing, temperature or taking care of should be discarded for the consumers' wellbeing

reasons. Still, lessons should be gained from the mistakes so that they goal that they won't be repeated again (Baldwin & Shakman, 2012).

In terms of post-consumer food waste, Shakman in (Baldwin & Shakman, 2012) explains three main reasons. The first reason is the large portion sizes. The portion sizes are always bigger than what the customers can actually eat. In addition, inefficient service model can create a significant amount of food excess. Self-service food points such as canteen, buffet restaurants, and other non-commercial foodservice operations allow their guests to take more than what they can eat. Also, customer's menu acceptance can contribute to waste in a sense that when customers do not enjoy some part of the seasoning, some herbal ingredients, or the quality of the served meal, they usually refuse to complete their meals (Baldwin & Shakman, 2012).

Table 2.1 Causes of pre-consumer and post-consumer food waste

Pre-consumer	Post-consumer
Unidentified demand	Large portion sizes
Overstocking	
Inefficient Production	
Poor communicate	Inefficient service model
Staff behaviour	
Unskilled training	Customer’s menu acceptance
Over-merchandising	
Food safety	

Source: Baldwin & Shakman, (2012).

2.3 Freshness requirements

One of the biggest challenges in every Japanese restaurant is the fact that most food must be fresh in order to cook meals people are willing to pay for. The consumer's high expectations concerning looks with every Japanese restaurant,

freshness and variety are among the reasons good products are thrown away. These "quality standards" are partly developed according to the customer's preferences and restaurant reputation, and to change these preferences, it is required that several actors collaborate (Priefer, Jorissen & Brautigam, 2016). Although freshness requirements are a significant factor, there are differences within the foodservice industry, depending on the quality and type of food served. For instance, the Japanese restaurant will have no choice to throw away good food because of a freshness requirement because we serve fresh and raw like sashimi and sushi menu. Consumers have higher expectations of freshness and quality. Furthermore, it is necessary to comment on the regulatory constraints that national governments put on food operators. The harmonized laws in the European Union and Norway regarding temperature, preparation method and hygiene, are created to protect the health of people (Regjeringen, 2015). However, it is possible that these restrictions force Japanese restaurant to throw away edible food, just to comply with food safety laws.

2.4 Impacts of food waste

2.4.1 Environment impacts

The wastefulness of resources (including energy, carbon, water and nutrients) needed to produce food that never get eaten, poorly managed food waste oppositely affects our climate change due to the greenhouse gas or GHGs that are emitted upon its decomposition, contaminates watercourses from nutrient and leachate runoff and can be a vector for diseases and a health hazard. This section gives an overview of the breadth and scale of the impacts that food waste inflicts upon society and the environment and how its collection and recycling can mitigate some of these. It describes the impacts, identifies the relevant international commitments in place to address these impacts, and explains some of the potential mitigation measures needed to achieve this, with particular regards to GHG emissions and climate change, Water footprint, Nutrient loss, Sanitation, Ecological impacts and Economic impacts.

2.4.2 Financial consequences

The financial impact of food waste in the foodservice industry has rarely been studied in the research context. One study conducted by Eriksson (2012) detected a marginal benefit of €1.30 per kg. Reduction of food waste in the sector of restaurants and catering in Sweden. This marginal benefit would result in noticeable amounts if every business start to reduce food waste by a few kilograms each month. With most of the food waste being avoidable, we see that there are a way for significant financial benefits if managing to reduce food waste. Another study, performed on the hospitality and foodservice sector in the United Kingdom, identified the breakdown of waste-costs. It found that food procurement costs and man-hour (time spent preparing the food) accounted for the vast majority of the costs, at 52% and 37 %, respectively (Wrap, 2013). Energy and water use, for instance, only make up 4 and 0.6 % of the overall costs. The implications of these results are important. Implicitly, with the high labour costs and material prices of Europe, great profits can be generated if food waste is minimized.

2.5 Trends, tendencies and global goals

In 2014, the foodservice industry grew by 5,7 % on a global basis (Statista, 2016). Along with this growth, certain trends are developing, which are important for actors in the foodservice industry to consider. Furthermore, these trends underline the importance of the thesis, as they demonstrate the future need for reducing food waste.

In Europe, people still spend more on grocery than on dining, although the tendency is that people dine out more often, especially young people (Statista, 2016). In the UK, researchers have found that young people spend more money on food than any other age group, and especially food from the foodservice industry (Independent, 2015). The researchers explain this by lack of cooking skills and a busy lifestyle. Research conducted in Norway shows that people with residence in the cities spend more money in restaurants and cafés, compared to people in more sparsely populated areas, due to easier access and a more hectic lifestyle (Statistics Norway,

2012). All these trends are part to consider, as they implicate that more of the planet's resources is to run through the foodservice industry. Consequently, the industry will have an even bigger responsibility than before to ensure sustainability. The idea of a circular economy has brought more attention to the possibility of eliminating all waste, and instead adopting an approach where everything is reused or returned to the earth to create more value. A similar goal would be desirable also in the foodservice industry (Jurgilevich et al., 2016).

There is also a general tendency that societies demand more sustainably produced food, both from retailers and foodservice restaurant. What is "hot" in the food world changes constantly, and several nutritionists, food operators and industry associations forecasted food waste management to be one of the top emerging food trends in 2016 (Duron, 2016; National Restaurant Association, 2015; Webb, 2015; Zegler, 2015). Keywords such as waste management, waste-based cooking and zero waste-policy are flourishing among restaurants, and the popularity among consumers is growing. For the commercial segment, this implies that there are financial opportunities in the reduction of food waste if this is communicated well to the consumers.

2.6 Global goals: Sustainable Development Goals (SDGs)

The Sustainable Development Goal 12 "Ensure sustainable consumption and production patterns" established by the United Nations in 2015. includes a specific target for FW reduction: halve per capita global food waste at kitchen and consumer levels by 2030. Additionally, it also includes a more common goal to reduce food loss along the food supply chains (United Nations, 2015).

2.7 Framework

2.7.1 Business Model Canvas (BMC)

In general, a business model perspective better allows for innovation in business. Firstly, business models may represent a new dimension of innovation that

complements traditional ones, such as product, process, and organizational innovation (Casadesus-Masanell & Zhu 2013) This was also confirmed by Zott and Amit (2008), when explaining how business models may introduce nuances that have escaped the traditional strategy. Also, Teece (2010) finds that business models are able to shed light on important issues that have remained relatively unexplored. Lastly, research finds that firms that seek to change or reshape their business model, experience higher growth compared to those who do not implement such changes (Johnsen et al. 2008; Sosna, Trevinyo-Rodriquez & Velamuri, 2010).

These findings make business models highly relevant for firms to explore new solutions or guideline to adapt to current business developments. Economists believe that the world can move towards what they call the 4th industrial revolution, resulting in changes in consumer trends. These new trends will create new demands making ideas and innovation more critical to meet the new requirements (Saebi, 2016). Among these trends is the shift towards more sustainable business solutions. Business models additionally become an increasingly important concept in the field of environmental sustainability (Zott & Amit, 2008).

Because of these business model characteristics, it becomes easier to see new solutions for solving the problem of food waste when thinking in terms of business models. Johnson et al. explain how businesses see the need of a new business model, among others, if there exists an opportunity to "bring a job-to-be-done focus where it doesn't exist" (Johnson et al., 2008, p. 58). This job-to-be-done focus is what this thesis aims to bring to the food waste issue. By doing this, we argue that food waste reducing business practices are contributing to the shift to meet future demands. Food waste reduction in the foodservice industry is a relatively unexplored theme, which is why it could benefit from being looked at from a business model perspective. Firms, especially large firms, can have difficulties in evaluating their existing business model (Teece, 2010), we argue that this evaluation will be even more complicated if the management lacks the systematic review presented by business model theory. So, to change business model need to be clear on doing infrastructure

where are Key Resource, Key Activities and Key partnership. To reduce food waste, we have to set this infrastructure in order to keep every part ongoing along the side.

This thesis creates a guideline for reducing food waste in the independent Japanese restaurants where bring out five restaurants case study and compile them in a service design solution as the aim is to provide a guideline for both existing and newcomer Japanese restaurant adaptation. Present easily applicable and practical business practices, we choose to use elements of a business model that has already been thoroughly tested attitude and is in use in 5 cases study Japanese restaurant in Bangkok, Thailand. We argue, ensures the practicability of the business practices we present. The business model we choose to adjust infrastructure part in the Business Model Canvas, first introduced by Alexander Osterwalder in 2008, and later redefined in Osterwalder & Pigneur (2011) and others.

The nine building blocks are presented in figure 1. By changing one or more of these building blocks, a company can create new strategic alternatives in a structured matter relevant for food waste-reduction in the independent Japanese restaurant.

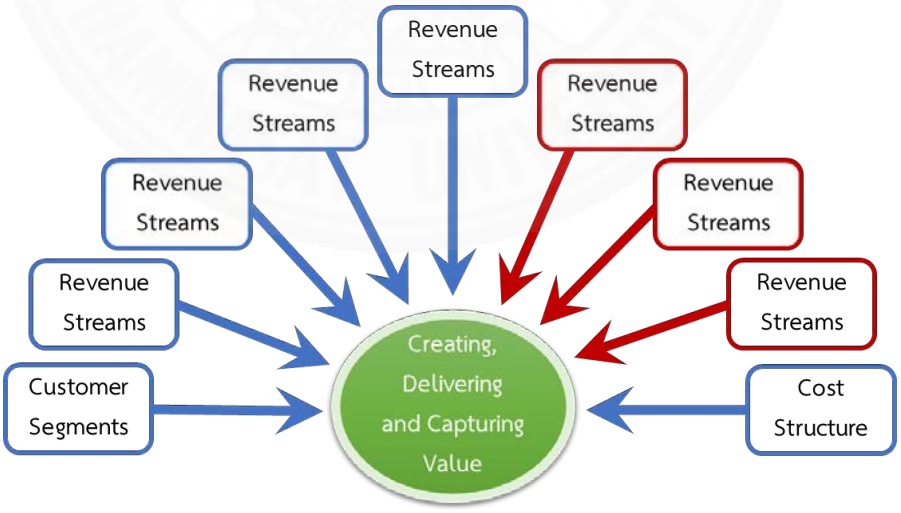

Figure 2.1 The business model canvas and the three business model elements

In this thesis, we choose to focus on three of these nine building blocks: key resources, key activities and key partnerships. These three building blocks represent two different parts of the business; the front-end and the back-end. The front-end is the part facing the market, and includes customer segments, key activities, value proposition, channels, customer relationships and revenue streams. Thus, this is the visible part of the company. The back-end refers to how the value proposition is created and delivered, and includes key resources, key partnerships and the cost structure. Our selection of the three building blocks can be explained in terms of the front-end and the back-end.

2.7.1.1 Key resources

Key resources represent the most important assets required to make a business model work. According to Osterwalder and Pigneur, physical, intellectual, human and financial resources are the most important resources a company has. These resources can be owned by the company or leased from a partner. Physical resources are physical assets, such as sales points, machines and IT systems. Intellectual resources can be the company brand, knowledge and partnerships, among others. A characteristic of such resources is that they are difficult to develop, but in return they can create considerable value to the company. Human resources refer to the company staff, and in certain industries, such as knowledge-intensive industries, human resources are particularly important. Finally, financial resources include cash, stocks and other financial instruments. Several causes of food waste are associated with lack of knowledge. By addressing key resources, we seek to find solutions that can increase knowledge about storage, logistics and portion sizes, freshness requirements, and consumer attitudes. Focusing on increased knowledge of these matters will smoothen and simplify the job to deliver the value proposition of serving meals that create the least possible food waste.

2.7.1.2 Key activities

The key activities are the most important activities a company must perform to create and deliver the value proposition, and to make the other

business model elements work, such as reaching markets and customers and earning revenues (Osterwalder & Pigneur, 2010).

Depending on the type of business model and the industry the company is operating in, the activities will differ. For most food service businesses, the key activities will be related to preparing and serving food, but also related to solving problems for the customers, such as catering to individual needs. The latter is a common key activity in service organizations. In terms of food waste, key activities play an important role because these activities provide concrete examples of what to do to decrease food waste. Without addressing changes in key activities there would be no way that food waste could either be prevented or reused.

2.7.1.3 Key Partnerships

Key Partnerships constitute the network of partners and suppliers needed to deliver the value proposition and make the business model work. Osterwalder and Pigneur (2010) categorize partnerships into four types: strategic alliances, cooptation, joint ventures and buyer-supplier relationships. The reason for forming partnerships is to perform the business model better or cheaper than without them, reduce risk, or get access to and acquire or lease resources or services. Partnerships are very important when trying to redistribute surplus food. Without partners, it would often be costly and time-consuming to do these activities in-house. For instance, if a hotel would have to distribute their surplus food to homeless people across the city every evening, it would require extra people, more time, and not to mention more knowledge. Although this would create awareness and a good reputation, having to pay for transportation and salary to their employees would be costly. Furthermore, due to health issues and freshness requirements, the job could not be postponed. In this way, partnerships can be valuable parts of a business.

2.7.2 Service Design Blueprint

A service design blueprint consists of two dimensions (Flie ß & Kleinaltenkamp, 2004, p. 396): “the horizontal axis represents the chronology of actions conducted by the service customer and service provider. The vertical axis distinguishes between different areas of actions. These areas of actions are separated

by different “lines:””. An action is the work that was done by an actor. The sequence of actions by an actor is called action flow. A communication flow presents the sequence of actions between two actors. The things which affect customer’s service perception are called props and physical evidence (Bitner et al., 2008).

Line of interaction: separates customer actions from onstage and backstage actions; *Line of visibility:* separates the actions of onstage employees from backstage actions;

Line of internal interaction: separates the actions of backstage employees (or systems) from support actions; Line of implementation: separates support actions from managerial actions. In addition to these lines, Fließ and Kleinaltenkamp (2004) added another line: *Line of order penetration:* separates customer induced actions from customer independent actions.

Customer induced actions are affected by customer actions, goods, and information. Customer independent actions does not involve customer actions, or his/her properties (Fließ & Kleinaltenkamp, 2004). The steps of building a blueprint are (Zeithaml, Bitner, & Gremler, 2006):

1) Defining the target service process.

2) Defining the customer segment.

3) Designing the customer actions, frontline actions, and communication between customer with frontline employees or systems.

4) Designing support and management actions and their communication with frontline actions.

5) Adding physical evidence and props for each customer action.

The core concepts of service blueprinting are shown below in Table 2.2, which were defined earlier, with their precise definitions to complete the data collection form.

Table 2.2 Concepts in service blueprinting

Concept	Definitions
<Action>	Actions that customer, onstage personnel, backstage personnel (or systems), support and management perform in a service process (Milton & Johnson, 2012).
<Actor Categories>	Actor categories are customer, onstage personnel, backstage personnel and systems, support and management (Bitner et al., 2008).
<Action Flow>	Action Flow presents the sequence of actions by an actor (Milton & Johnson, 2012).
<Communication Flow>	Communication Flow presents the flow of communication between any actors in the service (Milton & Johnson, 2012).
<Line of Interaction>	Line of Interaction is an interface between customer and frontline employees (systems) (Bitner et al., 2008).
<Line of Interaction>	Line of Interaction is an interface between customer and frontline employees (systems) (Bitner et al., 2008).
<Line of Visibility>	Line of Visibility is an interface between onstage and backstage employees (systems) (Bitner et al., 2008).
<Line of Internal Interaction>	Line of Internal Interaction is an interface between backstage employees (systems) and support employees (systems) (Bitner et al., 2008).
<Line of Order Penetration>	Line of Order Penetration is an interface between customer induced actions and customer independent actions (Fließ & Kleinaltenkamp, 2004).

Table 2.2 Concepts in service blueprinting (Cont.)

Concept	Definitions
<Line of Implementation>	Line of Implementation is an interface between support employees (systems) and managerial actions (Bitner et al., 2008).
<Props and Physical Evidence>	Props and Physical Evidence are all the tangibles that customers see during the service process and influence the customer's perception of quality (Bitner et al., 2008).

2.7.3 Material Flow Analysis for food waste in restaurants

Applying the UNIDO Material Flow Analysis framework, to mapping food waste in restaurants, the first two steps are somewhat straightforward. The specific focus parameter, in this case, would be mapping food waste material flows, and the scope would be material flows specifically within the confines of a restaurant system (i.e. the food waste that occurs on-site, and not further up or down the food supply chain). There is, however, a need for a clear and consistent definition of "food waste" (European Commission, 2011). As for the following steps in the Material Flow A Analysis methodology, we would need to understand the food material flows within a restaurant system and how to quantify food waste in restaurants in order to develop indicators and benchmarks.

2.7.3.1 Process mapping and food waste source-points

When it comes to conducting an MFA, identifying the food material flows within a restaurant system, and the food waste source-points (and not just the amount of food waste produced overall) is extremely important. Waste prevention, by its very nature, means identifying the source and cause of food waste to prevent it from being produced. Food within a restaurant system follows a number of steps that can be divided into two main stages: pre-consumption and post-consumption. Pre-consumption is essential all the steps the food goes through before

it reaches the consumer (i.e. in the restaurant kitchen), including food inventory; preparation, processing and cooking; and serving the food. Post-consumption is everything that happens once the food arrives with the consumer, which naturally includes consumption. Food waste sources in restaurants can, therefore, be separated into pre-consumption and post-consumption food waste (LeanPath, undated). Pre-consumption food waste is all food waste that occurs in the hands of the employees and before the food arrives with the consumer. Pre- consumption food waste includes, for example, preparation waste, food spoiled in storage, spillages, and overcooked food. Post-consumption food waste, on the other hand, is all the waste that occurs once the customer has received the food, mainly food that is left behind on consumer plates.

Minimal academic studies have sought to map food material flows in restaurants and quantify the source of food waste in restaurant systems – i.e. whether more food waste occurs pre- or post-consumption. The general congruence appears to be that the majority of food waste in restaurants generally occurs in the kitchen through preparation. A UK study by the Sustainable Restaurant Association (SRA) sought to provide a snapshot of food waste produced in 10 different restaurants in the UK, along with the identified sources and causes (SRA, 2010). The research involved surveying 10 restaurants in the UK and asking them to separate and weigh their food waste over one day according to source, being (1) preparation waste and any food ruined in cooking, (2) food classified as spoilage (e.g. out-of-date and unused items), and (3) customer plate waste. The researchers also collected data on the number of people served on the day in question. The waste audit was followed up by a survey where the association asked participants on the possible causes of food waste in their restaurants and what they do to reduce food waste. The research found that the restaurants produced, on average 59.8 kg of food waste a day, or 0.48 kg of food as per customer served. Of this waste, 65 per cent came from preparation, 5 per cent was spoilage, and 30 per cent came from customer's plates showed in Figure 2.2.

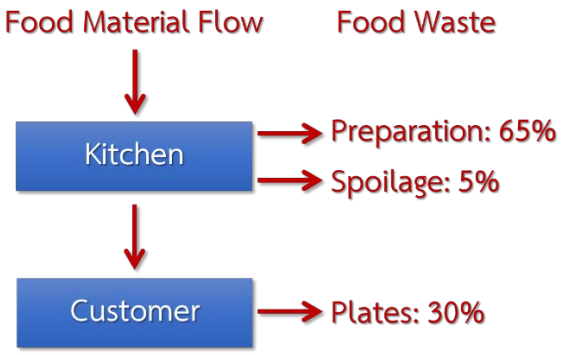

Figure 2.2 Material Flow Analysis for findings of sustainable restaurant association study

Source: Author's own illustration based on Sustainable Restaurant Association, findings., (2010)

Unilever Food Solutions also adopted the food waste source points that Sustainable Restaurant Association identified (being customer, kitchen and spoiled) in its guidelines on reducing food waste (Unilever Food Solutions, 2013). The Unilever guidelines suggest that restaurants follow the same approach used in the Sustainable Restaurant Association (SRA) study for measuring the quantity and source of food waste and thus assigning costs to food waste (Unilever Food Solutions, 2013). Unilever UK has also released a mobile phone application where enables restaurants to measure the quantity and source of food waste. Using this methodology and estimate how much money they could save if they reduced 20 per cent of all their food waste each year. While this is a useful methodology for identifying the source of food waste in restaurants, there are two significant limitations in using this methodology for Quick Service Restaurants. Firstly, it does not align with the UNFAO definitions of food waste, or global targets for reducing food waste, in that it considers both "avoidable" and "unavoidable" food waste as the same type of food waste. Costs are estimated based on all food waste, even though a proportion of food waste will always be unavoidable (also classified as inedible). Instead, the UNFAO and WRAP definitions of avoidability should be applied to any Material Flow Analysis, as per the recommendations by Norden (Nordic Council of Ministers, 2012). Secondly, and more

specifically for Quick Service Restaurants, it only looks at three steps along the restaurant food chain, as opposed to all potential steps involved in the pre- and post-consumption stages of food material flow in restaurants previously discussed.

In normal restaurants, for example, we would not expect much cooked food to be wasted because food is generally made to order. The majority of cooked food that's wasted will be plate waste rather than pre-consumption waste. Rather, pre-consumption food waste would relate to preparation food waste, or food that has been damaged or spoiled in storage (as in the Sustainable Restaurant Association and Unilever methodologies). Quick Service Restaurants, however, are characterised by their ability to serve people food quickly. As such, food is generally already cooked and ready to be served by the time it is ordered. We would therefore expect more food waste at the point between when the food is cooked and when the food is actually served due to cooked food "going off" or passing holding times specified in food health and safety guidelines before it can be served to customers on Figure 2.3.

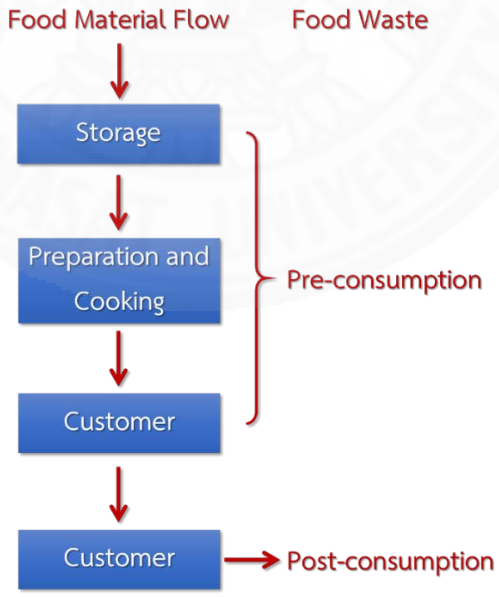

Figure 2.3 Material Flow Analysis and food waste source-point in quick service restaurants system

Additionally, in any restaurant system, it is important to understand whether food is wasted in the kitchen because it has spoiled in storage or for other reasons. If it spoils in storage, then measures would involve looking at the restaurant's storage system and methods.

The studies identified also have not gone further to identify actual food waste material flows from the point of food input – i.e. what proportion of food is actually consumed in a restaurant compared to the proportion of food wasted. This information is helpful to put the quantity of food waste produced in to context, and to fully understand the extent of the food waste problem. It would also be necessary to produce Sankey diagrams, which help paint a more comprehensive picture of the problem. Knowing how much food is wasted is only one part of the story; it is also helpful to know how much food is actually consumed in order to better understand the proportion of food wasted versus food consumed. Only a small number of studies have actually sought to estimate the proportion of food consumed versus the proportion of food waste in restaurants. A commonly referred to estimate (from a 2005 US study) is that fast food restaurants waste 9.6 per cent of food, while normal full service restaurants waste 3.11 per cent. The same study found that fast food restaurant losses vary greatly depending on the size of the chain. The large fast food chains have much lower loss rate (5-7 per cent) compared to small local chains where loss rate can be as high as 50 per cent (Jones, 2005).

Table 2.3 Cause of food waste in restaurant contexts

Pre-consumer	**Description**
Unidentified demand	forecast and predictive, understand the customers' preferences and other factors such as seasonality, weather patterns, and local competition is very needed.
Overstocking	Restaurant did not want to deny their customers that they cannot prepare an order, as a result, they end up preparing too much than they actually sell out.

Table 2.3 Cause of food waste in restaurant contexts (Cont.)

Pre-consumer	Description
Inefficient Production	To avoid creating an unwanted waste, they might offer a cook-to-order model or present their food in smaller containers and change the display.
Poor communicate	Communication is very significant on operating between the front and the back of the restaurant because when miscommunication happens, such as the language or culture shock or limited time, the physical layout of the operation.
Staff behaviour	if an ingredient requires four and a half kilograms of beef and the beef box just comes in 5 kilograms, the chef cannot separate the box and leave the rest unused but use up the whole package of meat.
Unskilled training	Staff members should acquire proper kitchen skills training and anticipate skills to produce food without generating so much waste.
Over-merchandising	Operators want their merchandising products to stay fresh, beautiful, and abundant on the shelves. Nevertheless, this can result in an redundant amount of products wasted by the end of the day
Food safety	Food with any issues regarding timing, temperature or taking care of should be discarded for the consumers' wellbeing reasons.
Freshness requirements	the Japanese restaurant will have no choice to throw away good food because of a freshness requirement because we serve fresh and raw like sashimi and sushi menu. Consumers have higher expectations of freshness and quality.

2.8 Conceptual framework

2.8.1 Type of food wasted

Food waste has been categorized into three forms, and this thesis was mainly focus on avoidable part in the independent Japanese restaurant where is food that for human consumption at the time before the expired date. And as we observe, salmon fish are the principal material of every Japanese restaurant in Thailand, and it was to the main ingredient for the variable cost of every restaurant. So we focus intensely on how we can manage salmon for use as much as possible.

Table 2.4 Type of food waste

Avoidable	– food that is appropriate for consumption at some time before the disposal
Possibly avoidable	– food that is eaten by part of the people and not ate by others (bread crust), or that is eatable when prepared in a certain way and not eatable when prepared in other ways (potato skins)
Unavoidable	– parts of food products that are inedible, or waste that originates from food preparation and that is not usually proper for human consumption (bones, tea bags, eggshells) This thesis will not determine unavoidable food waste explained above to be part of the food waste based on Bagherzadeh's definition since it does not fulfil the "edible parts" description. Thus, the concept of food waste used in this thesis will only include avoidable and possibly avoidable food waste.

2.8.2 Cause of food waste

Food waste occurs at different stages of the food chain from the farm to fork. It is impossible for a restaurant not to create any waste at all costs. But almost

part its values inside the kitchen in a part of pre-consumption. This thesis was going to adopt the Causes of pre-consumer and post-consumer food waste from Baldwin & Shakman to identify in five independent Japanese restaurants. But we add more and give significant on the freshness requirement because Japanese restaurant serves food as a raw in menu sashimi, sushi and some roll where this kind of menu is the traditional and unique part of every Japanese restaurant.

This thesis brings out the existing problem that stated in the above table to asking question to 5 cases study to find out insight by short cut way in independent Japanese restaurant context.

2.8.3 Impacts of food waste

Table 2.5 Impact of food waste

Environment impact	Managing food waste oppositely affects our climate change due to the greenhouse gas or GHGs that are emitted upon its decomposition, contaminates watercourses from nutrient and leachate runoff and can be a vector for diseases and a health hazard.
Financial consequences	The breakdown of waste-costs. It found that food procurement costs and man-hour (time spent preparing the food) accounted for the vast majority of the costs, at 52% and 37 %, respectively

This thesis aims to help the independent Japanese Restaurant gain more benefit both financial and non-financial, so we intend to use service design innovation to reduce food waste and turn into value form. This study will provide a measurement scale along with the guideline. Some impacts can not achieve immediately, but it takes time until we see a change in the long-term.

2.8.4 Framework in used

Table 2.6 Theory framework

Business Model Canvas (BMC)	Using Business model Canvas infrastructure (Key Resources, Key Activities and Key Partnership) as a hypothesis of this thesis to examine what is the key to reducing food waste in the independent Japanese restaurant.
Service Design Blueprint	To understand the business operation and pain point where Japanese restaurant faced and find out the adjustable blueprint to replace with the existing.
Material Flow Analysis	To investigate how they manage with salmon fish and how many per cent of waste they generate and how much it cost for the trash.

To summarize the scope of the thesis from literature, the writer using both service design blueprint and business model canvas to the exploration of food waste management in Independent Japanese Restaurants business. SDB is the first key analytical approach for studying business operation from back-end to front-end by wearing customer shoes. BMC to be applied to business practices by changing the BMC infrastructure of Key Resource, Key Activity and Key Partnership to reducing food waste generating in the kitchen. Furthermore, after we understand the business operation from SDB and discussion with the case through the BMC, we have set the conceptual framework for collecting data in the form and related. The key finding of this research study will be what is the key element to reducing food waste in the Independent Japanese Restaurants business.

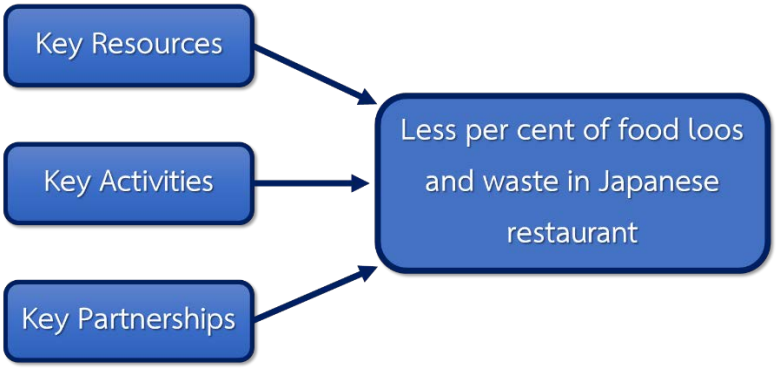

Figure 2.4 Framework

In the following parts of the thesis, we will state about methodology and method that be used in this thesis. Moreover, qualitative research and quantitative research will mention below. Step by step framework to be the use of collecting data and analyse data. Each framework will be explained clearly.

CHAPTER 3
RESEARCH METHODOLOGY

Research is something that is undertaken to find the answer to an issue systematically in order to increase knowledge (Saunders et al., 2012). Thus this is regarded as a research since the aim is to find out where is the key to reducing food waste in the independent Japanese restaurant Key Resources, Key Activities and Key Partnership and relationship within food waste reducing in the independent Japanese restaurant in Thailand. In research, it is essential to know the difference between method and methodology in order to explain the study and how it will be conducted. Methodology refers to the set of a theory of how the research will be undertaken; this includes research strategy, philosophy, approach and technique. The method is the set techniques and procedures in which the investigation will be conducted; in other words, it describes how data will be collected (Saunders et al., 2012). This research will use a qualitative method when conducting primary data because qualitative methods are particularly useful in researching the meaning that people give to events that they experience (Merriam, 1998). However, in order to fully understand the choice of method, the concepts concerning methodology will be further elaborated below.

3.1 Methodological procedures

In this section, we provide a detailed description of the three main steps taken in order to write the thesis. These three steps are (1) the research and writing of the literature review, (2) the data collection process, and finally (3) the data analysis. Figure 3.1 summarizes the main procedures within each step.

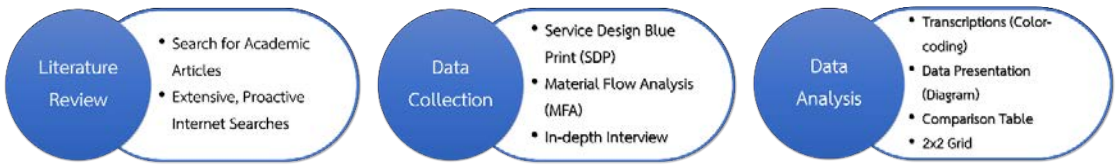

Figure 3.1 Methodological procedures diagram

3.2 Data collection

3.2.1 Primary Data

The approach of discovering primary data was conducted using the in-depth interview, and observation to be the primary source of data collection. The re0spondents were reached through 5 Japanese restaurants where each will be similar and can benchmark. By the study have set the criteria for selecting Japanese restaurant by;

1) The restaurant has to be independent or family-owned, not a franchise.
2) The staffs who work in the restaurant are between 5-7 people.
3) Salmon menu is based and has to cut fish by themselves.
4) Located in the Bangkok metropolitan region including Bangkok, Pathumthani, Nonthaburi and Samutprakan.

Furthermore, using the service design blueprint to be a primary tool use and Material Flow analysis to investigate the pain point of food waste problem inside the restaurant. And others design kits based on double diamond in the service design process. To ensure the reliability of research, we try to gather all insight from various stakeholder in the restaurant; Waiter, Cook, Dishwasher and the owner. Along the side, the investigation will evaluate the result by testing with the owner of an independent Japanese restaurant on how they think and possibilities to apply this guideline. At the end, this study will show as two by two grid of performance and feasibility. Making the review useful will collect data from another side of partnership from the restaurant supplier to evaluate and ideate the possibility of the guideline.

3.2.2 Secondary Data

Secondary data is collected in order to review what has already been stated within the academic research area and to renew the outcome of the research question (Saunders et al., 2012). The secondary research in this thesis was collected from online databases and literature found in connection to the Thammasat University Library. Learning on the process of collecting secondary data. The training was

scheduled with the subject librarian. This training gave the researchers insight on several other databases available through the Thammasat University Library website. Examples of databases accessed were ScienceDirect, Emerald insight and ResearchGate. In addition, to mention databases, Google Scholar was used to some scope together with relating subject books within the field of study. When searching for articles, journals or existing thesis with relation to this research the following keywords were used: Food waste, Food waste management, Restaurant, Business Model Canvas, Material Flow Analysis, Service Design Blueprint, Cause of food waste, In-depth interview, Impact of food waste, Thailand. At the beginning of the search example process, there was a lot of results found that unlikely was found irrelevant for this research topic we have set. This led the researchers to adjust and scope the keywords to be more specific within the research topic. To ensure the reliability of the articles, we only used peer-review articles in the research. To further ensure the reliability, the aim was only to include articles, which were highly cited since they are considered to be of a higher educational value — articles regarding restaurant food waste management, Business Model Canvas, Material Flow Analysis, and Service design blueprint.

3.3 Qualitative research

Qualitative research genres are essential for the studies of social sciences and applied fields such as education, regional planning, nursing, social work, community development, and management. (Marshall & Rossman, 2006) The purpose of qualitative research is “to explain and understand a phenomenon and give it a reasonable clarification” (Kananen, 2013).

Qualitative research is often used when there is no previous information, theories or research on the phenomenon, and the phenomenon is new as an aim and objective of the research (Kananen, 2013). Regarding the data, while quantitative research creates numbers to structured questions, qualitative research produces words

and sentences to survey questions to help the researcher gain an in-depth understanding of a phenomenon (Kananen, 2013).

Qualitative research is more flexible than quantitative research in the sense that the research results straight to the progress of the research. The clarification and findings are dependent on the researcher. However, this does not mean that the researcher can produce wrong results and clarification (Kananen, 2013).

This thesis aims for "in-depth understanding and description of a phenomenon". Qualitative research shares the same objective the difference lies in the scope and variety of a phenomenon in research methodology. More often than not, case research is described as intensive research or in-depth research (Kananen, 2013).

3.4 Data analysis and processing the data

3.4.1 In-depth interview

In order to identify all the food waste-reducing business practices, we needed a systematic method to process all of our data. Each step of this data analysis process is illustrated in Appendix D. Firstly; interviews were transcribed by using the recordings from the interview. Before all interviews started, we also made sure to get approval to use the company's and the interviewee's name as a source in the thesis. After transcribing the interviews, we needed to obtain a more detailed overview of what information we had collected. Here, we used a simple, but effective color-coding method, where each analysis element (e.g. key resources, partnerships, benefits and so on) was marked in a different color.

3.4.2 Service design blueprint

3.4.2.1 Find support or collaboration

First, pull together a multidisciplinary that has a role and responsibility for a part of the service and verify stakeholder support for the blueprinting initiative. Collaboration can be made from a manager, owners, or clients.

3.4.2.2 Define the goal

Choose a scenario and focus. Identify one scope and its corresponding customer. Decide how detail the blueprint will be, as well as which aim of research purpose.

3.4.2.3 Gather research

Unlike customer-journey mapping, where much external research is required, service blueprinting is contained of primarily internal research.

1) Gather customer research

Begin by collecting research that informs a baseline of customer actions

2) Gather internal research

Choose at least two research methods that put the researcher in direct line of observation with employees.

1. Employee interviews
2. Direct observation
3. Contextual inquiry
4. Diary studies

3.4.2.4 Map the blueprint

1) Set up

It is useful to create a short workshop session (2–4 hours) to do steps 4 and 5. The workshop helps create a shared understanding amongst researcher and restaurant working team to ensures that the blueprint remains collaborative and unbiased.

2) Map customer actions

In a service blueprint, customer actions are drafted in sequence, from beginning to finish. A customer-journey map is an ideal beginning point for this step. Do remind that a blueprint's focus is the staff or employee experience, not the customer's experience. Thus this section does not need to be a fully baked customer-journey map — instead, the researcher can include only the customer touchpoints and parallel actions.

3) Map employees' front-end and back-end actions

This step is the main of a service-blueprint mapping. It is easiest to start with front-end actions and move downward in back-end actions. Inputs should be collected from real employee accounts and validated through internal research.

4) Map support processes and evidence

Add the process line where employees interact with the customer. These processes are the interactions involving all employees in the restaurant, including those who don't show up directly with customers. These support processes need to show in order to deliver the service. These below-the-line interaction activities often impact service quality. Categorize in the evidence at each customer's action step. Do remember to add evidence that occurs front-end and back-end.

3.4.2.5 Refine and distribute

Refine by adding other contextual particular as needed. These particular include arrow, time, metrics, and regulations (rely on Service Blueprints Definition for a full list). This blueprint is a tool that will help the researcher communicate his understanding of the internal operation processes engagingly.

3.4.3 Material flow analysis (MFA)

Material Flow Analysis is a systematic method aiming at

1) Showing an overview of the materials used in a organization.
2) Identifying the spot of origin, the volumes as well as the causes of food waste.
3) Forecast future development by creating a basis for evaluation.
4) Defining strategies to improve the overall food waste situation.

And to complete material flow analysis contains six steps.

3.4.3.1 Defining parameters

One of the purposes of material flow analysis is to go back interesting flows of raw material through the restaurant with regard to criteria of costs and volumes. It is needed to decide from the starting. The way of defining the objective

is to start with a material flow analysis of the restaurant; we should ask them to answers the following questions:

A: What materials are used in the restaurant?

B: How many kilograms you need a week?

C: How much it cost?

D: What quantities of food waste are disposed of at the end of the production process?

3.4.3.2 The balance scope

The balance scope can either contain the restaurant as a whole or be limited to individual production. This thesis wants to focus only on a salmon fish production where it was the main cause of food waste and very significant on economic value.

3.4.3.3 The balance period

Selecting a specific time span as the balance period has proved successful. The researcher chooses to go collect data on the date that the fish supplier sent raw material to the case study restaurants.

3.4.3.4 Identifying and defining production steps

Listing processes and procedures of a restaurant; what they do and how they did it as a step by step.

3.4.3.5 Drawing the flowchart

All processes are divided as steps and represented in the form of a flowchart. This flowchart should be relied either on activities and equipment, on production units. As graphical elements, rectangles are used to indicate production steps and arrows for material flows.

3.4.3.6 Flowcharts illustrate the production process

All relevant data on material flows are illustrated in the flowchart and all important data of process steps or equipment such as technique, temperature and time have to be noted. These flowcharts can be utilized to draw up a waste management plan.

3.5 Ethical considerations

Although anonymity and confidentiality is an important issue when conducting a research thesis, this was not a concern in this thesis. We asked all participants for approval to use their name, title and the name of their restaurant as sources of our findings, and all participant gave us this approval. Furthermore, as the researcher was not collecting any personal information, also not faced with any restrictions regarding data collection and data presentation. However, the project is still approved by Thammasat University, it is most desirable not to keep interview objects, and cases study restaurant anonymously, so this was also beneficial for the quality of the research.

A second ethical issue to consider is the accuracy in data collection and presentation. We have proactively worked to avoid these problems. By collecting data from several sources, and adding to the appendix. The interview guides, interview transcripts and an example of how we coded the interview are available on the appendix. Additionally, with a table of findings, illustrating Material Flow analysis chart and Service Design blueprint.

CHAPTER 4
RESULTS AND DISCUSSIONS

In the following five sections, we present our analysis and findings. Firstly, we present the case study overview to introduce the five case study we has been selected to study as a sample size. Secondly, we present the Service Design blueprint, where we identify the cause of food waste in the restaurant operation. These sections were collecting data on January 2020 at the weekend operation of the restaurant. Thirdly, we present the Material Flow Analysis of five case study to see how different each case. This section will surely show the data of waste percentage and production step of restaurant operation. Fourthly, we present the business practices that we identified in the interviews and document analysis. In total, X food waste-reducing business practices are compiled in an informative table, based on the toolbox, we have set hypothesis Key Resource, Key Activities and Key Partnership. This toolbox aims to engage in food waste-reduction in the independent Japanese food restaurant in Thailand. This table, called Business Practice Guideline. Lastly, we discuss what financial and non-financial benefits can be seen when adopting these business practices. The aim is that these benefits incentivize businesses to change towards food waste-reducing business models.

4.1 Case study overview

Figure 4.1 Shuriken by Sonie restaurant overview

4.1.1 Shuriken by Sonie

Shuriken by Sonie has been a fusion Japanese restaurant for 20 years, and it was located at Sukhumvit 31 and had changed their location for four times but still have an old customer coming in and follow him. Nowadays, Shuriken by Sonie has been now located at Phaholyothin 8 near Paolo hospital with the same old style of Japanese fusion. This restaurant has a various menu both cook and fresh meal. The researcher talked with the manager of this restaurant, and the purpose of us was the same. They aim to achieve to reduce food waste in their restaurant in order to increase benefit. So it was the same goal of the researcher, and we have contact to work together. Shuriken by Sonie has been approved from the control variable that the restaurant should be an independent restaurant, and salmon menu was based, working team or staff 5-7 people.

Figure 4.2 Kin Hashi restaurant overview

4.1.2 Kin Hashi

Kin Hashi was famous among Thammasat University Rangsit students. The researcher has been there for four years. This restaurant outlook was so simple, but the quality and price were impressed by every customer. Kin Hashi was the restaurant where roll and sushi menu very popular. The chef had been working in the USA for ten years and move back and working in the 5-star hotel. And he decides to open his restaurant at Thammasat University at the first idea to offer students a high

quality and reasonable price for them. This restaurant was selected to be one of five case study because of it under thesis control variable and after researcher talked with the owner. He aims in the same direction as us, and he would love to share and adapt every recommendation. Kin Hashi has been approved from the control variable that the restaurant should be an independent restaurant, and salmon menu was based, working team or staff 5-7 people.

Figure 4.3 Ryuho restaurant overview

4.1.3 Ryuho

Ryuho was a family-owned restaurant where had know-how on doing restaurant business from his father for 58 years. This restaurant was opened in December 2019 at the aim to offer high quality with reasonable price to the customer in the Rama 2 area. There is a Japanese traditional style chef, but the menu still modern and fusion with the owner vision. The chef had been experiencing from Japanese for 20 years, and he came back to help the owner to operate this restaurant. The restaurant had a beautiful view from Rama2 road and have the frequency customer coming to try. The owner vision was open wide, and the researcher talked to them on food waste visionary. This restaurant was doing many existing ways to keep a percentage of food waste lower by giving to staff worker to eat or even set free as complimentary to the customer. And this was truly one of five restaurants we are looking for. Ryuho has been approved from the control variable that the restaurant

should be an independent restaurant, and the salmon menu was based, working team or staff 5-7 people.

Figure 4.4 Blue Ocean Sushi restaurant overview

4.1.4 Blue Ocean Sushi

Blue Ocean Sushi was one restaurant in Mega Bangna department store. This restaurant had adapted the recipe from Missouri, USA. The core value of this restaurant is to create a fusion between Japanese and western country. So the menu was created by chef and only available in here. The researcher talks to the owner and manager; they are agreed with us that reducing food waste is one of the critical success factors in the restaurant business because all food waste that we throw away is our cost. So, the vision of us was the same, and we agree to achieve this goal. They decide to be a part of this thesis, and Blue Ocean Sushi has been approved from the control variable that the restaurant should be an independent restaurant, and the salmon menu was based, working team or staff 5-7 people.

4.1.5 Sugoi Express

Sugoi Express is a restaurant that located inside Police General Hospital where the primary customer is patients and workers; Due to restaurant location, this place is concern much on the heath of customer who comes to eat. So the restaurant concern so much on Hygiene of food. So, food waste is also generated in here because they need to serve fresh food to the customer. The researcher talks

to the restaurant owner and chef, and they agreed on this thesis purpose to reduce food waste in the restaurant and provide both financial benefit and non-financial benefit of the restaurant. Sugoi Express has been approved from the control variable that the restaurant should be an independent restaurant, and the salmon menu was based, working team or staff 5-7 people.

Figure 4.5 Sugoi express restaurant overview

4.2 Service design blueprint

4.2.1 Shuriken by Sonie

Wearing shoes of the real customer of Shuriken by Sonie, it impressed me from the first step-in to the catering zone. The research was taken on 4 February 2020 at the restaurant at 12.30 - 2.00 pm. These times were crowded with office workers who work nearby to get lunch at this restaurant. The staff are nice and active to introduce recommend menu for us. Only got trouble on lunch traffic from office workers who are coming quite a lot number at the same time. It takes longer than before preparing the food from the kitchen. Its so loud when full of the customer inside the restaurant. However, the waiter taking care of us non-deficiency of recommending and introducing food menu. The service operation is very pleasant and comfortably at the same time. Mood and tone of customer experience were impressive, keeping us happy all along the process of being a customer. As a customer

interview, only food delayed due to lunchtime is a bad experience for retrieving restaurant service operation. The food quality was impressive due to the price and the location of the restaurant. Something still needs to improve from customer feedback is about Not attractive menu, Not clear picture and description, and the price after VAT and Service Charge still high with some customer. The promotion was quite reasonable for the office worker who wants to get a big meal where this restaurant serves as a Bento Lunch set that includes three side dish and one main course together in the boxes. So, overall of this restaurant quite impressive we score this at 9/10 by giving a word of Best roll in town as a recommendation for the next customer who came here.

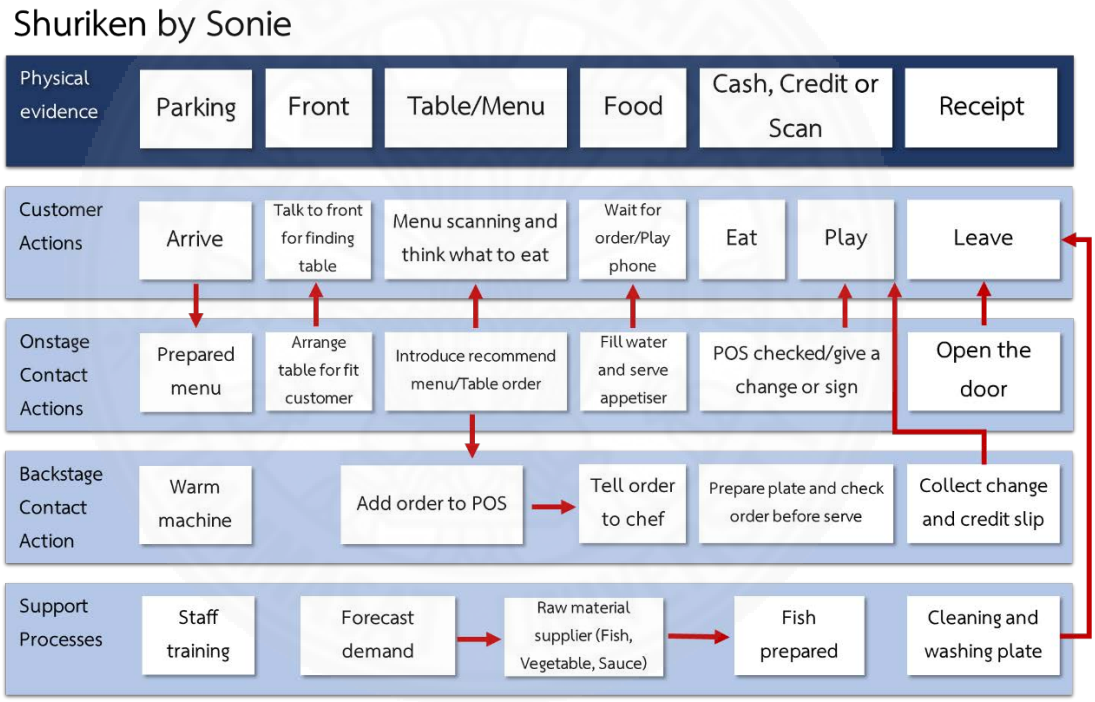

Figure 4.6 Service design blueprint of Shuriken by Sonie

Table 4.1 Customer pains and gains of Shuriken by Sonie

Pains	Gains
Not attractive menu to order	Recommendation of menu
Not clear picture on menu	Chef choice menu was so good
Unclear description	Comfortable and modern restaurant

Table 4.1 Customer pains and gains of Shuriken by Sonie (Cont.)

Is it too expensive?	Nice service
	Ask to add more favorite ingredient to order
	Explanation of menu with taste and texture

4.2.1.1 Material flow analysis

To briefly understand this restaurant on service operation, the flow was on high standard and high quality food serve. But, in term of front house operation it does not appear food waste behaviour on front house operation only appear a leftover food from customer side. That we not focus on this part. So dig down on back-end operation were discuss in the next paragraph.

Talking about fish management, Shuriken by Sonie use Food Project as a main fish supplier where sent the material 2 time per week on Tuesday and Friday at 2 pm. The order was minimum of 4 fish a week. The order was separate on two kind of fish (1) Fresh fish (2) Freeze Fish. The different kind of fish was used in the different kind of food. The fresh one going to use a main source for raw menu like sashimi, roll and sushi and located in the cold kitchen of the restaurant. The freeze fish will use as main source on hot kitchen where serve cook menu only. To separate this it has two reasons (1) Different menu use the different cut to manage material. (2) Reduce cost of fresh material because it the same taste if we use fresh fish to serve cook menu. Using freeze option save cost on fish material and help restaurant to manage fish easier.

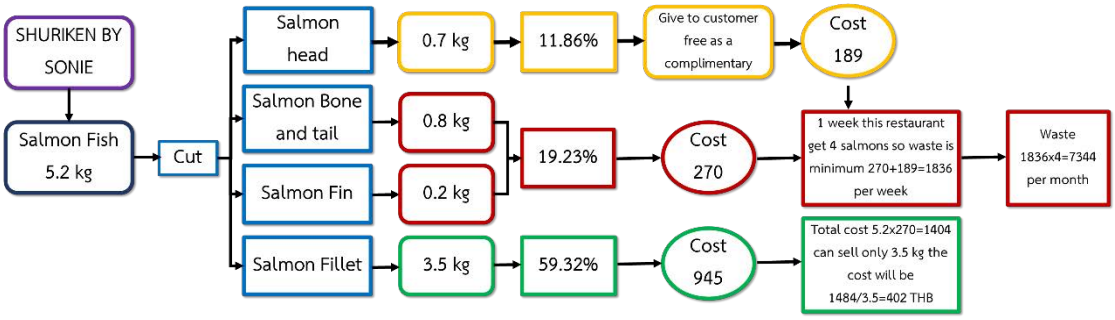

Figure 4.7 Material flow analysis of Shuriken by Sonie

4.2.1.2 Fish journey

The chef will cut the fish at the date arrival at the lunch break time. Chef trow Salmon bone, tail and Fin away because he does not use in any menu. Chef keep only salmon head, salmon fillet and salmon skin and bring it into freezer for 1 day to keep it fresh and ready to use in the next day. They apply the same thing with two kind of fish only how they cut it the different. For the freeze on they cut it by big piece that serve in Bento menu. But the fresh one they cut it by top fillet and bottom fillet by the top will use for sashimi and the bottom use for roll because it less fat in the fish.

4.2.1.3 Price calculation

Fish price assumption around 270 +/- 40 THB based on time period of fish supplier from Norway. So, in this calculation we set 270 as a price assumption to easy and maintain to calculate waste cost.

Fresh salmon was measure at weight 5.2 kg by 0.7 kg was Salmon head, 0.8 kg was salmon bone&tail and 3.5 kg was salmon fillet&skin. Total fish was use count at 3.5/5.2 x 100 = 67.30% of fish can use from 100% of fish brought. Total waste 0.8+0.2+0.7/5.2 x 100 = 32.69% of fish can not sell and this part consider as a restaurant cost at 1.7kg x 270 = 459 THB per one fish but this restaurant use at least 4 fish per week that means in 1 month 459x4 for 1 week x4 for a month this restaurant will waste at least 7344 THB and if those week were order more than 4 fish will cost more cost of material.

4.2.1.4 Interview highlight

After the researcher know the restaurant operation as a customer side and already understand material flow analysis of the restaurant. The interview were started by asking question set from interview guide that appear at the appendix X. And mainly to focus on business model canvas of adjusting where important to change customer. The interview are discuss on Key Resource, Key Activity and Key partnership that which one are key to reduce food waste in the restaurant operation.

1) **What your opinion about food waste?**

"From my experience, I thought food waste happen from demand and supply. Look at the detail, we all know that we should provide raw material at this portion but what we do to bring customer to come. Is our promotion can convert the customer to come and have a meal here or not? If I can make that it will be no food waste."

2) **How they calculate how much to inventory?**

"Our restaurant has a checklist to check inventory. The supplier will come almost every day, but it a different source that comes. So, we will checklist the number need and send to sale person week by week. We set this list as a default standard require to run our restaurant, but if we need more, we will call sale person later."

3) **How many salmon fish coming in a week?**

"The fish supplier will come on Tuesday and Friday every week. And we set minimum order of 2 fished a time so one week we use at least four fishes. If we need more, we have to tell sale person before one week, but usually, it works at four fishes a week."

4) **Key to reduce food waste from your opinion? Key resource?**

"For Key resource, I was thinking about the chef who mainly plays as the main actor in the kitchen. I think this part also significant, chef skill will be helpful about managing fish and technique to achieve it. Our restaurant, a chef is one

of partner he did like the family business he took care of work and very concern about the cost of the material. So this point I thought I not much effect on food waste in my side because we can control chef to do their best of managing raw material."

5) Key activity?

"For Key Activity, I think it was the main part of reducing food waste. So, this part is like a question for our restaurant. Did we do enough on promoting restaurant to get customer get in?, did our inventory management is worked to manage all raw material?. The number of food waste it reflects restaurant operation and cost. So, if we can control our activity, it can lead to food waste reducing."

6) Key partnership?

"For Key Partnership, this is something we can control because if we arrange them to come frequency, we still get fresh raw material every time. And the partnership we selected, it all guarantee of freshness resource to produce a meal for the customer. But I think it would be nice if food supplier will collect some part we did not use back like salmon bone or even salmon head. It will successfully to help us food waste reducing."

4.2.2 Kin Hashi

There researcher and the gang has been this restaurant since Junior year on undergrad degree. The experience was all the same but this time we aim to go to experience at lunch time where the research was conduct on 12.00-14.00 on the afternoon.

The staff already remember me as a frequency customer they know what we would like to eat as usual but this time as a research we pretend to let them recommend the menu for us. The staff did well on introducing new menu of restaurant and also tell us to try lunch buffet which is new thing in this restaurant. So, we decide to order 2 main course 1 bento and 1 roll and it complimentary free miso soup. The overall experience was impressive every time. This time chef adds something special as a chef choice section on bento set. It was good to try the new combination of eating experience by chef let us try. The experience is very satisfy by keeping customer in the mood and tone of happy through restaurant service experience. So, the overall of

this restaurant are good the researcher can defined this place in three word friendly, quality and reasonable price. We give 8/10 from expericing this restaurant as a customer.

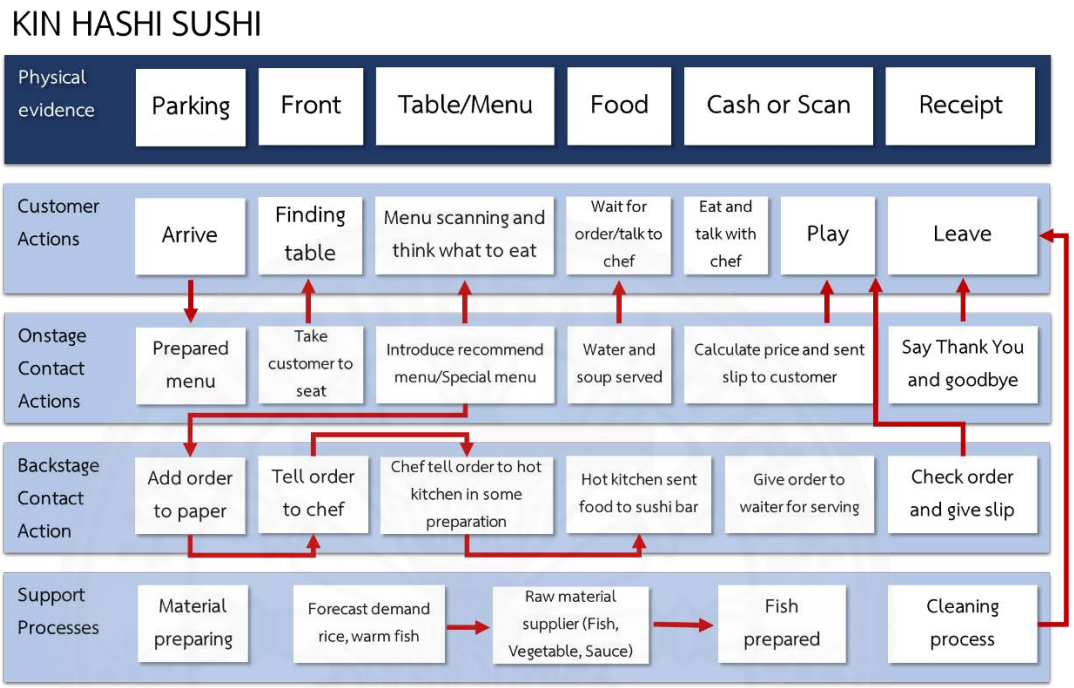

Figure 4.8 Service design blueprint of Kin Hashi sushi

Table 4.2 Customer pains and gains of Kin Hashi sushi

Pains	Gains
2 pages of menu without description	Chef cook sushi in front of us
Plate decoration is too normal	Worst it with price and quality
Is that so long for waiting	Cooking sound salmon burn
Don't think it so delicious at first	Warm welcome
Restaurant decoration is not nice	Friendly staff
	Reasonable price

4.2.2.1 Material flow analysis

To briefly understand this restaurant on service operation, the service flow was smooth due to a family business run. Giving family be liked mood and tone was very successful on atmosphere of the restaurant. The chef is very talent to show skill and alway ad something special in detail to customer. And this make the service of the restaurant outstanding and unique. At the front house we did not see any food waste behaviour from chef only found leftover food that caused bt customer who come to use this restaurant service. So, we came back at the back-end operation time to see how they waste and flow the fish material inside the restaurant.

This restaurant located in the area of Pathumthani where nearby also has others Japanese restaurant in the same route. Main fish supplier that be used is Food project co.tld and second choice was a Makro to support material source of the restaurant operation. The material was sent at least 2 time per week Tuesday and Friday at 11.00 am and they cut it at the date arrival. This restaurant use only fresh salmon grade does not use the freeze one. They said they had their own secret source if use the freeze one might affect the taste of fish that is very priority concern of their restaurant.

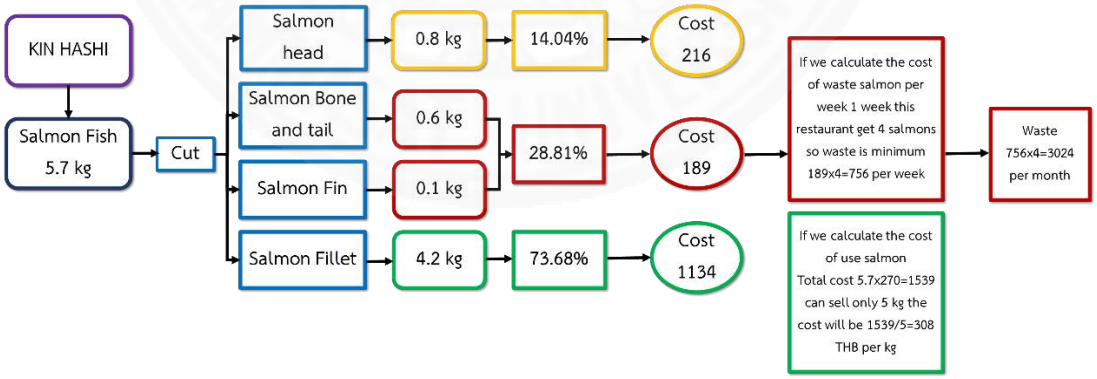

Figure 4.9 Material flow analysis of Kin Hashi sushi

4.2.2.2 Fish journey

After they close lunch time there will have a meal first and staring cut fish after that. So, this restaurant uses at least 2 fish at least per time that

mean in one week they use 4 fish as a minimum order. So, chef was scape off the fish scale and starting cut it as right and left side. They bring out all bone inside the fish meat and seperate it into four part (two top and two bottom). Chef clean it and wrap with the plastic seal and they keep it for 2 day before use it. They said it was a technique of cleaning fist to be tasty and still good quality. The top part there bring it to use in Sushi, sashimi and roll menu and the bottom part they cut it as a fillet and serve in Bento menu on lunch set or big meal in dinner time.

4.2.2.3 Price calculation

Fish price assumption around 270 +/- 40 THB based on time period of fish supplier from Norway. So in this calculation we set 270 as a price assumption to get easier and maintain to calculate waste cost.

Fresh salmon was measure at weight 5.7 kg by 0.8 kg was Salmon head, 0.7 kg was salmon bone&tail and 4.2 kg was salmon fillet&skin. Total fish was use count at 4.2/5.7 x 100 = 73.68% of fish can use from 100% of fish brought. But this restaurant also sell salmon head in menu that mean 0.8/5.7 x 100 =14.04% the total use will be 87.72 of total number. Total waste 0.7/5.7 x 100 = 12.28% of fish can not sell and this part consider as a restaurant cost at 0.7kg x 270 = 189 THB per one fish but this restaurant use at least 4 fish per week that means in 1 month 189x4 for 1 week x4 for a month this restaurant will waste at least 3,024 THB and if those week were order more than 4 fish will cost more cost of material.

4.2.2.4 Interview highlight

1) What your opinion about food waste?

“Food waste was being the restaurant cost, reducing food waste like lowering cost. In this restaurant, Chef is the one who concerns and care on food waste; he tries his best to use every part of salmon fish. He creates a menu that demands many parts and that kind of menu salmon skin, and Salmon head shoe is our recommendation menu from Chef's secret recipe.”

2) How they calculate how much to inventory?

“We always check the list of minimum material in our restaurant. And we order as a default of minimum. But if it not enough we going to

find out a way to find fish such as check with another source. Usually, we never short of inventory just sometimes the fish that we made it not ready to use and we still need to bring it out."

3) How many salmon fish coming in a week?

"For salmon, we order a minimum of 5 fishes per week divide into 2 on Tuesday, 2 on Friday and 1 on Saturday. But if we need more, we can order, and he can come and sent every day because around here there have others restaurant who use the same source. And we are going to cut at the date arrival."

4) Key to reduce food waste from your opinion? Key resource?

"For Key Resource, we think it the most important part to key reducing food waste. Our Chef taking care and give detail on overall salmon fish. He want to bring out every part to create a menu. Once he used to made a teriyaki sauce by using the salmon bone as a ingredient. But we not do that anymore because it take time but if it no people conming we will do it again. So we think that Chef skill are need as a key resource to manage fish."

5) Key activity?

"For Key Activity, this restaurant open lunch and dinner time. We have the time to manage and prepare raw material. We think this part helps us to operate a restaurant easier. Our restaurant uses lunchtime to promote buffet menu which contains a specific time for the customer, and we can bring out the material to make a value of the order and serve it in a buffet. And at dinner time we open for alar-cart, so this is going to have time to prepare and bring out fresh and ready to use for serving the customer as a premium. In conclusion, the buffet is one of the keys that help us release raw material."

6) Key partnership?

"For Key Partnership, our restaurant has a 2 main supplier where they can come every day if we need fish or other raw material. So, the supplier is another help us to less concern about short material. We just order for the minimum if it required just call sale person will get the material at next round. But the bad thing

is if we can not sell out the old one we need to tell him one week at least that impossible. So, this part does not help if it can not sell but helpful if materials were short.”

4.2.3 RYUHO

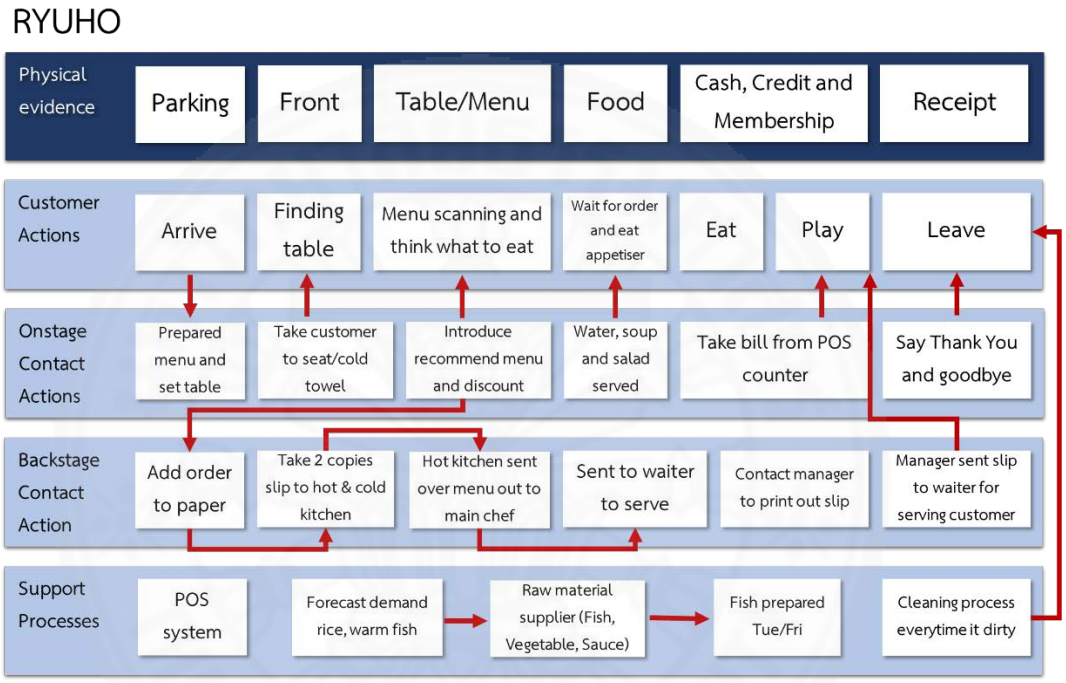

Figure 4.10 Service design blueprint of Ryuho sushi

RYUHO sushi was a stand alone restaurant with their own parking lot. This restaurant is one of family-run the same owner with Long Hong the famous Chinese restaurant in Thailand. Experiencing RYUHO sushi make us feel the professional of restaurant as a service provider. The researcher was be there at 13.00 in the afternoon for lunch and at the time arriving only few customers left from the lunch time. So, we can get the food very quick and full operating from staff and recommendation of each menu. They provide us a hot towel for clean our hand and make us refresh before eating that quite impressive and traditional Japanese style.

The restaurant decoration are modern but styling of food and menu list are traditional dish from Japan. The customer journey map keeping us in the good

mood while eating time. The chef was come out and introduce the signature way to eat his food to make better experience and tasty with the design chef has been setting up. So we order a big set of sashimi and 1 set of sushi that are chef choice menu. It come a big portion with a various type of fresh sashimi. So, the overall of this restaurant are good and high standard service. the researcher can defined this place in three word Comfortably, Traditional Japanese style and lot of promotion. We give 8.5/10 from expericing this restaurant as a customer.

Table 4.3 Customer pains and gains of Ryoho sushi

Pains	Gains
So plain restaurant and decoration	Talking with the owner and let him recommend menu for us
A little bit too far location	Reasonable price with promotion
Feel normal not to attractive	TV show of presenting this restaurant
Explaination of menu with taste and texture staff ask chef to explain	Take a photo because it so big portion and thick cut
Cooking sound	

4.2.3.1 Material flow analysis

To briefly understand this restaurant on service operation, the service flow was high standard from 7 decades of experience restaurant business. The front-end operation are very satisfy to customer. Their are run the restaurant by 7 people with their own duty and work along together. The chef experience are from traditional Japanese for 10 year in Japan. And he move to be one of a part of this family-business to create and design the menu together with the owner. We did not see much food wasting behaviour from the front house operation. Only leftover has been seen from customer behaviour. The reason is from big portion that menu quite

not show up how big it was from the picture. So, we do more interview to collecting data from the back-end operation of the restaurant.

This restaurant located in the area of Rama2 where are in the south part of Bangkok. They use two main fish supplier form Food Project and Panfood company who provide fish material for them. The material was sent 2 times per week Tuesday and Friday and minimum order of 2 fish a times. This restaurant use the fresh salmon grade only and they cut it at the date arrival. They said they has a very unique technique from Japan on how they keep fresh salmon for serving in the whole weekday and weekend.

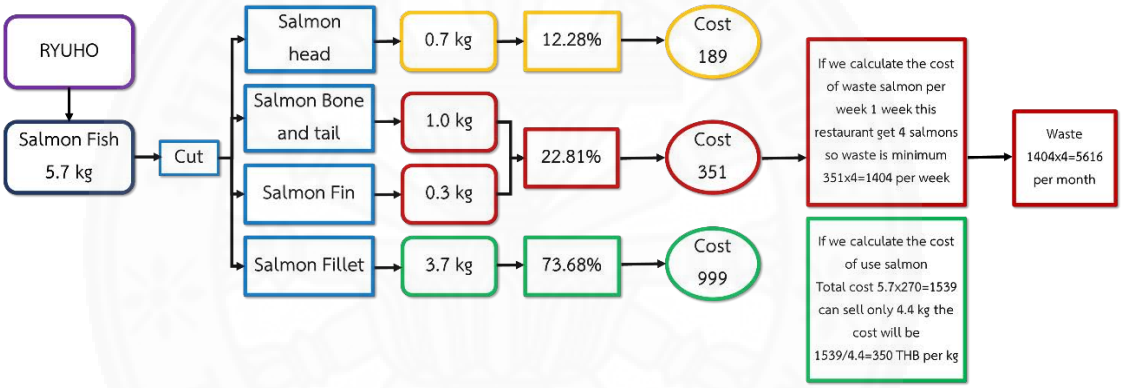

Figure 4.11 Material flow analysis of Ryuho sushi

4.2.3.2 Fish journey

At the time after 14.00 the customer are less coming in this time. The restaurant still open and everyone in the shop are working with cleaning and preparing material at the back of the house. They start clean fish by scratch the fish scale and bring it to the big table at the back. They start cut it as left and right side but try to bring out all bone out out the fish meat. So they cut it in to 4 pieces and wrap for keep in refrigerator. The secret sauce are here that they have 4 cool zone for these sfrsh material. They have very freezer where temperature are around -10 c for keeping beef, chicken and other type of fish food except fish. The use -5c cool zone for keeping fish that already cut for 1 day because -5c are the same temperature in the sea that salmon has living before. And after one day. Chef bring out the fish and

keep it in the cool zone of 5 c for chilling before use it at the time needed. And the last zone are for the fresh fruit and vegetable that separate for chilling and deep it fresh as long as possible.

4.2.3.3 Price calculation

Fish price assumption around 270 +/- 40 THB based on time period of fish supplier from Norway. So in this calculation we set 270 as a price assumption to get easier and maintain to calculate waste cost.

Fresh salmon was measure at weight 5.7 kg by 0.7 kg was Salmon head, 1.3 kg was salmon bone&tail and 3.7 kg was salmon fillet&skin. Total fish was use count at 3.7/5.7 x 100 = 64.91% of fish can use from 100% of fish brought. But this restaurant also sell salmon head in menu that mean 0.7/5.7 x 100 =12.28% the total use will be 77.19% of total number. Total waste 1.3/5.7 x 100 = 22.81% of fish can not sell and this part consider as a restaurant cost at 1.3kg x 270 = 351THB per one fish but this restaurant use at least 4 fish per week that means in 1 month 351x4 for 1 week x4 for a month this restaurant will waste at least 5,616 THB and if those week were order more than 4 fish will cost more cost of material.

4.2.3.4 Interview highlight

1) What your opinion about food waste?

“In my opinion, I feel guilty about food waste, but I still give flexibility to our crew. It's too stress to force them not to waste any source, but if you have time enough, I will tell him please taking care of detail. And something if we waste it maybe it help crew to operate thing easier. I don't want to be a piggy boss to every detail on every part.”

2) How they calculate how much to inventory?

“Using experience to think about how much to inventory. But we have a minimum order due to the minimum revenue that we use to operate this restaurant. And the weekend and weekday are different volumes because sometimes we got x4 revenue from the weekend customer that what we concern to order more on the weekend and less on a weekday.”

3) How many salmon fish coming in a week?

We usually order at least 6 fishes a week coming on Tuesday 2 and Friday 4. If the date that fish come still has enough, we will not cut we going to freeze fish at -5 c to keep it like ocean temperature. And when we bring out nee to chill on ice and cut it as a part.

4) Key to reduce food waste from your opinion? Key resource?

For Key Resource, we think it the most important part of reducing food waste. The manager is not on role and checking crew every time. But it was about staff volunteer to take it seriously on food waste generation. I think our restaurant has done a good promotion of an excellent menu to lead a customer to come in, but inside operation, we can not tell all crew always to follow the rule. Human error is the key to reducing food waste.

5) Key activity?

For Key Activity, we sure that our restaurant name can lead the customer to come in. And also our machine, inventory management is good enough to operate all raw material. We mostly give free complimentary to the customer if we consider the material it almost expired. And we do have a technique to cook if as serve as a menu for free. So this part is not a concern point in our restaurant.

6) Key partnership?

For Key Partnership, we have been doing a restaurant business for 58 years. So, we and food supplier are closed to working together. Our restaurant had more than 6 lists of the supplier where we selected from price and quality. And the supplier can come every time we call, but we set a standard of two times per week. And this helps us on when we short of material.

4.2.4 BLUE OCEAN SUSHI

The researcher has been walk pass this restaurant many time but never tried it before. So, this will be the first time for visiting and experiencing restaurant service. We went there at 15.00 pm before dinner time for avoiding traffic from dinner in order to have a short interview with them. This restaurant located at

Mega Bangna Shopping centre in Samutprakran with connect to Bangkok not too far away.

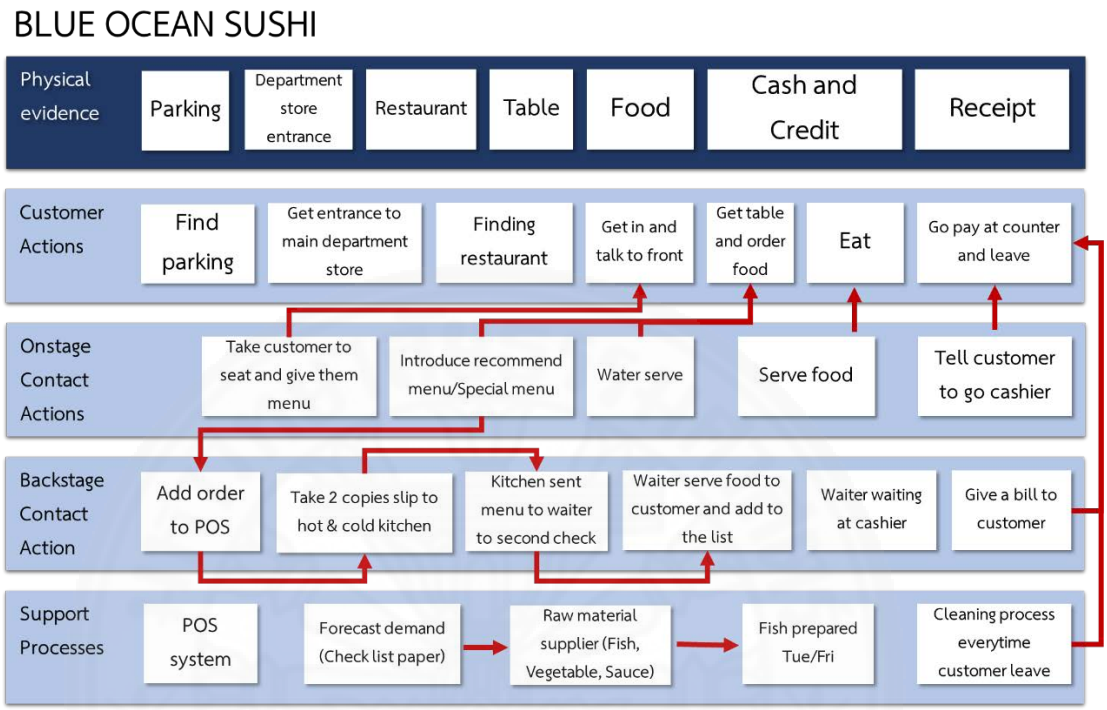

Figure 4.12 Service design blueprint of Blue Ocean sushi

Mega Bangna consider as the biggest department store in Thailand. It's full of restaurant, Brand, fresh market and more. Even big furniture brand like IKEA also locate inside this department store.

This restaurant has both buffet and alarcate menu with the western fusion style. We order an alarcate menu with wide type of food sashimi, sushi, spicy salad, and bento set. The taste was good, but the outlook of food was normal not to attractive and instagramable. We can not deny that one factor that ring new customer to come and try restaurant is a social media. So, the plate decoration not impress to customer they will not share this experience with anyone that mean it can lead to customer satisfaction of being served. So, the overall of this restaurant are good but still need to improve on plate design and menu picture to make it more luxury and classy as it competitor. the researcher can defined this place in three word Reasonable

price, Easy access, and unique style. We give 6.5/10 from expericing this restaurant as a customer.

Table 4.4 Customer pains and gains of Blue Ocean sushi

Pains	Gains
Food is too various choice so we take a photo how much we eat today	Ask for check in promotion
Too much choice of menu	Staff talking with check list menu
Cooking sound, Plate sound	Other customer ask waither to take photo
Plate was not well decoration	
A little bit too hot inside	
The menu not look attractive	
Do the table is to small for all order we have made	

4.2.4.1 Material flow analysis

To briefly understand this restaurant on service operation, the service flow was smooth due to has multi-function of worker work together. The menu that serve from cold-kitchen pretty fast. The front-end operation are chill but productive. But the thing need to change very qiuck is the outlook of food so if there can close this gap it will help restaurant get more new comer customer come in and try their food. The food was wonderful with the taste and material quality. We did not see much food wasting behaviour from the front house operation from the service provider side. But in-term of customer behaviour we have sitting their for 3 hours to see reaction of customer found that the buffet cause a lot leftover food on plates. So that might affect on restaurant operation or promotion that lead to food wasting

behaviour. And we must research more on the back-end operation to see more food waste in the kitchen.

This restaurant located in the area of Samutprakran where inside the biggest shopping mall in Thailand. So that mean there are many restaurants that located next to them and it easy for getting fresh material almost everyday because to much demand the supplier will provide full service for 7 days a week. This restaurant has supplier around 4 suppliers. They said easy to manage and compare the price and if we need emergency material, they will provide for us as soon as possible.

The material was sent at least 2 time per week Tuesday and Friday at 10.00 am before the shop are open. But they did not cut it at date arrival they will check inventory first before cut it. This restaurant use only fresh salmon grade does not use the freeze one. And these restaurant has no technique on keeping material as a freeze they jest bring out from freeze to chill and use it when fish is ready.

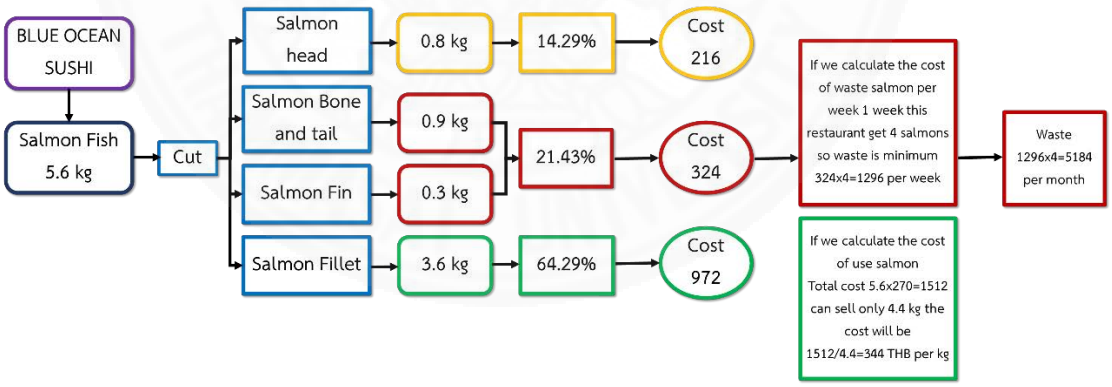

Figure 4.13 Material flow analysis of Blue Ocean sushi

4.2.4.2 Fish journey

At the time after 15.00 the customer are less coming in this time. The restaurant still open and everyone in the shop are working with cleaning and preparing material at the back of the house. They start clean fish by scratch the fish scale and bring it to the big table at the front line of chef operating. They bring out all

bone inside the fish meat and separate it into four part (two top and two bottom). And bring head to clean again ant striating cook the Salmon Head shoe and the they bring only the part that use now to prepare and wrap by portion and the rest keep it in refrigerator. No special technique apply on this. They keep the fresh of salmon by freeze and chill zone. Manager are the one who decide how much fish should bring out for chill in the day.

4.2.4.3 Price calculation

Fish price assumption around 270 +/- 40 THB based on time period of fish supplier from Norway. So in this calculation we set 270 as a price assumption to get easier and maintain to calculate waste cost.

Fresh salmon was measure at weight 5.6 kg by 0.8 kg was Salmon head, 1.2 kg was salmon bone&tail and 3.6 kg was salmon fillet&skin. Total fish was use count at 3.6/5.6 x 100 = 64.29% of fish can use from 100% of fish brought. But this restaurant also sell salmon head in menu that mean 0.8/5.6 x 100 =14.28% the total use will be 78.57% of total number. Total waste 1.2/5.6 x 100 = 21.43% of fish can not sell and this part consider as a restaurant cost at 1.2kg x 270 = 324THB per one fish but this restaurant use at least 4 fish per week that means in 1 month 324x4 for 1 week x4 for a month this restaurant will waste at least 5,184 THB and if those week were order more than 4 fish will cost more cost of material.

4.2.4.4 Interview highlight

1) What your opinion about food waste?

For my role as a manager, food waste is being one of challenge that I want to achieve. I always told the Chef for taking care of fish detail. What we can do we will do to use the material the most useful.

2) How they calculate how much to inventory?

We have the checklist of minimum material, and we will let every crew help to check, and we send out the needed number to the owner, and the owner will consider what to order and double-check again. Mostly we will have a standard order, but if need more just tell owner she will provide for us.

3) How many salmon fish coming in a week?

"We order minimum salmon of six but depend on restaurant promotion if it was a salmon lover promotion we are going to add on order of salmon. Our restaurant uses other fish Hamachi, Tuna and Unagi but all that we don't cut it. We buy only the fillet part."

4) Key to reduce food waste from your opinion? Key resource?

"For Key Resource, it use to effect when we got new crew that we have to train them. We all know how to use the fish as full option. But the challenge is teach new crew to do the same. Chef Ego was so important, If there not concern and help us, we will not achieve food waste reducing because it on his hand."

5) Key activity?

"For Key Activity, it's so importance to our restaurant. We locate in department store and it was more than 100 restaurants to be customer choice. So, promotion or picture very helpful to keep customer coming. So, Key activities for me is to manage inside restaurant to be ready and create some promotion to catch customer to come and try."

6) Key partnership?

"For Key Partnership, for my opinion it doesn't connect our food waste management. Our restaurant just check ourselves the list to order. And manage inventory by our own way. The supplier just link of freshness requirement or the fish that what they have to do"

4.2.5 SUGOI EXPRESS

Sugoi Express was being the brand new restuarant which just open on January 2020 and located inside Police General Hospital. To enter this restaurant, need to find a parking lot downstairs where had no walling access into the building need to use the car way to walk up to main entrance. The restaurant are locate in the store zone of hospital there are total of 7 store open in this place. The restaurant size is not big have around 14-15 small tables. Usually the customer are someone who worked here or come to visit patient in this hospital. I have taken look on menu it very

shorts lists menu and the price are cheap. The waiters come and get order by I try to order Salmon Don and Sushi set. It takes only 5 min to serve food that was very fast for operating in the kitchen by the way my menu was fresh and easy to cook. The outlook was so plain not interactive and lead customer to take any photo. I take around 8 minutes to finish this meal and not so impressive with the taste and good react.

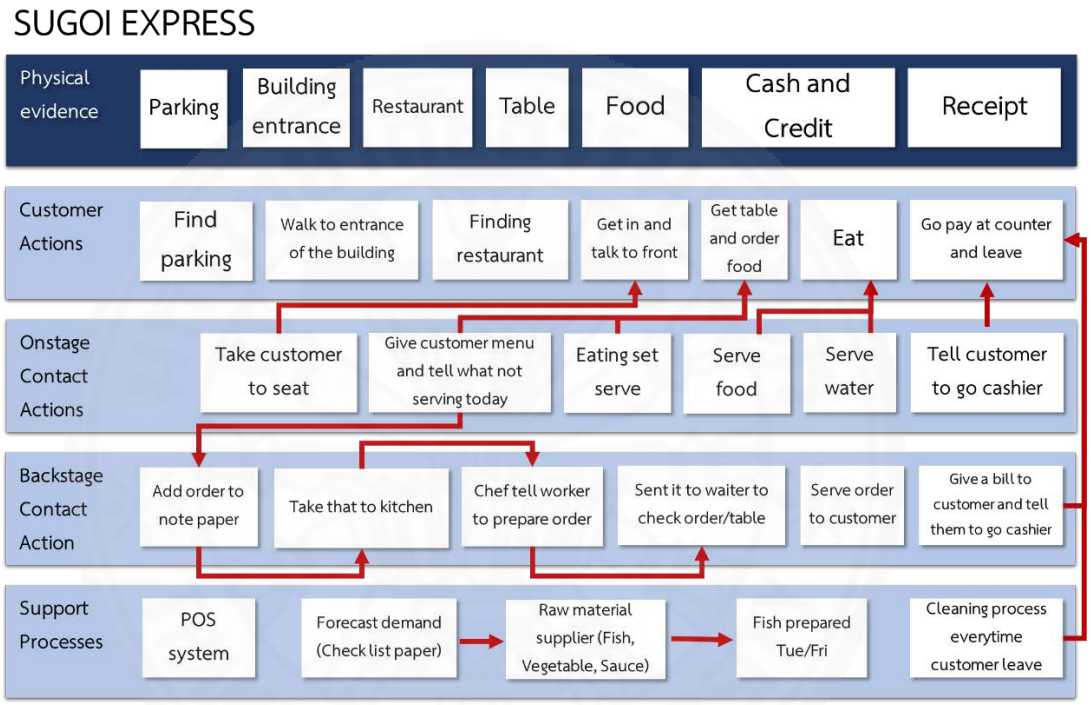

Figure 4.14 Service design blueprint of Sugoi Express

Everything was intermediate about food decoration and feel a little bit disappointed. If we have to give the rated of this restaurant, I will put 4/10 from taste and service. I think the very needed to change right now is the menu. It very short list but there have 6 people working. So wide choice of menu can lead to customer choice to have and also bring to best material used practice.

Table 4.5 Customer pains and gains of Sugoi Express

Pains	Gains
Very short menu list 10 menu of total	Song open
A lot of worker are free because only few customer	Chef cook sushi in front of us
Ask for more menu and special menu	Cheap price
How quality of the raw material	
Not to wow reaction of this place	
Tell him to refill water	

4.2.5.1 Material flow analysis

To briefly understand this restaurant on service operation, the service flow was fast and very rush on everything. Even while customer thinking about what to eat. It 10 menus how can make a decision with very short lists. The basic satisfaction of being their customer is quality, price and food outlook. So, this restaurant can achieve only price that cheap and big portion. I have heard some bad comment on freshness of fish material from customer next to us. The researcher had been sitting there for 3 hours to see change of table and service operation. Only 5 tables coming in this time. We did not see any food waste at the front-end operating only leftover part that customer select some part out from plate and they not eat it. That can convert to taste of food or maybe freshness of material that lead to changing taste. And we must research more on the back-end operation to see more food waste in the kitchen.

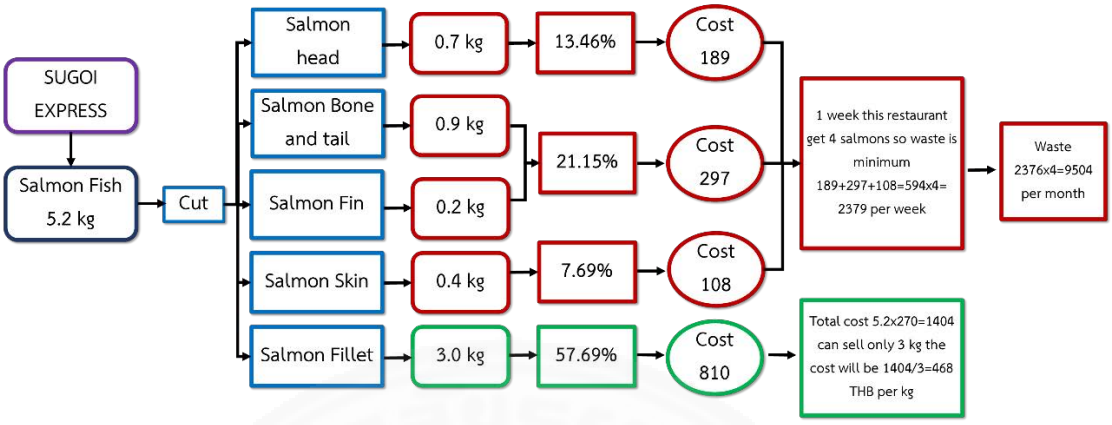

Figure 4.15 Material flow analysis of Sugoi Express

This restaurant was used Pan Food co.,ltd as a main supplier and they only get material one time per week that very different from other case study. This restaurant open for Mon to Friday that mean it operate five day per week and no weekend only week day. The researcher has been talk with head chef. They said the fish will com on Monday and we will cut it on that day and bring some part that not use to freeze and some part are reserve at the date cut. Not to freeze it as others restaurant recipe. So, the chef has only 2 year experience on doing these and this part are important to operate the Japanese restaurant.

4.2.5.2 Fish journey

The restaurant will open 10.00 on Monday the fish will come early and the cut it at that time before restaurant open. The chef starting cut from left and right side to take out bone and tail from the fish fillet. And then he tries to bring out big bone that locate inside the fillet and start cleaning fish. They bring it and cut into four pieces the bottom one use for hot kitchen and the top fillet are reserve in cold kitchen. There are no secret technique on doing these. They try to serve a fresh and natural taste to customer.

4.2.5.3 Price calculation

Fish price assumption around 270 +/- 40 THB based on time period of fish supplier from Norway. So in this calculation we set 270 as a price assumption to get easier and maintain to calculate waste cost.

Fresh salmon was measure at weight 5.2 kg by 0.7 kg was Salmon head, 1.5 kg was salmon bone, tail and Salmon skin. 3.0 kg was salmon fillet&skin. Total fish was use count at 3.0/5.2 x 100 = 57.69% of fish can use from 100% of fish brought. Total waste are collected from salmon bone, tail, skin and salmon head it calculated 2.2/5.2 x 100 = 42.31% of fish can not sell and this part consider as a restaurant cost at 2.2kg x 270 = 594THB per one fish but this restaurant use at least 4 fish per week that means in 1 month 594x4 for 1 week x4 for a month this restaurant will waste at least 9,504 THB and if those week were order more than 4 fish will cost more cost of material.

4.2.5.4 Interview highlight

1) **What your opinion about food waste?**

Food waste is the thing that we have to manage because it relies on our cost. But I don't know much on cost, but I try to do my best to handle it as useful as possible.

2) **How they calculate how much to inventory?**

Normally this part was calculated by the owner, but I'm the one who checks the stock of the restaurant. So I will know that we have a checklist of minimum order. So mostly we inventory a minimum never order for more inventory.

3) **How many salmon fish coming in a week?**

The salmon fish will come on Wednesday and Thursday, and we use it for the whole week. And it was at least three fished a week because our restaurant open Mon-Fri did not open on Sat and Sun. So, we are gonna cut it and use as a side by side.

4) **Key to reduce food waste from your opinion? Key resource?**

For Key Resource, The chef skill very impacts on food waste reducing. The Chef is doing his best to cut the salmon, but the menu is not cover all source we have. Many time that we bring the salmon head and bone back home not sale it.

5) Key activity?

We offer only a few menus, so, it easy to control overall work in the restaurant. But in the future, we plan to have more menu and offer full service. For the customer, this restaurant opens in Police General Hospital so it only the person who is working here can and being our guest.

6) Key partnership?

For Key Partnership, our restaurant gets raw material because we open only five days a week. So, in my opinion, it not good to operate but we do our best to keep it fresh by freeze it. So this partnership affects us but the key is our activity to manage it.

After done interview with the 5 case study, the researcher had done the ideation of the insight that imply from the interview transcript. The guideline of this will be use to asking and consulting with the case study of possibility of applying this guideline into the restaurant operation in order to reduce food waste generating in side the restaurant.

4.3 Ideation of guideline base on interview

4.3.1 Key activities on reducing food waste

4.3.1.1 Planning the menu

According to the interview says planning the menu is an important part of their work today on reducing the avoidable food waste were the part of being undue on some restaurant. Utilizing such resource is closely related to menu planning. ISS in Denmark has developed a tool for menu planning in order to optimize the use of raw material and food that has not been served

4.3.1.2 Planning production

According to the interview routine of planning the production is an important part of their work today Mcdonals in Sweden is a typical restaurant chain having advanced production planning tools; other operators say they have such

planning tools as well. This means that such restaurants can forecast the demand for different food and beverage based on historical data, the weather and another key parameter hour for hour. Do not prepare 100% of the food in advance. Instead, the canteens base their operation on batch production. In addition, sauce and some other ingredients are added just in the last minute also to minimize avoidable food waste.

4.3.1.3 Production optimization

Restaurants are working in order to optimize their production and logistics, including the structure of the kitchen. The structure of the production might have influence also on the avoidable food waste along the value chain. Dependent strategy waste generation can be moved upwards to the food producer or downwards to the local kitchen or even the guest being served at home.

4.3.1.4 Buffet management

The interview said this is important and helpful in preventing food waste by offering the buffet line. Serve buffet at the specific time and specific day might easy to manage stocking or inventory. Excess food for staff.

Internal routines for eating not sold food internally (by staff) are important parts of for their efforts to reduce avoidable food waste today. 8% says that such routines are important for further actions in the futures.

4.3.1.5 Waste sorting

All the restaurant already know what they throw away every time, but in fact, no one has measured the food waste sort or raw material type on exactly number or percentage they have wasting. Waste sorting can help the manager know the number and percentage for ordering food next round and compare the result per week.

4.3.2 Key resource for the reduction food waste

4.3.2.1 Knowledge

Knowledge in the form of education and experience was the key to prevent food waste generation and to reuse food. The main Chef from restaurant B â€œProfessional and experience can lead to less mistake of doing a job and technique needed to reduce food waste and material use as a full option. He

continuously seeks to develop his knowledge, such as through works of literature on cooking techniques. This reflected in Restaurant B ability to manage the source of material successfully.

4.3.2.2 Equipment

The right equipment and the proper use of it also identified as a key resource for reducing food waste. This pain got from the observation that knifes are the key that help restaurant can offer to the chef in work and the ability of knife show ability to cut fish and bring out bone without losing fish fillet. Furthermore, the vacuum machine or material can support a lifetime of freshness requirement.

4.3.2.3 Motivated employees

As many food wastes reducing initiatives mentioned in the thesis requires much effort from employees, we argue for the importance of motivated staff. Restaurant C the owner had mentioned the way they motivated staff by giving a reward of the chef where help restaurant mange material by less per cent of waste by only 0-10% that acceptable for throw away.

4.3.3 Key partnership on reducing food waste

4.3.3.1 Customize material made supplier agreement

By cooperating closely with the supplier, a restaurant can reduce its food waste by ordering more selected part of usage from the fish supplier. Restaurant E has been a good representative for food being trow away from a significant number. They use only the fillet part and cut fish by the restaurant operation might not the right answer for doing. Bothe wasting time and wasting money on the selected part that unused.

4.3.3.2 Partners for reusing

There are some part of material specifically salmon bone and tail. All restaurant had to throw it away for sure or even some doing by making a sauce or soup but actually, they can not use it every time due to validity time and technical that might stable for doing by themselves and otherwise buying the existing cost might lower cost and save time. So all these might not have important to all five case study. Partner is one option of letting some partners come and get the material to manage

it for example, sauce company that finds the fresh part for doing sauce as mass production.

We create a discussion interview with the 5 case study online through Zoom meeting or Line video call due to the corona virus situation of collecting the data from restaurant. But in some case the restaurant are start operating so, we went to the restaurant and had a discussion with the rating scale of possibility of applying our guideline base on possibility and productivity of each guideline.

The researcher has set the criteria of a rating scale to be in the form of Agreement by the 5 is strongly agree, and 1 strongly disagrees in the graph X equal to possibility and Y equal to productivity. By the notes are the giveaway reason of rating score.

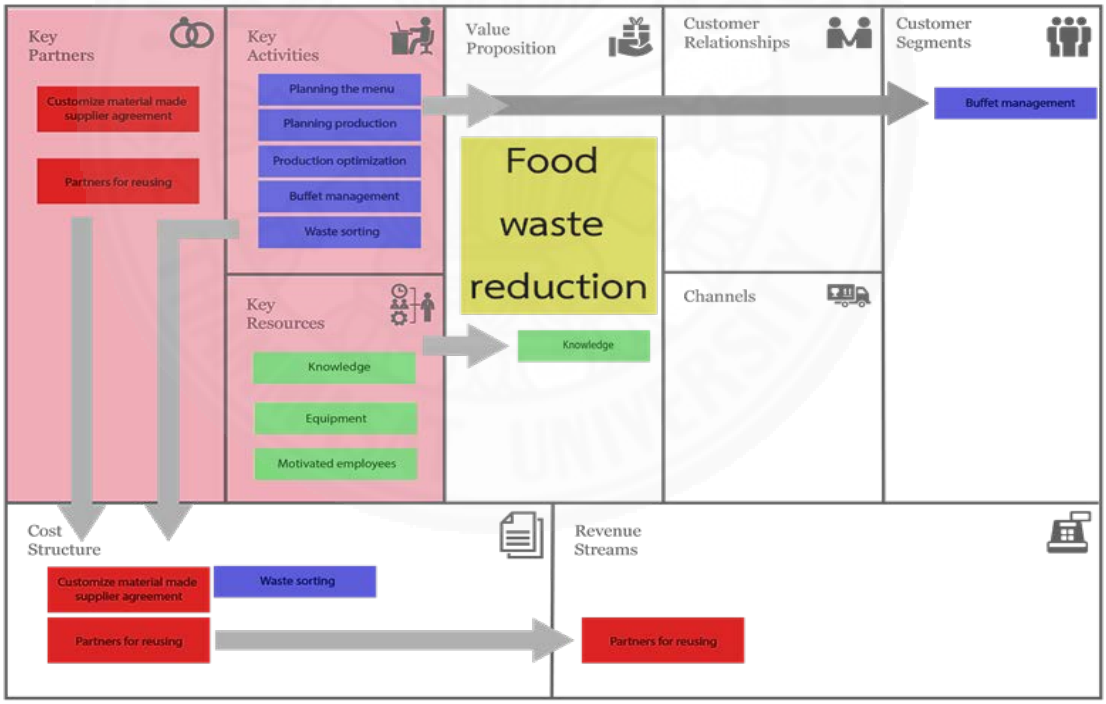

Figure 4.16 Implementing guideline into BMC

4.4 Testing key activity for reducing food waste

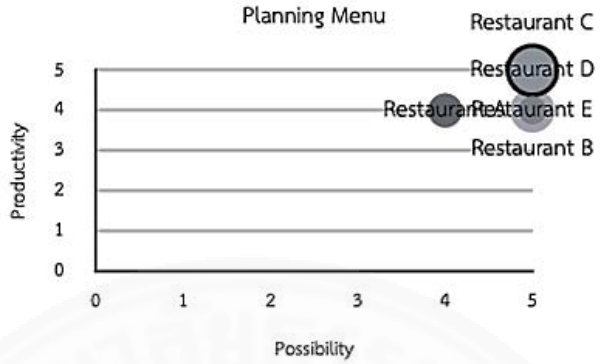

Figure 4.17 Planning Menu 2x2 testing

Planning Menu is the basic requirement of running a sustainable business. Before starting operation, the chef and owner have to discuss about this topic. Behind this, the owner also wants the best menu where can manage every part of material but the chef skill and time must be concern in this part. If we can generate a success and fit every part of waste generation a head chef have to spend more time with developing a working process. To this point make the five case agree upon this guideline that was help restaurant save cost by reducing waste and turn that waste into value form of the new menu but still spend more time preparing but it work for reducing waste that what the goal of sustainable restaurant business.

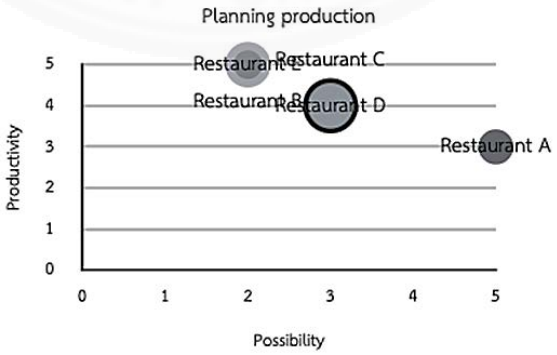

Figure 4.18 Planning Production 2x2 testing

Planning Production is a essential tool for working together as a team. In the case, restaurant have five-seven persons working in that mean it a less number of working people. The less people working the less problem generating. Planning production might be very successful in the big chain restaurant but in small size restaurant also easy to apply and get a productive result.

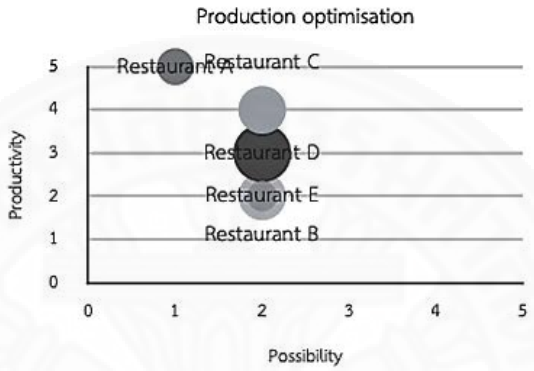

Figure 4.19 Production optimisation 2x2 testing

Production optimisation are the one that everyone said that it less possibility to apply due to the size of the restaurant. The basic part of separate hot and cold kitchen have been set up as all restaurant operation. If said about productivity of doing this will say that high productive and can reducing food waste generating because we know what have been done in where and what time and know how many wastes generate in the process.

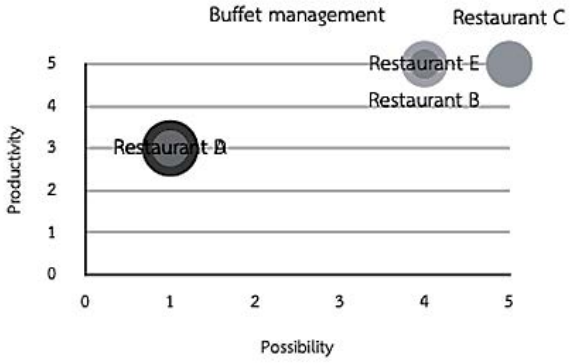

Figure 4.20 Buffet management 2x2 testing

Buffet management have been discuss on very different perspective. Some restaurant said Buffet it come with uncontrol demand of customer. Can not deny that it very productive on inventory management but it lead to food waste on plate cause it a buffet time we order as much as possible not concern on leftover food. But if said on restaurant point of view, it got less food waste percent for sure but less margin of profit.

Figure 4.21 Waste sorting 2x2 testing

Waste sorting are both possibility and productivity to apply. Waste sorting can lead to manager decision of ordering food and it was so easy by provide a weight measurement to measure how many we waste and how much it cost. Every restaurant agrees on doing these by start see through the garbage bag to know exactly waste number and find out reason behind that waste portion. Moreover, waste sorting helps manager find out pain point in the restaurant or the error that happen.

4.5 Testing key resource for reducing food waste

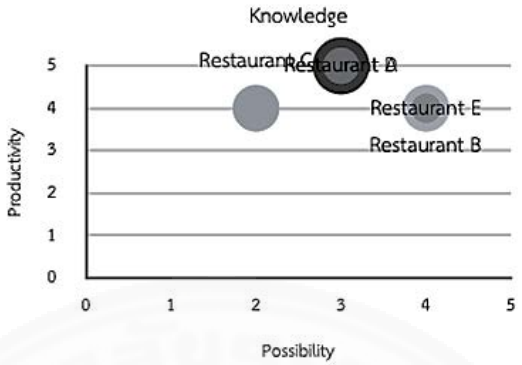

Figure 4.22 Knowledge 2x2 testing

Knowledge are being discuss differently against to the salary and experience of the chef. The small restaurants size hire only one main chef that get high salary and the assistant just normal chef or the one who keeping experience to be the head chef. Knowledge are the hard thing to apply it due to experience and character of each chef, but it still has a way out. And every restaurant said that if can give more knowledge and training it will affect human error that is the one of reason of food waste generating in the restaurant.

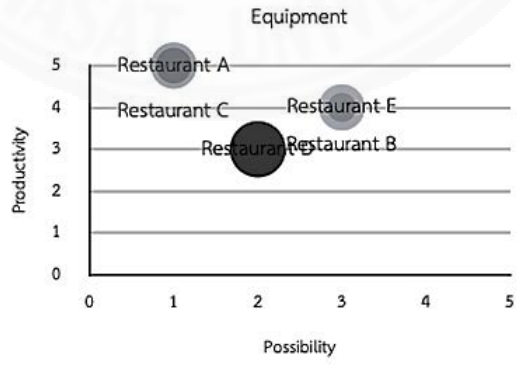

Figure 4.23 Equipment 2x2 testing

Equipment were mentioned on discussion is a knife and the refrigerator of the restaurant. They key element of Japanese food are the knife that use for cutting fish. There have various type of knife for specific cut of each fish. But it come with high cost, small size restaurant do not provide this as a standard equipment the chef have to bright it themselves or share the knife with other chef if it belong to the restaurant.

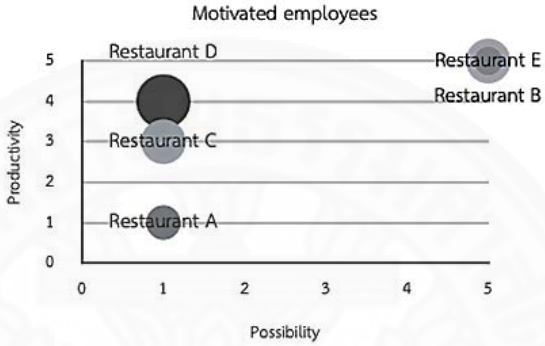

Figure 4.24 Motivated employees 2x2 testing

Motivated employee are depend on restaurant condition. Some said employee should pay full attention for working but some said give some incentive might increase loyalty and good working behaviour. So, the result represent two side that one are super supportive and another are not agree upon.

4.6 Testing key partnership for reducing food waste

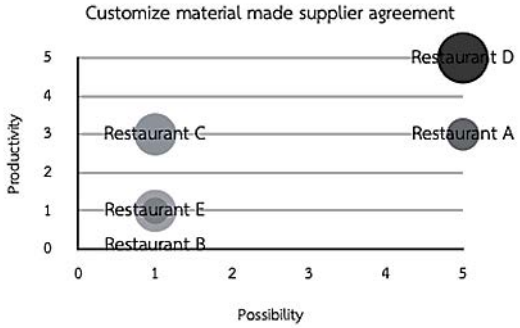

Figure 4.25 Customize material made supplier agreement 2x2 testing

Customize material made supplier agreement are the deal with supplier. All fish supplier already has this reserve as a service for cutting fish and it very possibility in some restaurant that ready for using it but in-term of business if we can sell all fish part it better and save money to cut it by ourselves. This solution are appropriate with the big chain when human error are come and effect food wasting. If your restaurant are good planning on menu it no need to use this.

Figure 4.26 Partners for reusing 2x2 testing

Partners for reusing everyone agree upon that no possibility to apply this due to keeping material process and number of raw materials. The case study is small size restaurant. To find partner to collect waste are not proper on waste number and keeping that waste in freezer process. Some said trow away it gives chef and worker good psycho.

Table 4.6 Mean of possibility and productivity

	Possibility	Productivity
Planning Menu	4.8	4.4
Planning production	3.4	4.2
Production optimisation	1.8	3.2
Buffet management	3.0	4.2
Waste sorting	4.4	4.6

Table 4.6 Mean of possibility and productivity (Cont.)

	Possibility	Productivity
Knowledge	3.2	4.4
Equipment	2.0	4.2
Motivated employees	2.6	3.6
Customize material made supplier agreement	2.6	2.6
Partners for reusing	1	2.4

After the discussion between the researcher and five restaurant business case study, the result has been shown in the figure 4.27 is represent the less possibility and productivity of applying guideline to the restaurant. 5 is represent the high possibility and productivity of applying guideline to the restaurant. As in the graph the guide can categories into 3 phase High, Medium and low possibility and productivity.

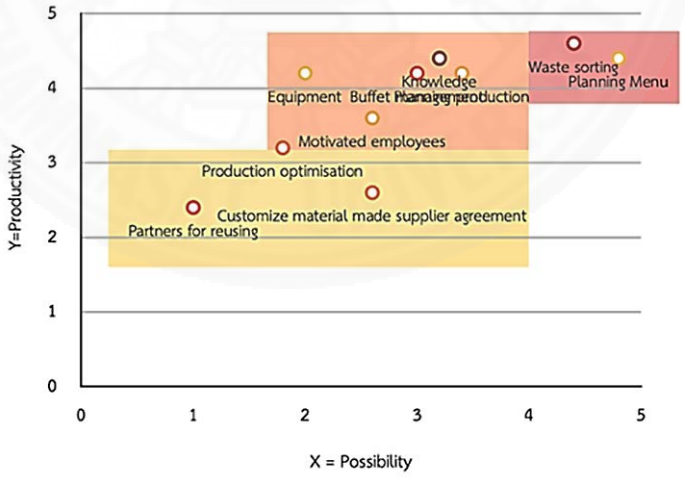

Figure 4.27 2X2 grid mean of possibility and productivity

4.7 Result of testing

4.7.1 High possibility and High productivity

4.7.1.1 Planning Menu

There is low cost to implement this guideline onto business operation. It requires creativity and time from staff or Chef that operate the kitchen of the new menu. However, the planning menu is hard at the first stage of implementing but after the restaurant setting up the menu and planning operation. This guideline will very useful in long-term by reducing waste and turn it into value-form of new menu selling. That is the reason behind why all restaurant case study set it as a high possibility to implement due to low investment and high productivity of lone-term reducing food waste.

4.7.1.2 Waste Sorting

There is the way to implement this manually just need the checking list to set it up and put the data into the Excel and visualize data as a graph to see how many it is waste and how much it cost. In the other hand, waste sorting also has the existing program for calculating named WINNOW. The platform is the waste tracking for a restaurant which have a system on-shelf ready to use in measuring and calculating the cost just put the input data. It will have data predication provide for next purchase. This platform is a guarantee that 50% reducing waste in the kitchen.

Restaurant size and scale are one of the reasons why the segment of the independent restaurant using to choose the guideline that needs low investment and use the technique or skill required from Chef or staff. The independent restaurants are not complicated with the operation process with a small number of working staff. So, it takes easy on human control inside and only one brand it no needs to set the standard of branding to be an equal and certain level of standard.

4.7.2 Medium possibility and High productivity

4.7.2.1 Knowledge

Knowledges are the basic requirement of the chef occupations but the knowledge mostly come from working experience. But it also have a shortcut

by working with high experience chef, the more experience Chef has the less error that happen. This guideline require no investment just need the worker intention of learning new thing and right technique for achieve food waste reducing. But human still human that why this guideline got medium possibility and high productivity. The discussion are about the human intention to help manager or owner to reduce food waste.

4.7.2.2 Planning production

Planning production is the thing that we separate work into a phase of working on getting less human error in each phase. It has strong research taking about focusing are help working better. So, to planning production require brainstorming from worker and owner. So this guideline requires time to change the work role with the time spending and preparing raw material. So it still needs the investment on some equipment that create less work on working hour such as meat cutter machine to cut it thin slide.

4.7.2.3 Buffet management

Thai people always buffet at least once a month and the Japanese restaurant are one of the most popular buffet lines in the buffet segmentation. The researcher was discus with the owner that the buffet is helping them release material. The more material buys the lower cost that a restaurant has to pay during to shipping cost and volume price from the supplier. The more customer is going to more per cent they come back and have a meal with us.

4.7.2.4 Equipment

Equipment in the context of Japanese food is about knife and temperature monitor. This two are essential of equipment the keeping fresh material in the standard of freshness requirement. The Japanese food mostly serves as a fresh and raw, so if the material was kept in the wrong way, it would affect the taste and texture of fish. The knife if the equipment for cutting fish. The expensive knives are helping Chef less work and power to cut big fish. This guideline needs a high investment cost on buying new material, especially knife that they usually change often. So if the restaurant investment on this part it makes worker have a less work less error will

happen and that makes the medium possibility to invest, but high productivity after implement if buying the new equipment.

4.7.2.5 Motivate employees

Employees are key person that due to food waste for every restaurant. The employee is the one that knows small detail and reason behind the waste that happens. So, motivate the employee to have less waste behaviour or awareness of food waste generating will be the others eye on food waste problem. So, this requires some reward model investment in the form of bonus or incentive in some case. Moreover, this guideline got the medium possibility due to human is the one that can not control and even can still hard and unstable to control. And, it will be high productivity to improve this part but take time to see up and it a longterm adjusting.

4.7.3 Medium possibility and Medium productivity

4.7.3.1 Customize material made supplier agreement

Suppliers are the key that helps restaurant control the quality of food. Food supplier has been one of the restaurant connection that has to build a strong relationship. The more volume of the order, the more concentration and take care from sale the restaurant got. So, to customise material from the supplier is already on-shelf, but the margin that got from transform material will be collect by suppliers, not the restaurant. The scale of the restaurant is easy to control, and quality control of different branch is no require. So, this is a medium possibility due to the extra price that will get from the fresh material and this guideline also good on time that the restaurant does not need to spend time on preparing material.

4.7.3.2 Production optimisation

The production optimisation is not appropriate for small size restaurant production optimisation are good on control quality of food or preparing material like a big chain restaurant. It is a high cost of investment to separate central kitchen and in-house kitchen. So this is not suitable to apply when it comes with high investment and require professional worker for it.

4.7.3.3 Partners for reusing

Partner for reusing is the idea of collecting the same type of waste and transform into another kind of food like animal food, process food, sauce or the thing that consume smelling of natural material. To during with partnership, it requires quality standard in keeping material and independent restaurants are small and low volume of waste that why this part is the medium possibility to implement, but the researcher prefers it on supplier side or big chain size to using this guideline. However, if we can really do it will high productive in the form of cost-saving and cut time to managing waste.

4.8 Importance Performance Analysis (IPA)

Importance-performance analysis (IPA) is a quantitative method for determined how people feel about specific characteristics of an issue or a process (Martilla & James, 1977). Recently, this technique is used to develop various attributes of a practical solution or new process development (Hammitt, Bixler, & Noe, 1996; Oh, 2001). A benefit of IPA is that it evaluates a clear picture of how importance and performance of certain indexes are in comparison with how satisfying they are to users or customers (Levenburg & Magal, 2004; Siniscalchi, Beale, & Fortuna, 2008).

The visualization of this method, an IPA matrix, is created by plotting individual attributes' importance values and satisfaction values on a 2x2 dimensional graph having four quadrants. And the means of the measure were set as the parameters of the matrix's quadrants. In an original interpretation of IPA, each quadrant is interpreted as having implications for prioritization and management of attributes. Implication need to be focused on elements in the "Concentrate here" (high importance and low satisfaction) quadrant B, or users will be lost; resources should continue to be developed and adjust on the "Keep up the good work" (high importance and high satisfaction) to keep up user satisfaction; and implication can be cut off from the "Lower priority" (low importance and low satisfaction) and "Possible overkill" (low

importance and high satisfaction) quadrants D (Hugo & Lacher, 2014; Levenburg & Magal, 2004; Martilla & James, 1977; Siniscalchi et al., 2008).

An advantage of IPA is that it allows the researcher to identify elements that restaurants perceive as important but have dissatisfaction about. Attributes falling into quadrant A are recognized as the main priority. For example, Hugo and Lacher (2014) investigate the attributes of community festivals by using IPA and found that the cultural perception of the festivals (i.e., culture event through arts and crafts, food, and music) was not important to festival attendees. However, there were high satisfaction gaps related to relaxation and entertainment component of the festivals that needed to be developed to encourage continued participation in the showcases.

To apply IPA to food waste guideline, we evaluate a guide for interpreting the quadrants around different dimensions of an issue (Figure 23). We set items with high importance and low satisfaction to be "Concentrate here," which should be addressed when communicating with an restaurant owner. We plotted the mean importance and satisfaction values for each index on a matrix where satisfaction comprised the x-axis and importance comprised the y-axis. We divided the matrix into four quadrants (A B C and D) by using the grand mean score for importance and the grand mean score for satisfaction (Hugo & Lacher, 2014).

Figure 4.28 Adapted form "Importance-Performance Analysis

Table 4.7 Food waste reduction guideline indexes

Index name
Importance of reducing food waste in the restaurant by using the **Planning menu** guideline/ Satisfaction with reducing food waste in the restaurant by using the **Planning menu** guideline
Importance of reducing food waste in the restaurant by using the **Waste sorting** guideline/ Satisfaction with reducing food waste in the restaurant by using the **Waste sorting** guideline
Importance of reducing food waste in the restaurant by using the **Knowledge** guideline/Satisfaction with reducing food waste in the restaurant by using the **Knowledge** guideline
Importance of reducing food waste in the restaurant by using the **Planning production** guideline /Satisfaction with reducing food waste in the restaurant by using the **Planning production** guideline**.**
Importance of reducing food waste in the restaurant by using the **Buffet management** guideline /Satisfaction with reducing food waste in the restaurant by using the **Buffet management** guideline.
Importance of reducing food waste in the restaurant by using the **Equipment** guideline /Satisfaction with reducing food waste in the restaurant by using the **Equipment** guideline
Importance of reducing food waste in the restaurant by using the **Motivate employees** guideline /Satisfaction with reducing food waste in the restaurant by using the **Motivate employees** guideline

Table 4.7 Food waste reduction guideline indexes (Cont.)

Index name
Importance of reducing food waste in the restaurant by using the **Customize material made supplier agreement** guideline /Satisfaction with reducing food waste in the restaurant by using the **Customize material made supplier agreement** guideline
Importance of reducing food waste in the restaurant by using the **Production optimisation** guideline /Satisfaction with reducing food waste in the restaurant by using the **Production optimisation** guideline.
Importance of reducing food waste in the restaurant by using the **Partners for reusing** guideline /Satisfaction with reducing food waste in the restaurant by using the **Partners for reusing** guideline

4.9 Results of testing IPA

The overall importance means ranged from 1.2 to 4.8 across the indexes, and the overall satisfaction means ranged from 1.2 to 4.8 across the indexes (Table 4.8). The total grand means for importance and satisfaction were 3.24 and 2.68, serverally. As noted previously, we brought the grand means to set up the parameters of four quadrants and drafted the mean values for the indexes on the presenting 2x2 matrix (Figure 24). The data points that fell into the "Keep up the good work" quadrant were for the following indexes: "Importance of/satisfaction with reducing food waste in the restaurant by using theÂ Planning menuÂ guideline," "Importance of/satisfaction with reducing food waste in the restaurant by using theÂ Waste sortingÂ guideline." and "Importance of/satisfaction with reducing food waste in the restaurant by using theÂ Production optimisation guideline.

Table 4.8 Mean of Importance/Satisfaction of food waste reducing guideline

	Importance	Satisfaction
Planning Menu (A)	4.8	4.8
Planning production (B)	4.6	4.2
Production optimisation (C)	4.4	3.4
Buffet management (D)	2.8	2.8
Waste sorting (E)	2.8	3.8
Knowledge (F)	3.8	1.6
Equipment (G)	4.4	2.2
Motivated employees (H)	1.6	1.4
Customize material made supplier agreement (I)	1.8	1.2
Partners for reusing (J)	1.4	1.4
Grad mean	3.24	2.68

We present this application of IPA as a means of choosing dimensions of food waste reduction that are likely to be remarkable with a restaurant user, and we used nonprobability data to prove what could apply into the restaurant business practice. So, the next evaluation will be to select the most importance and high satisfaction to improve in the business operation.

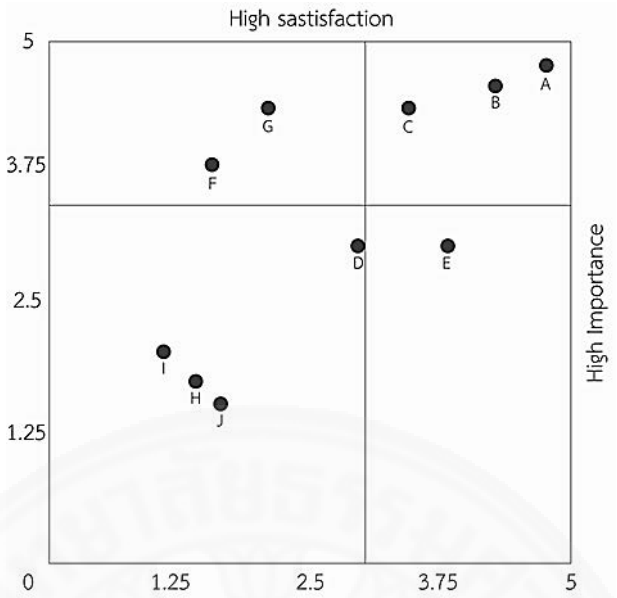

Figure 4.29 Importance-Performance Analysis for Food Waste reducing guideline

In conclusion, All the guideline can be use on applying as a business model practice for the reducing of food waste in the kitchen of the restaurant operating. But in this part we aim to suggest to apply the high importance and high satisfaction first in the context of small-size Japanese restaurant. In the chapter 5 we will discussing in the detail of applying this guideline and the scenario that going to happen after apply.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

The objective of this thesis is t Design guideline for newcomer Japanese restaurant to adopt food waste-Service Design Blueprint/Restaurant management reducing practices. and Presenting a wide choice of business practices, along with real-life examples and guidance of finding solutions and measurement tools of applying them. The researcher has got guideline for business model practice through Key Activity, Key Resource and Key Partnership from this research, After all, the most valuable benefit that the writer receives from this research is essential information for creating a business model guideline for the independent Japanese restaurant in Bangkok metropolitan region, Thailand.

5.1 Conclusions

The five independent Japanese restaurant where the selected sample size for the small size Japanese restaurant segmentation in Bangkok metropolitan region area, were collected to understand business operation through service design blueprint, waste measurement through material flow analysis and in-depth interview for testing hypothesis that everything that researcher has been thinking are a part of infrastructure of existing business model and how it work as it operation. The writer had been develop the first idea from hypothesis testing with the case and generate to be a business model guideline for reducing food waste through Key Activity, Key Resource and Key Partnership. The guideline we get it appropriate for the small size Japanese restaurant where stand alone and operate by themselves not a chain restaurant. The participants were chosen by random sampling method with the same control variable to keep it match the thesis objectives.

The findings of this work revealed food waste reducing guideline for small size Japanese restaurant segmentation as the overall perception of the owner, head chef and staff toward reducing the food waste in the back0end operation. Besides, the

main findings the researcher also understand the business operation through the front-end research that lead to stop investigate in the front house because food waste are happen in significant number in the back-end operation or in the kitchen. The outcomes reveal chef's skill and creativity to create dishes made from every part of salmon, the key raw material, is counted as the Key Resource. Promotion and inventive menus that satisfy customer's appetite to initiate repeated visits are the two relatively hard to manage factors in the BMC most significant Key Activities due to the fluctuating numbers of customers. Suppliers who deliver and help to manage raw materials inventory are parts of the Key Partnership.

Meanwhile, the key to reduce food waste that most significant from the interview is Key Activity. Beside the Key Resource are still impact to food waste as a second and lastly for Key Partnership that less match to food waste reducing practice. The interview lead to ideation of business model practice with the secondary research and represent as a idea of guideline and bring this to discuss with the five case study for the second time. The researcher use the scale questionnaire to asking question to the owner of what they thinking in the perception of possibility to apply and productivity if successfully apply. Scale of 1 to 5 and bring the all opinion to create a mean and set up as the figure X in chapter 4. The researcher can categories the guideline into 3 phase named High potential, Medium potential and Low potential of applying the business. We recommend the reader start apply the high potential first as it has been testing that high possibility to apply and high productivity after apply. The business practice will be shown as a list and add on with the secondary research real-life case.

5.2 Guidelines

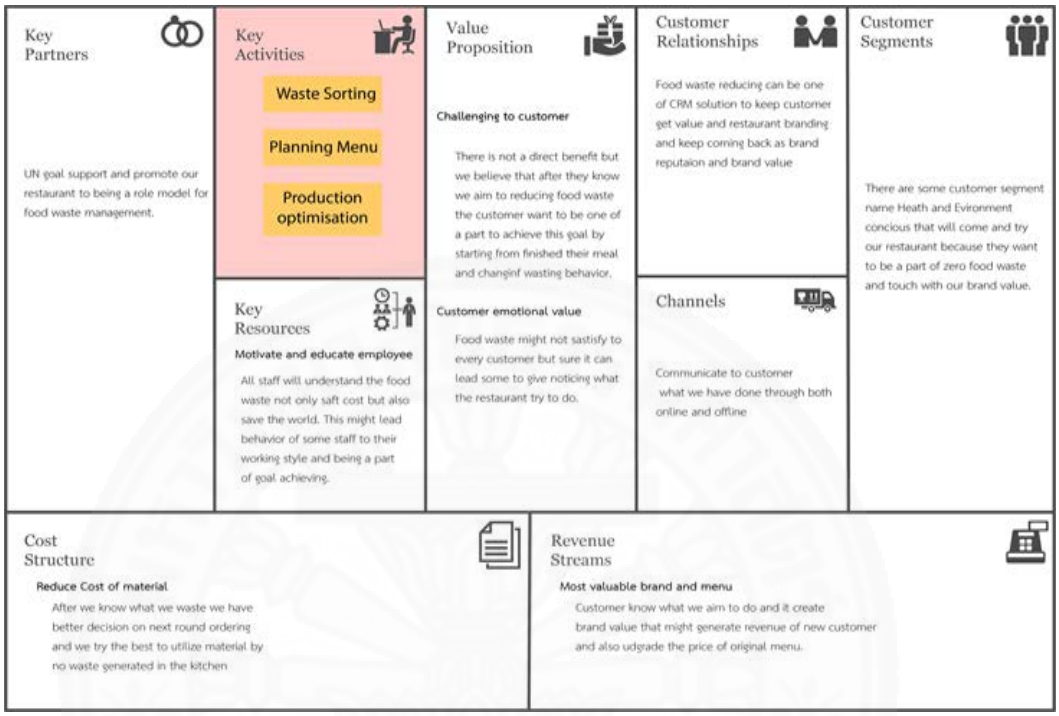

Figure 5.1 Senario of implementing guideline in the BMC

Planning menu and waste sorting has been possibility and productivity on implementing in the BMC for reducing food waste in Independent Japanese restaurant in Thailand. The figure 5.1 show the effect of applying them as a basic sensation that going to happen. It effected Key Partnership, Key Resource, Value Preposition, Customer segmentation, Channels, Revenue Streams and Cost structure. The more planning menu it create a new dishes for customer to try and generate the new way of revenue stream and reducing the part of unused of fish material. This can also communicate through the online and offline channels of new menu or special menu at the date made. And the lunch set or any promotion are the part of planning menu too. So the promotion can lead new customer to come and try the restaurant for the first time but taste and quality is something keep customer coming back. The waste sorting are internal activity that require an employees to take responsibility of checking

and weighting the waste that in the garbage. So, this will be linked to cost structure that how many we waste it show as the cost that we lose.

Table 5.1 Guidelines on practice

Planning Menu	The restaurant have to plan what to sell based on fish material and creativity of the chef. In some part of fish like bone or head it can create a menu but need a skillset and creativity to adaptation from chef to make it an amazing menu that can be sell on the menu. If every restaurant can bring out the best chef skill and creativity there will have wide choice of menu with full-cover the waste that going to happen in the restaurant.
Waste sorting	The restaurant need to know what and how many they're waste a day as a categorise chart. This are connect to the decision making of manager to estimate the next purchase of ordering resource from food supplier.

5.3 Key reducing food waste

Key activities in the Japanese restaurant concerns how to planning production, store, prepare and serve food to prevent food waste, and how to maximize the utility of any leftovers from these processes. During the interviews and observation, five key activities were identified. Most target the prevent- option in the food waste-hierarchy. Our findings show that Planning Menu, Waste Sorting and Production optimization are by far the most important activity reduce food waste. Not only do we consider Planning Menu, Waste Sorting and Production optimization as a separate key activity. But for most business practices presented in this thesis, such as changing others block of business model canvas to better practice on reducing food waste.

1) Change cost structure by knowing how many we waste the manager will have a better decision for making a next round ordering material from the supplier.

And planning menu together helps the worker can prepare a sort of material ready and proper for a dairy serving. Utilization is the key that long-term effect to cost-minimizing because it mostly reduces on time, human hour and psychology effect.

2) Change the Revenue Stream by changing the value of the brand. Food waste-reducing restaurant can be a new brand reputation and raising the brand awareness of doing this activity. It catches attention from some target to come and try the restaurant. And it also adds more value to there dishes. The less waste we reduce, the more revenue we can expand.

3) Change the channels by changing the customer perception by communicating food waste reduction at back-end to customer. It the same process of branding by this can create a huge impact on brand and value proposition.

4) We are changing the value proposition to customer perception. Once we are doing good on the back-end, and the customer knows what we are doing. This will be the challenge to the customer to motivate themselves to be a part of making the restaurant 0% food waste by finishing their own meal.

5) Changing customer relationship by empowering the relationship management to the customer to bring the waste reduction back home and also generate a brand campaign to raise awareness to the new customer coming to try.

6) Changing Key Partnership, not only the supplier can be a key partnership the NGOs that aim the same goals can come and support activity that the restaurant tries to do. Such as UN sustainable development goals that promote and support of restaurant activity.

7) Lastly, additional key activities can create motivation and educate the employees by changing the Key resource of awareness and utilizing material and worker flexibility to be a part of restaurant food waste reducing activity. This behaviour can lead to improving their habit of wasting back home.

It’s very successful in changing the Key activities of running the restaurant aim to reducing food waste back-end it connects to all business model canvas that restaurant run. This can reflect that Planning Menu, Waste Sorting and Production optimization are key to reduce food waste in the Independent Japanese restaurant.

5.4 Guideline on practice

Planning Menu was started from evaluation inside following by this step

Step 1: List what you have

The different restaurant will have different material and skill to make the menu. The chef also has the signature menu or even the unique technique on making the food. Bring that on the list and write down what you have in the kitchen. What you good at in the kitchen and what the thing that mostly goes waste on the paper.

Step 2: Brainstorming on what you can do

This step is about the ideation of the staff and chef ability that what they can be made to improve their wasting behaviour. The manager should come and give the price of on each material that makes more sense for employees on how much it cost for wasting and also remind them to use the equipment properly. Brainstorm can be a crazy menu that was never existing in the world make sure the chef and staff can make it really due to the time and the cost of making it.Â

Step 3: Research on what competitor do

The easy and shortcut way is about research on your competitor. So, it's no need to very creative need and the idea of adaptation. The same kind of food show out the old taste of product viability. So, a competitor can help you remind yourself of what you lack on and what you miss. Learning from the competitor might be the way of brainstorming

Step 4: Planning for the operation

After you are agreed upon the new menu list for reducing your food waste so, you need to plan on new production because new menu need a training to prepare the material for serve. This point also helps the manager decide before putting this on the existing list. They will know how long it takes on preparing this new one. So, if it does not affect the time of operation, it can serve in real operation time.

Step 5: Try menu with real customer

After everything is done, the manager needs to put the need menu to out for the customer to try and give us real feedback in return. The feedback can bring it

to develop the taste and time of serving. This menu might have only dinner hour before closing the restaurant to push out the overstocking material to serve than left it over in the fridge. Also, It can set up for free complimentary or chef choice for serving this as a surprise me a promotion.

Waste Sorting is the option to manual count and using the existing program but need to have to weigh measurement machine to measure per kilogram of waste you had been trow away.

For manual count, it needs a table of showing the cost of each material. This cost belongs to the supplier who sent the material to the restaurant. Before throw everything away, it needs to weigh that waste and put into the table and let Exel calculate for how much the waste cost today. What is the rank one of high volume waste, and what is the hight cost of the waste? The analysis should be shown as a graph and clearly to communicate to the manager for the next round ordering. They also had a system name WINNOW - Save time and cost. Weight, track and manage your food waste with hardware system additionally validated to ensure data quality. And this is no need of a human job because it an AI tracking drop the garbage into the machine AI will calculate their own and show as a report of waste analysis. So, they use the image recognition to remember all food material in the restaurant the system provider needs to set up 200-1000 images to set up the AI solution. WINNOW can track big chain restaurant, and they are doing well on high volume waste that small size from the individual. So, WINNOW can be good for a big chain and also be a sample of small chain to prototype their operating system. So, the next will be the prototype of evaluation of the waste sorting solution for small size restaurant.

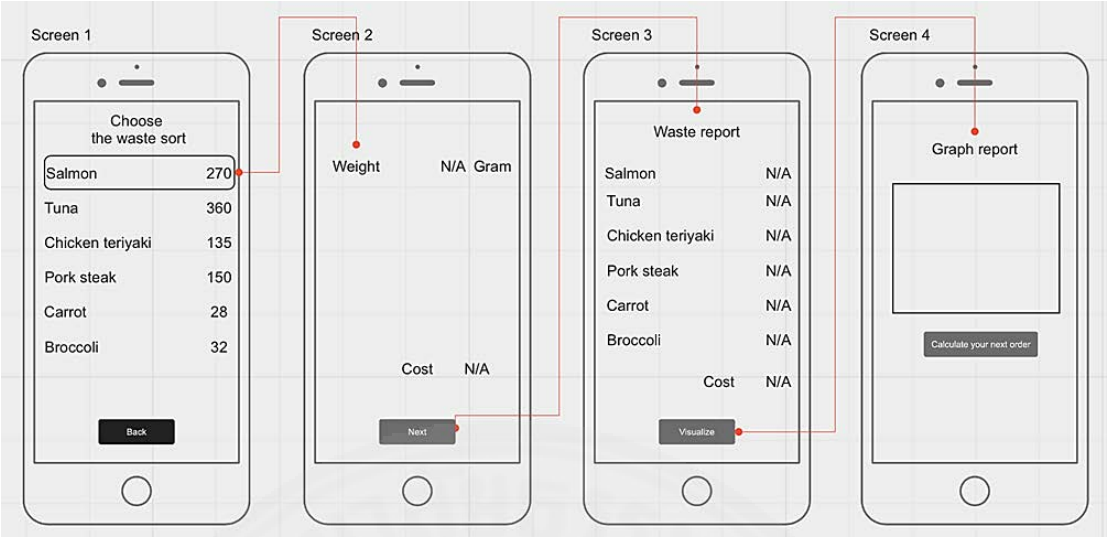

Figure 5.2 Wireframe of design the waste sorting software

In Figure 5.2, the researcher had drafted the wireframe for the future development of food waste calculating program for small size restaurant. The small size has no need AI for calculating due to the waste volume and the variable of waste type.

Step 1: List of material used

Every material used potential to be waste in someday. The restaurant needs to bring the shopping list to set up On the software. To show how much it cost and how many you buy as an input for the restaurant operation.

Step 2: Create a table of inventory in the software

The thing that you put on the table in the software it the same thing of your number of inventories. You need to check up on them to make sure its actual data.

Step 3: Weigh your waste

The system provides the way to put the weight of waste, and it automatically calculates the cost of waste and shows as a report to the manager. Just need requirement from worker to measure their own. And after they know the cost and visualise data into the graph form, the program can suggest the prediction of ordering material for the next round from the stock and waste input.

5.5 Monetary benefits

There are few businesses that have implemented food waste-reducing measures throughout their entire business model. However, as our analysis points at, the ones that do work on reducing food waste in every aspect of their operations, have no doubt when they claim they have experienced large monetary benefits from this work. We will start off by presenting an important challenge regarding the calculation of profits. This is important, as our study does not establish a causal relationship between food waste-reduction and profit.

5.5.1 Calculation challenges

Challenge all restaurant of our sample reported monetary benefits, and it can be challenging to measure the precise savings, and more importantly if those savings are caused by the food waste-reduction itself. As this is an explorative, qualitative study, identifying a causal relationship is not our aim. Nevertheless, it is important to gain an understanding of what benefits that can arise, as this can increase motivation to change.

Firstly, the problem of measuring exact saved costs is complex. In addition to the loss of money in food that is thrown away, there will be costs due to transport and labour used for preparation. Furthermore, waste management services require money to dispose of a company's waste. Some of these variable costs can be difficult to identify, such as calculating how much electricity was spent in preparation of 1 kilo of meat, where 200 grams were wasted. On an even more detailed level, it can be difficult to know if wear of equipment should be included or to know the exact cost of the implementation of a measure, such as weighing and measuring waste. These are choices each restaurant business must consider individually until standard measurement methods have been designed. The point is that savings could be different than expected. Thus, the following examples should be read with an open, yet critical mind.

5.6 Non-monetary benefits

Among the sample group, we identified six non-monetary benefits. These are increased flexibility, motivated employees, positive reputation, as well as increased quality of food. These benefits are placed within the non-monetary category, as they are not a direct source of revenue. However, for a long-term perspective, we argue that these benefits could result in monetary value, thus increasing the companies' profits. We will present each of these six non-monetary benefits.

5.6.1 Flexibility

Regarding flexibility, two food waste-reducing initiatives stood out as a source of increased flexibility. The first is the use of technical equipment. According to the restaurant staff, this dramatically increased their flexibility, as the kitchen is no longer dependent on knowing the exact number of guests before preparing food. Instead, the chefs can now prepare a large quantity of meat in small packages in the wrap to vide machine, which can be cooked as guests arrive.

The second initiative that increases flexibility is the absence of menus. We identified large menus as a source of food waste in restaurants, as this requires the restaurant to purchase large quantities of all ingredients. However, by not promising certain dishes in a menu card, the restaurant is not required to place these large orders. By rather offering one or two menus consisting of "the chef's choices", these restaurants will be free to use the ingredients they have available. Consequently, food waste generated from large purchase orders can be reduced.

5.6.2 Motivated employees

The organizational psychology researcher Edgar Schein states that people want to be a part of something bigger than themselves and that they want to know that their contribution has a positive impact (Schein, 2010). Applying food waste-reducing will fulfil both these needs. By contributing to solving the problem of food waste, leaders can give their employees tasks that make a positive change. The employees regard food waste-work as fun and are highly engaged in learning more and developing practices. A motivated employee has several positive repercussions for the restaurant, although two of the most important factors are that employees tend to be

more effective, as well as contributing to retention. Thus, motivated employees could lead to both increased income and saved costs.

5.6.3 Reputation

A third non-monetary benefit is a positive reputation; many foodservice operators build when working on reducing food waste. When the customers have informed about the food waste-reducing initiatives that are implemented, they give positive feedback and state that they like what restaurant is doing and also motivate them to finish their own meal to be a part of achieving. This is particularly the case after the customers have eaten the food.

5.6.4 Quality of food

In search of reducing the food waste, new ways of how to preserve the commodities even further were explored. Such initiatives may increase the quality of food, as storing conditions and preparation techniques can be improved, which prepares the product in a way that reduces any nutritional waste and weight loss of the product. This way of cooking the product at a lower temperature over many hours also means that the texture of the product is better saved. If communicated to the customers, we argue that such non-monetary benefits can lead to a better reputation and higher willingness to pay.

5.6.5 People and the planet

The result of throwing away one-third of all food produced is creating 33 billion tons of greenhouse gases yearly, in vain emitted to the atmosphere. Although the causes of global warming is a much-debated topic, scientists agree that these greenhouse gases will retain heat from the sun, resulting in increased temperatures. This illustrates how food waste-reduction can contribute positively to the environment.

Food production requires the use of our planet and its limited resources. Water is a scarce resource in many parts of the world. Reducing food waste is highly relevant to this issue. For instance, producing only one hamburger from farm to fork requires the same amount of water as taking a 90-minute long shower (TGTG-Norway, 2016).

Besides reduced CO2 emissions, another environmental benefit is the transformation of food waste into fertilizers and green energy. Although preventing food waste is the best alternative according to the food waste hierarchy, once the food waste exists, transforming this waste to, for instance, green energy represents a much smaller CO2 footprint compared to the process of rotting in a landfill.

5.7 Limitations and future research recommendations

Although we have worked on making the best possible methodological and practical choices throughout the planning and writing of this thesis, there are four areas of improvement that we wish to highlight. This can also serve as a point of departure for future research topics.

Firstly, we need to comment on relatively small sample size. Ideally, we would have identified many more food waste-reducing business case, especially since we cover such a small market size of research. However, the sample is small due to two reasons. The first is the connection barrier, which became a significant reason as we are collecting data and testing our research hypothesis. The second reason is that we realized that many businesses in the foodservice industry are never promoting their food waste-reducing efforts or set this effort as a priority, thus limiting our ability to identifying and educating them. To overcome these two issues, we believe it would be beneficial for future researchers to focus on geographic areas, with the supporting research by bringing policy or incentive to the businesses to open to identify food waste and make this issue as a priority to manage its back-end.

A second limitation regarding our sample is that most of the observations are located in the Bangkok metropolitan region area, Thailand. However, due to the reasons mentioned above, it proved to be challenging. Nevertheless, we believe that our findings are generalizable to other areas in Thailand. Consequently, food safety is being the topic of discussing nowadays and food waste is being one of them to achieve food safety to our country. Thus, restaurants throughout Thailand can implement food waste-reducing business practices, without government policy and support.

Working on this thesis, we argue there are, in particular, third topics that need further research. Firstly, we need more statistics and numbers on food waste and food waste reduction in Thailand. As emphasized throughout the thesis, the lack of a unified definition and measurement method is the reason there is not enough data available. More and better food waste data would allow for Thailand comparison and comparison across time. Only after obtaining such data, can we say with certainty which businesses and which countries have reduced their food waste, and if we are reaching international goals.

Secondly, we see the need for further research about how to implement changes in a business model. Our findings will guide the reader through a presentation of different measures, information about requirements for using them, as well as which part of the business model the measure belong to. It will also explain possible problems along with managerial recommendations for a successful implementation. Still, it does not provide managers with details on how to make changes in their business model. Here, we argue, more field research is needed.

Lastly, we believe there is a need to explore how public policies can be used to reduce food waste. If we are going to bring the UN Sustainable Development Goals, the responsibility cannot be left with individual businesses. As stated in Saebi et al. (2016), businesses will more likely change their business model when confronted with a threat rather than an opportunity. We believe such threats should come from a national level, as many business model changes could be done easier if individual systems and infrastructures are provided.

In order to be able to manage with this problem, we need innovative ideas and new ways of delivering the value proposition of a meal. One such idea is the company called Lunchfarm, who serves as a "canteen on wheels" for companies where are too small to build their own canteen (Lunchfarm, 2016). Another idea was initiated from private households in Trondheim, are outdoor fridges placed on the street where anyone can share their surplus food with those in need (Bull-Engelstad, 2016). The future also brings technological inventions. Scientists have managed to apply 3D printers to print food, which in the future could enable people to print

exactly what they need, whenever they need it. In addition, the scientist believes that we will be able to use food waste as input in these printers (Wasteless Future, 2016).

In sum, research on food waste is believed to help managers understand the threats and opportunities of food waste, and as a result of this contribute to finding ways to solve the problem. The foodservice industry must change its business practices, in line with the demand of the growing world population.

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APPENDICES

APPENDIX A

DATA COLLECTION

A.1 Interview highlight

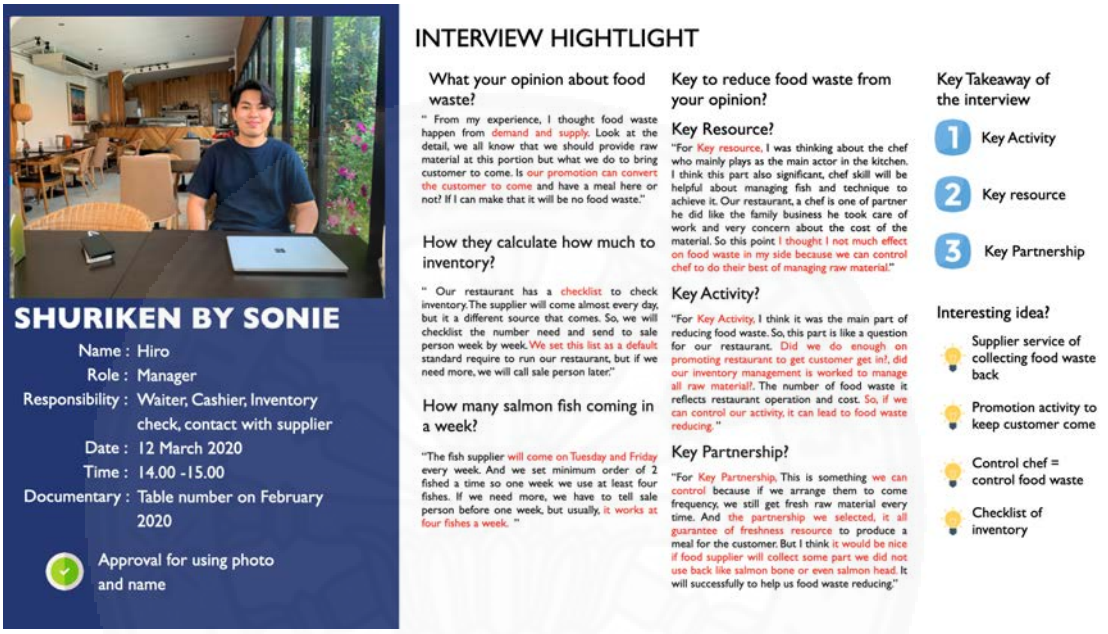


Figure A.1 Interview highlight of Shuriken by Sonie.

Figure A.2 Interview highlight of Kin Hashi

Figure A.3 Interview highlight of Ryuho

Figure A.4 Interview highlight of Blue Ocean Sushi

Figure A.5 Interview highlight of Sugoi Express

A.2 Background of Japanese restaurant

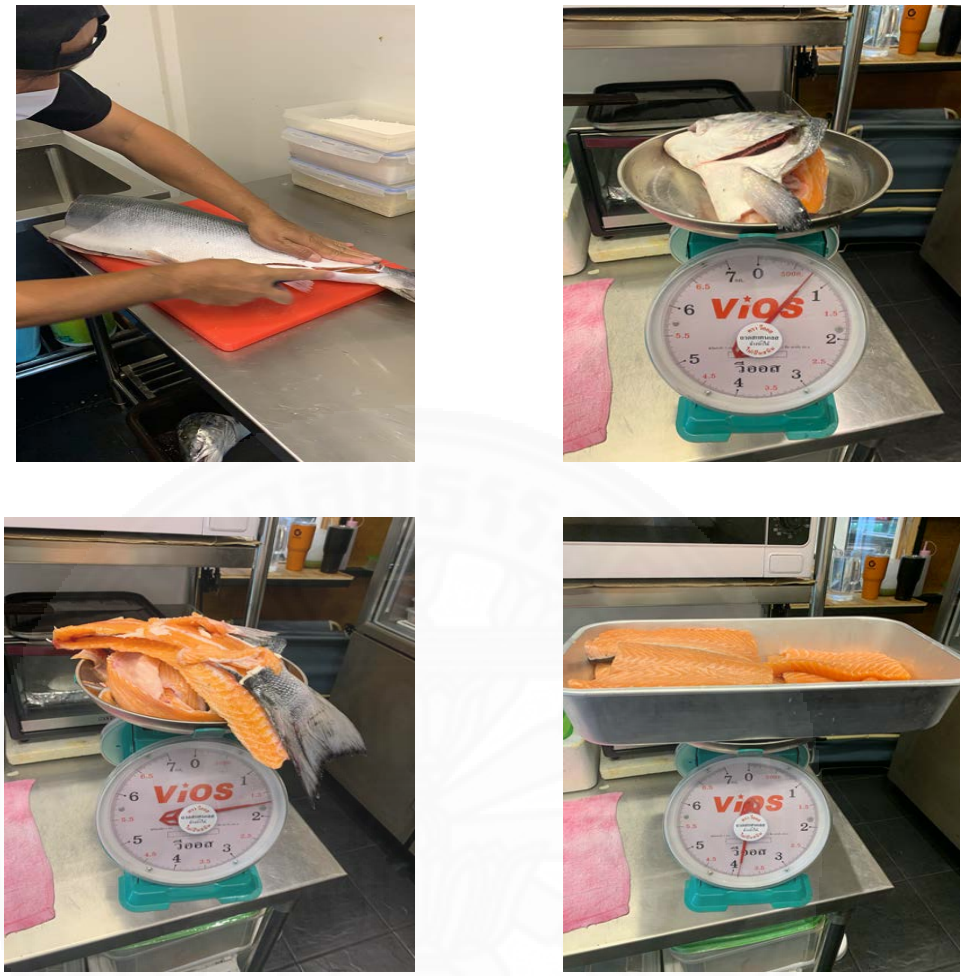
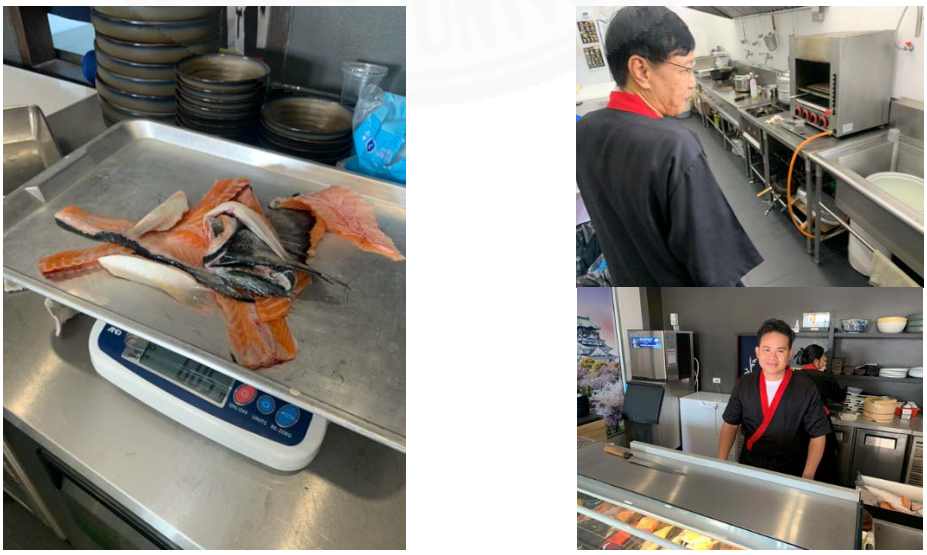


Figure A.6 Background of Shuriken by Sonie



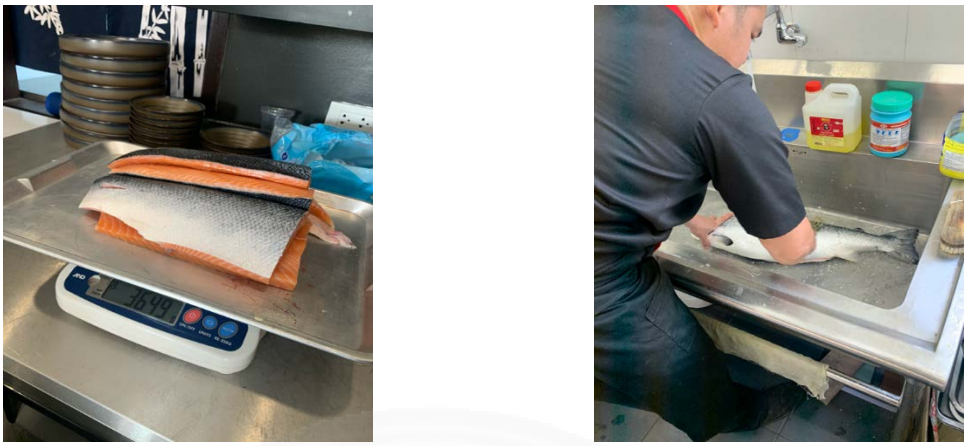


Figure A.7 Background of Ryuho Sushi

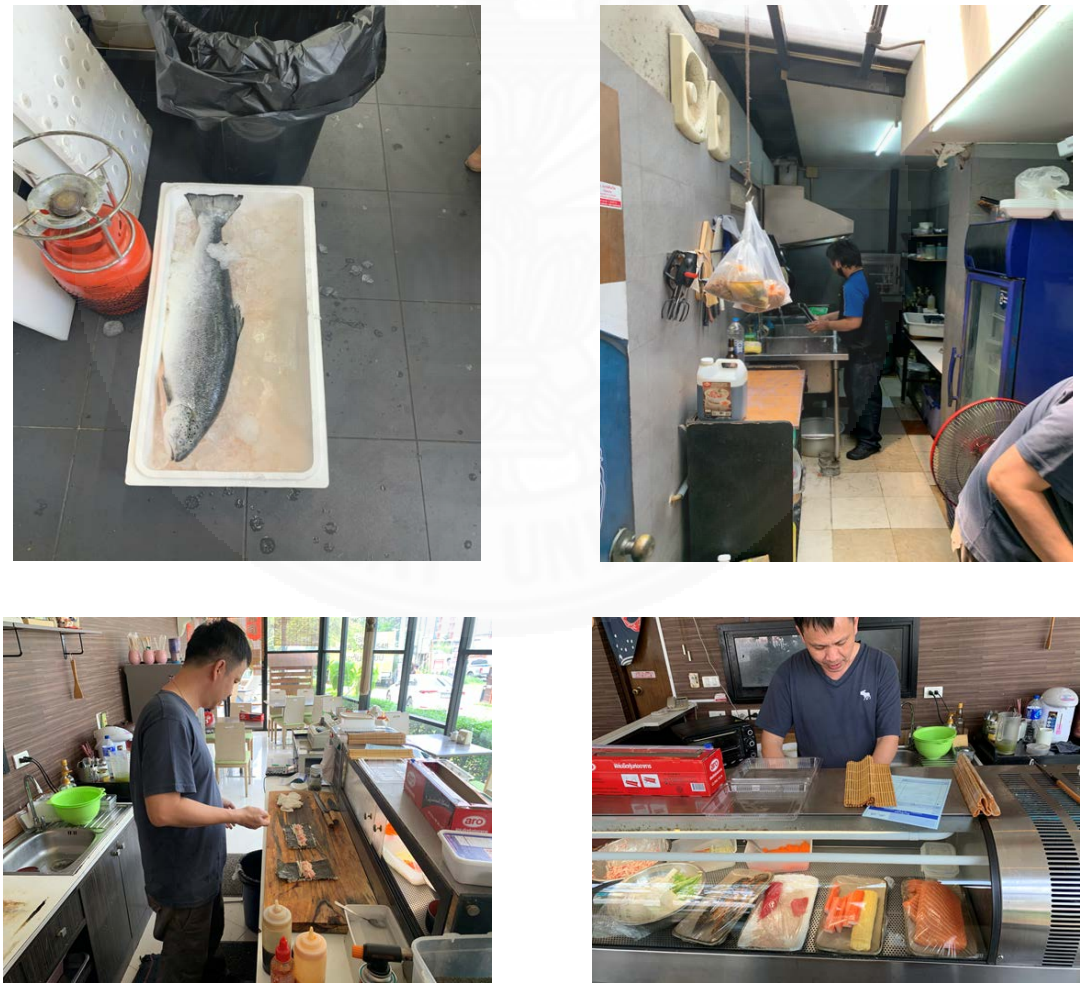


Figure A.8 Background of Kin Hashi

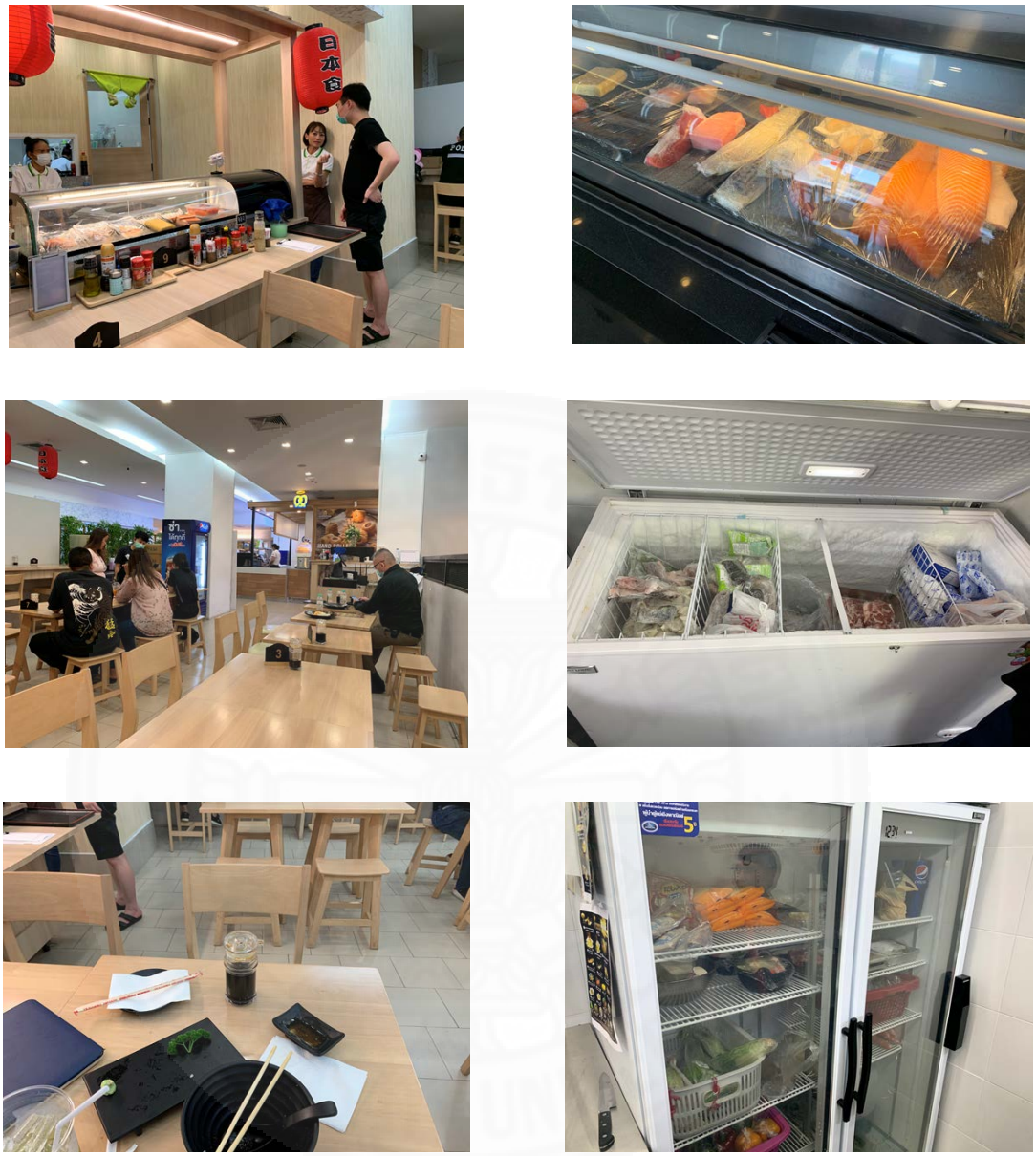
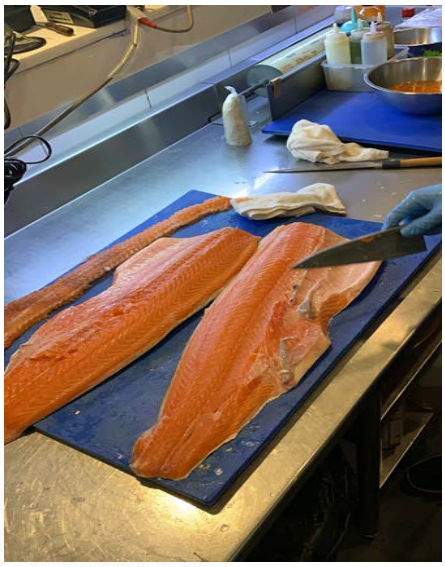


Figure A.9 Background of Sugoi Express




SUSHI ROLLS
FRIED SALMON SKIN
FRIED PHILLY ROLL

Figure A.10 Background of Blue Ocean Sushi

Interview Guide

Phase 1 : Introduction

A : Tell him/her about the background of the master thesis and the purpose of it

B: Tell him/her what we will use the interview for and how the data will be used

C: Ask if it is okay that we use the restanrant's name and him/her name as a source in the thesis

D: Ask if it is okay to record the interview

E: Start recording

Phase 2 : Open question (No guide and Bias)

A : Can you tell us how these restanrant currently doing.

B : Do you know how many per cent of food that come in your restaurant and being waste. (Introduction for measurement request)

C : Do you want to know what exactly number of money that you loss from wasted food

Phase 3 : Focus point

A : What things have you implemented to reduce food waste in your restaurant?

B: What challenges do you face with these things?

C: What benefits have you achieve by reducing food waste

D: Have you ever measure your food waste before? How?

E: What the next step that you will take to reduce food waste

F: What factor that you think it lead to food waste and how?1

G: What the supplier that you use and how frequent they come to your restaurant to send the raw material? And did supplier effect on your restaurant food waste

H: How much you order salmon(in kg) ? And how do you know it proper for the whole restaurant operation.

I: What is key point of reducing food waste in your opinion and why?

J: Did weekend and weekday effect your restaurant operation and your inventory management? (Includes Starting and ending of the month)

Phase 4 : Recap and summary

A : Ask if she has anything to add

B : Ask if she there is anyone she recommend we talk to

C : Repeat what we will use the information for

Figure A.11 Interview Guide

BIOGRAPHY

Name	Mr. Bancha Chawpraknoi
Date of Birth	April 17, 1997
Educational Attainment	2018: Bachelor of Science (Design, Business and Technology Management) Faculty of Architecture and Planning Thammasat University

Publications

Bancha Chawpraknoi & Archan Boonyanan. (2020). *Service Design Guideline to Achieve the Reduction of Food Waste in Independent Japanese Restaurants business in Thailand.* Built Environment Research Associates Conference, 11th, 25th June 2020, Bangkok, Thailand.

Work Experiences	Venture Builder PTT Public Company Limited