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**Sustainable strategies of restaurant food surplus platform as a framework for responsible tourism in the sharing economy**

The main purpose of this two-phases longitudinal study is to reduce the amount of food waste and food surplus in the restaurants in Taiwan. In study one, the systematic literature reviews, in-depth interviews, focus group interviews and simple survey were conducted simultaneously to construct the food waste critical control point and the factors influencing food waste. Based on the results of study one, this study will build the Restaurant food surplus platform to collect all the food waste information. Data will be examined and identified the particular points of food waste in the restaurants. The hierarchy of restaurant food waste and the food waste critical control point will be promoted all around the hospitality industry in Taiwan. At the end, the implication for the sustainable foodservice model of the sharing economy will be suggested for all the members in the hospitality industry. All of the major finding, implication, discussion, and recommendations will be provided for the government and restaurateurs in hospitality field.

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Key words: Food surplus, Food waste, Responsible Tourism, Food sharing economy, Restaurant food surplus platform (RFSP)

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## **Introduction**

In the present society, due to an excessively high food accessibility and rapid development and prosperity of advanced and developed countries, many issues relating to food waste and surplus are caused and are deteriorating. According to the statistics of the Food and Agriculture Organization of the United Nations (FAO), roughly one-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year (FAO, 2011). Such a large amount of food waste will cause environmental and social burdens, such as social structure problem, overexploitation of land, economic ills, food security issue, greenhouse effect, and unequal distribution of global food (Godfray, Beddington, Crute, Haddad, Lawrence, Muir, Pretty, Robinson, Thomas, & Toulmin, 2010). Further, according to the statistical database of the Environmental Protection Administration, 46, 000 tons of food waste were recycled in October 2016 in Taiwan, and the quantity of food surplus in the same period would be more astonishing if food waste not recycled was taken into account.

It is obvious that the food waste became a global issue and the majority of researches approached the issues from the sustainable agriculture and environmental point of view (Filimonau and Delysia, 2019). Food waste represented a dramatic challenge to hospitality enterprises. Even and has been brought lots of attention in hospitality industry, most studies paid attention on the quantification of food waste streams rather than on the food waste mitigation by the managerial approaches (Filimonau, Krivcova, and Pettit, 2019).

Currently domestic literature and researches on food waste/surplus are neither popular nor complete, while there are also few related foreign researches, until 2018 when related researches are published successively. However, most of such researches are still limited to engineering or biological decomposition and there are few researches focusing on academic discussions on food waste issue in Hospitality Industry. Accordingly, this study related to

collecting and summarizing literature data on global food waste/surplus and coping strategies, investigation into the overview of food waste/surplus in Hospitality Industry in Taiwan, case study on restaurants paying attention to food surplus issue and analysis of further details of food waste/surplus, in an effort to develop critical control points for food waste/surplus in restaurants and identify main factors influencing food waste/surplus through in-depth interview and focus group interview with restaurant operators and consumers. Furthermore, management strategies appropriate to actual food waste situation were discussed through establishing “Restaurant Food Waste Information Exchange Platform” and the feedback mechanism of the platform. In addition, “Sustainable and Sharing Economic Model of Restaurant via Food Surplus Reuse” is expected to be developed through interaction with members of the platform and discussion on research results. In view of the above, purposes of this study are: 1. To understand the current situation of and views on food waste/surplus in Hospitality Industry in Taiwan; 2. To establish restaurant food surplus information exchange platform; 3. To develop critical control points for food waste in restaurants and food surplus management model; 4. To assess the feasibility of “Sustainable and Sharing Economic Model of Restaurant via Food Surplus Reuse”.

## **Literature Review**

### *Responsible Tourism*

Responsible tourism is one of the vital issues of sustainable tourism. Sustainability has been seen as a concept or theory, while the responsibility was understood as appropriate action or practice. It is hard to make a clear distinguish between responsible and sustainable tourism, so Mihalic (2016) suggested to join two terms as “responsustainable tourism” and demonstrate that responsible behaviour is based on the concept of sustainability in tourism. The World Commission on Environment and Development (WCED) defined the term of sustainability in 1987 as meeting the needs of the present without compromising the ability of

future generations to meet their own needs (World Commission on Environment and Development, 1987). Responsible tourism can be any form of tourism in a responsible way to minimize negative impacts. Reducing food surplus and food waste in hospitality industry is one of ways of minimize negative impacts on tourism. The Responsible Travel Handbook (2006) indicated that sustainable tourism development should meet the needs of tourists in terms of protecting and enhancing the opportunities for the future. When maintaining ecological processes, cultural integrity, life support systems or biological diversity, those needs can be fulfilled in different aspects such as social, economic, aesthetic, environmental and others. Restaurants should take the social responsibility by emphasizing reducing food surplus and food waste.

On the other hand, responsible tourism should generate greater economic benefits and well-being for local people in communities. The first International conference on Responsible Tourism in Destinations (RTD) defined responsible tourism as reducing negative economic, social and environmental impacts, generating greater economic benefits, making positive contributions to the conservation of natural heritage, providing more enjoyable experience for tourists or local people, and others. In addition, RTD showed that the responsible tourism and sustainable tourism shared the same concerns, such as economic, sociocultural, environmental and other impacts (McLaren, 2006). Industries are more interested in the economic benefits of tourism to achieve sustainability, including the certification programs (Klein, 2011). Hospitality industry paly a vital role of tourism and should pay attention on reducing food waste for responsible tourism.

#### *The food surplus issues in hospitality industry*

Everybody understands the severity of global food waste issue. Food waste/surplus issue is also concerned by the public and all walks of life all over the world. Food waste relates to broad aspects in practice. There are so many parts in the process from cultivation,

harvest of food to dining table that are prone to food waste. Food waste is likely to occur at the origin of food materials, during process of delivery and selling of food, at the food preparation place and food consumption place. After 2010, most researches on food waste are conducted in the United States and the UK, and most of them are qualitative researches. Although scholars and experts know that food waste occurs not only at household level, but also during delivery, processing of suppliers and selling of retailers, most of their research topics are still limited to discussion on food waste at household level (Aschemann-Witzel, Hooge, Amani, Bech-Larsen, & Ostindjer, 2015).

Catering Industry in Hospitality Industry is a place supplying food for consumers and is the place of the highest possibility of food waste in respect of food preparation and eating behaviors of consumers. However, the severity of the adverse effect of the wastes produced by Hospitality Industry on the environment has been gradually identified by the public and scholars who have pointed out that this is an increasingly serious issue and we should gain an in-depth understanding of and discuss and try to address issues relating to the large amount of wastes produced by Hospitality Industry. (Pirani & Arafat, 2014), Pham Phu, Hoang, & Fujiwara (2018) stated that the wastes caused by the kitchen of a hotel account for 36% (nearly 40%) of the total amount of wastes produced by the hotel. Many scholars also set about implementing researches on food waste or surplus in Hospitality Industry (Pham Phu, Hoang, & Fujiwara, 2018; Papargyropoulou, Wright, Lozano, Steinberger, Padfield, & Ujang, 2016; Pirani & Arafat, 2014).

### *Food Sharing Economy*

Heo (2016) conducted a research on the present situation and outlook of sharing economy in Hospitality and Tourism Industry, and indicated that the popularity of Tourism Industry to sharing economy represents consumers' demand for close interconnection among

local communities. However, there are few researches on how tourists would use peer-to-peer network sharing economy service model, and there is neither assessment on tourists' actual experience of the actual accepted value of such sharing economy model nor comparison of differences and similarities between peer-to-peer network sharing economy model and traditional service model. Richard & Hamilton (2018) formed a food surplus exchange market platform integrating commercial peer-to-peer mutualization systems and sharing economy based companies, and also developed a two-side network-demand model. Research results show that secondary market is in a more urgent need for such sharing model, and standard design of sharing platform model could enable smoother delivery of food surplus in secondary market and therefore food waste reduction in an effective manner. A research also found that the quality of social interactions of peer-to-peer network sharing economy model and the relationship between tourists and host of sharing platform would play a vital role in respect of their perceived value and satisfaction. Further, perceived value of tourists to sharing economy service may vary with the accumulation of their actual use experience. Experts and scholars have not conducted further researches on the relations between such peer-to-peer network sharing economy service model and responsible tourism and sharing economy (Heo, 2016).

#### *Food surplus management by using big data*

Currently there are cases aiming at improving food surplus/waste issue by technical means all over the world, such as Spoiler Alert, Leftover Swap, Food Cowboy, AmpleHarvest in the U.S.A., Too Good to Go in Denmark, FoodCloud in Ireland and Foodsharing in Germany (Michellini, Principato, & Iasevoli, 2018). But there are still no cases aiming at improving food surplus/waste issue by technical means like those in European and American countries, despite developed technology and high network penetration in Taiwan. Irani, Sharif, Lee, Aktas, Topaloğlu, van't Wout, & Huda (2018)

analyzed food waste big data framework with a fuzzy concept. Scholars are of the view that this is a complicated issue, involving complicated logistics, substantial money, and material impact on our environment. Currently some countries such as Italy and France have compulsively required that food retailers must donate food other than throwaway food. More and more non-governmental organizations in various countries designed platforms for addressing food surplus by network platform and data integration technology, such as Wastewatchers, Quantzig, Food Cloud, ZEST LABS. Hotels, retailers, restaurants and supermarkets can reach local charities through such platforms after simple registration. In case of fresh but defective vegetables and fruits in grocery stores, bread that cannot be sold on the following day in bakery, or edible food without health concerns that fail to be sold out, related stores could upload descriptions of such food by using a scanning device or on the mobile app on smart phones, which could send messages to charities or people in need in seconds (Irani, et al., 2018).

## **Methodology**

This study tries to understand the current situation of and views on food waste/surplus in Hospitality Industry in Taiwan. In addition, it will develop critical control points for food waste in restaurants via the Restaurant food surplus platform.

### *Data Collection and Sample*

In order to find the sample that can represent the population precisely, the subjects were drawn from the members in the Taiwan restaurant association. They were chosen using proportionate stratified sampling to fulfil a precise representation of the population. The sample was comprised of restaurant owners who agreed to participate in this study anonymously. It is desirable that subjects were chosen from the Taiwan restaurant association because it showed that they got the problems of food surplus/food waste and

familiar with the food processes and procedures in the restaurants. Therefore, the sampling frame was defined as all the members of restaurant association. The subjects were selected randomly from the members chosen by using stratified random sampling and who were willing to participate in this study. The main research instrument is the food waste survey in the restaurant industry and it is a 7- point scale. The preliminary sample size of 147 is sufficient for the analyses of understanding the current situation of and views on food waste/surplus in Hospitality Industry in Taiwan.

### *Data Analysis*

After data collection, the data was analyzed by using the SPSS 24.0. and AMOS 24.0, a program for analyzing structural equation models. Structural equation modelling (SEM) is a powerful statistical tool for examining the relationships among constructs; it is a statistical technique that can be used to reduce the observed variables to a smaller number of latent variables. Descriptive analysis, t-test, and analysis of variance were used to analyze data collected via platform.

### **Findings**

Of the 147 subjects, the mean and standard deviation of the concerns of food waste is a serious problem in the restaurant industry are 5.4 and 1.9. The mean and standard deviation of food waste causes problems for the natural environment and energy resources are 5.5 and 1.4. The mean and standard deviation of food waste is a moral and ethical issue, are 5.8 and 1.4. The mean and standard deviation of food waste has a negative financial impact on my business are 6.0 and 1.2. Surprisingly, the mean and standard deviation of taking some specific actions to reduce waste are 6.2 and 1.0. In addition, the majority of food wastes both in the kitchen and customers are from vegetable and main courses. In average, 33% of food is wasted in the kitchen and caused by customers is from vegetable. Almost 20% of food is wasted in the kitchen is from main courses, while 31% of food is wasted is



caused by customers.

## **Conclusion**

While many countries have been developed many regulations or strategies to reduce food waste, the results showed the restaurateurs in Taiwan still did nothing with the food surplus. In order to tackling food waste in restaurant through the collaborative power of information communication technology (ICT) network, this study is building the restaurant food surplus platform (RFSP) and take advantage of ICT to add value and redistribute the surplus prepared food. The platform aims to offer a responsible solution to tackle food surplus and food waste in restaurant and finding the key factors of reducing food waste in restaurants. This study invited all the vulnerable restaurateurs to join the RFSP and provide all the information in terms of food surplus and food waste. The RFSP architecture will be based on the requirements presented in WP2. The restaurateurs, the amount of food surplus and food waste and the profiles of the restaurants will be derived. With all the data they provided, this study will identify the key points which result in the food waste in restaurants. On the hand, the data will foster collaborations among all the restaurateurs to create a more effective operational model for their business.

In summary, one of the preliminary results is to define the main points of food waste in the restaurants. In addition, all the participants in this study can understand all the information of food surplus and exchange the opinion with others via the RFSP. Both of restaurant staff and customers should be educated in terms of the fundamentals and strategies of reducing food waste. Besides, the results will drive behaviour change toward reducing food surplus and food waste. Most importantly, this study will offer a Taiwan-wide social innovation solution to food surplus and food waste.

The limitations of this study are shown as followings. The food surplus platform is not stable and reliable web content management system. Even this study tried to build it on

open source framework, the willingness of the subjects in Taiwan restaurant association was quite low. This is argued that restaurateurs are facing the dilemma of commercial economic value of restaurants and social responsibility in tourism.

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