

A Study of Food Waste Behaviour in Tertiary Institution

Emy Ezura A. Jalil; Chong Wing Ying; Chang See Min and Loo Mei Chen

Technology and Supply Chain Excellence Institute,
School of Technology Management and Logistics,
College of Business, Universiti Utara Malaysia,
06010 Sintok, Kedah, Malaysia.
ezura@uum.ed.my

Abstract

The increasing amount of food waste is perceived as a problem in urgent need of a solution to solve it. In this article, the relationship between users in public university and their food waste behaviour is accessed. Besides, this study also aims to examine reverse logistics across food waste recycling. The two key factors that had been found that affect the food waste behaviour among users in public university are knowledge and experience, and accessibility and availability. By using the survey method, a set of questionnaire was distributed to 400 users. In this study, there is a significant relationship between knowledge and experience as well as the accessibility and availability of food waste behaviour. This study contributed to university management and users in order to have adequate food waste management.

Keywords

Reverse Logistics, Food Waste Behaviour, Knowledge and Experience, Accessibility and Availability

1. Introduction

As concern about climate change, environmental responsibility, and sustainability escalates throughout the developed world. Reverse logistics is a relatively new business concept, and firms tend to dedicate their assets and resources on the forward operations and to overlook reverse logistics, and the value can be generated (Hazen, 2011). The significant reverse logistics in the food industry is evident in the requirement to provide quality and safe food to consumers without posing any threat to the environment. Wasted food is a considerable component of the world's food system challenges. Food waste can be described as all edible food materials produced for human consumption but left uneaten, either lost or discarded throughout the food supply chain (Haibin, & Chen, 2015). Food waste, on the other hand, is the food that is discarded by retailers and consumers, for instance, unsold food that is destroyed by a supermarket after they pass their expiry date as well as uneaten food at school buffets. According to FAO (2017), approximately one-third of food produced in the world for human consumption is lost and waste globally. The amount of loss and waste is about 1.3 billion tonnes per year. Food is lost and wasted throughout the supply chain means from the initial production until the household production (Wigmore, 2013).

Malaysia is well-known for its diversity of exotic cuisine, and we are proud of the diversity and tastiness of our food. Unfortunately, our familiar foodie environment turning into a culture of waste. According to the Statistics from Solid Waste Corporation Management (AlBakri, 2016), every year, an average Malaysian household throws away more than one month's salary on the food they do not eat. The issues of food loss and food waste are becoming more and more prevalent as essential matters for leaders to address as Malaysia's food security becomes a national concern increasingly. Despite the massive amount and complexity of food waste produces, the standard of food waste management in Malaysia is still weak. These include outdated documentation and framework of food waste generations rates and its composition, inefficient storage and collection system — furthermore, the lack of knowledge among users in public university about food waste issues and being ignorant about the effect that improper food waste management has lead worsened to the problem. This paper explores insight about the food waste behaviour which highlighted a complex inter-relationship between personal factor (knowledge and experience), situational factor (accessibility and availability).

2. Literature Review

2.1 Reverse Logistics on Food Waste

Reverse logistics can be explained in other literature terms like return logistics, reverse distribution, or retro logistics but all term is same meaning (de Brito & Dekker, 2004). Reverse logistics is different from waste management as the latter is mainly concern with the efficient and systematic collection and processing of waste (de Brito & Dekker, 2004). Reverse logistics is a process in a supply chain line which from the point of consumption to the point of recycling, remanufacturing, or disposal (Dowlathshahi, 2000). Food waste is another global issue that illustrates the unsustainable system of food production and consumption (Silva, 2016). Food waste is related to the behaviour of the food service provider and consumers (Segrè, 2014). Improper waste management especially food waste could affect the quality of the environment (Lai, Lim, Teh, & Yeap, 2017). Food waste considered as one of the sustainability issues that need to be addressed (Aschemann-Witzel, de Hooge, Amani, Bech-Larsen, & Oostindjer, 2015). Therefore, it is necessary to have a clear understanding of the factors that affect the user's food waste behaviour.

2.1 Personal Factors

2.1.1 Knowledge and Experience

According to (Papargyropoulou, Padfield, Rupani, & Zakaria, 2014), most of the users from education institution are lack of waste management knowledge. The users from education institution intend to recycle food waste, but due to lack of knowledge on who is accountable for the food waste refuse, cause them difficult to implement their food waste practice. Consumers lack knowledge of food waste, has led to a lack of awareness and behaviour toward food waste management (Aschemann-Witzel et al., 2015). Packaging is one of the wastes that influence the environmental (Otterbring & Gustafsson, 2012). However, the users from education institution are lack of knowledge about it (Papargyropoulou, Padfield, Rupani, & Zakaria, 2014). The whole food packaging system is vital to change the packaging's ability to reduce food waste and environmental impact (Williams & Wikström, 2011). This knowledge about the method to reduce food waste must let all consumers know. Therefore they can reduce food waste to prevent environmentally.

Source separation depends fundamentally on public university participation because individual households' behaviour and attitudes predominantly affect the success of recycling (Refsgaard & Magnussen, 2009). When the consumers have a system of sorting or dispose the food waste at the residential level, and people experience that their sorting efforts are followed up by others and appreciated later on in the process, then the consumer's behaviour and attitudes to recycling food waste may be influenced in a positive way (Refsgaard & Magnussen, 2009). Individuals continued recycling can change the behaviour of residents which these benefits at least match the extra effort (Refsgaard & Magnussen, 2009). According to Farr-Wharton (Farr-wharton, Foth, & Choi, 2014) stated that the knowledge of consumers have a theory is suitable for the consumers which the theory called a theory of planned behaviour (TPB). TPB is generally used to explain behaviour change by providing possible causes of behaviour through exploratory consumers' attitudes, beliefs, and intentions (Farr-wharton et al., 2014). TPB does not assist a consumer's knowledge and skill for particular actions.

Knowledge about food hygiene safety, food storage and an understanding of use best before dates were also seen as an essential tool to help avoid food waste (Graham-Rowe, Jessop, & Sparks, 2014). The people have confidence in food management was said to dissolve some of the uncertainties of getting sick (Graham-Rowe et al., 2014). Therefore, many residents when buying food will mind that food management with knowledge and experience was important if food waste is to be kept to a minimum.

2.2 Situational Factors

2.2.1 Accessibility and Availability

Accessibility of recycling opportunities affects the relationship between people's behaviour and attitudes toward waste management. Reducing food waste is motivation by a useful method to prevent environmental (Refsgaard & Magnussen, 2009). Managing waste is a way in the right direction and cycle of the food production process to prevent food waste. To reduce the amount food waste sent to landfill and food waste can be reused as feedstock to downstream treatment method or reverse logistics which can be namely composting or anaerobic digestion is the

method of separation of food waste at its initiation source is identified as useful (Karim Ghani, Rusli, Biak, & Idris, 2013).

For the availability of food waste that includes uneaten food and food preparation remains from residences such as institutional sources like a cafeteria (Karim Ghani et al., 2013). Food waste separation and minimisation programs have not been broadly implemented in Malaysia because of several constraints which include low awareness among waste generators and low demand of products from food waste such as manure (Karim Ghani et al., 2013). Food waste has been fundamentally limited to the investigation of its contribution to environmental change through landfill methane emissions and of management practices (Sonnino & McWilliam, 2011). To improved resource utilisation will positively influence the profits of the food industry, produce new growth and develop opportunities through the achievement of a zero waste economy (Sze et al., 2013). All people should keep in mind that food waste issue is not only linked with economic, social, and environment, but it is also an ethical issue which needs to be extremely considered and find the better ways to reduce the food waste (Abdul Ghafar, 2017).

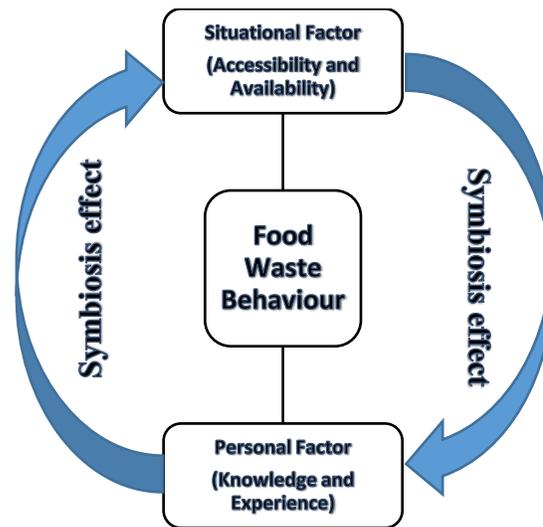


Figure 1: Research Framework of Situational Factors and Personal Factor That Affect Reverse Logistics on Food Waste Behaviour .Source: Adopted (A.Jalil, 2014) Symbiosis Effect

This study is constructed based on two particular factors from symbiosis effect supported by the studies of (A.Jalil, 2015). Personal factor in the form of knowledge and experience was considered necessary to influence the users recycle behaviour along with situational factors in the form of accessibility and availability was considered the precursors for users recycle behaviour. Therefore, the study tried to hypothesise as per below

H1: There is a significant relationship between knowledge and experience and food waste behaviour.

H2: There is a significant relationship between accessibility and availability and food waste behaviour.

3. Research Methodology

3.1 Sampling and Data Collection

Population in this research involves users in public university such as students, staff and food operators. The non-probability sampling is used in the study which is convenient sampling method. The sample size chosen for the research is 400 respondents. In the study, data is collected through a questionnaire. The questionnaire was distributed to respondents through google form. The type of scale used in the questionnaire was an interval scale, nominal scale, and ratio scale. The questionnaire was distributed through google form to respondents with Likert seven-point rating scale was used where anchored at each end only with descriptive labels. This scale is used to indicate the degree of agreement for each criterion, with 1 (extremely disagree) as minimum and 7 (extremely agree) as a maximum.

3.2 Research Design

Descriptive research and a correlation study are chosen to investigate the relationship between independent variables between the personal factor (knowledge and experience) and situational factor (accessibility and availability) to carry out the symbiosis effect (food waste behaviour). The quantitative approach is used to collect numerical data. A non-contrived setting is used in the research where minimal studies interferences. Besides, the unit of analysis for this research is considered as an individual group. In this research, a cross-sectional study is carried out over a short period or a single point in time. In the study, the study uses 400 respondents as a sample of a population (population size of 20 000). Table 1 provides a socio-demographic profile of respondents.

Table 1: Demographic Background ($n=400$)

ITEM	N	%
GENDER		
Male	163	41
Female	237	59
AGE		
20 and below	42	10
21-30	250	63
31-40	43	11
41 and above	65	16
COLLEGE/DEPARTMENT		
College of Business (COB)	221	56
College of Law Government and International Studies (COLGIS)	61	15
College of Arts and Science (CAS)	61	15
Others	57	14
TYPE OF USER		
Student	279	70
Staff/Lecturer	65	16
Food Operator	56	14

Based on table 1, the majority in this sample consists of 237 female users (59.3percent) and dominated by users between age 21 and 30 years, that is (62.5percent). Most of the users are from the College of Business (55.3 per cent); with students are the majority of the type of user (69.8 per cent).

4. Results

The reliability test was assessed in the study is to measure the internal consistency. Internal consistency reliability is to determine how well all questions on the measurement scale are related to each other. The higher the Cronbach's alpha score, the higher the internal consistency reliability. In the study, descriptive analysis is used to measure the central tendencies and dispersions in the questionnaire. Pearson correlation is used to measure the strength and direction of the linear relationship between variables in the study.

Table 2: Reliability Test of each variable. ($n=400$)

Variable	Number of Items	Cronbach's Alpha Value
Knowledge and Experience	8	0.579
Accessibility and Availability	6	0.732
Overall items	22	0.894

Table 2 indicates the Cronbach's Alpha value for the entire two studied variables. For knowledge and experience, there are 8 items and Cronbach's Alpha is 0.579. For accessibility and availability, there are 6 items and Cronbach's Alpha is 0.732. Therefore, the Cronbach's Alpha value for accessibility and availability variables are considered useful as it is a stable response and reliable as the value is between 0.7 and 0.9 (Panayides, 2013) whereas, the value

for knowledge and experience is less than 0.7 so it is considered as weak. However, the combination of the number of items has improved the Cronbach alpha values for an overall unit of measurement.

Correlation analysis was used to examine the occurrence and strength of the relationship between all variables which are knowledge and experience, accessibility and availability, and food waste behaviour. Based on table 3, the p-value for knowledge & experience is 0.000 at which it is less than α value of 0.01. Therefore the study concludes that there is a relationship between knowledge & experience and food waste behaviour. H1 which is a significant relationship between knowledge & experience and food waste behaviour should not be rejected. A positive relationship exists between knowledge & experience and food waste behaviour in which the correlation coefficient value, $r = 0.541$. This means that when knowledge & experience increases, sustainable food waste behaviour also increases. Based on table 3, the p-value for accessibility and availability is 0.000 at which it is less than α value of 0.01. Therefore the study concludes that there is a relationship between accessibility & availability and food waste behaviour. H2 which is a significant relationship between accessibility & availability and food waste behaviour should not be rejected. A positive relationship exists between accessibility & availability and food waste behaviour in which the correlation coefficient value, $r = 0.206$. This means that when accessibility & availability increases, sustainable food waste behaviour also increases.

Table 3: Pearson Correlation Analysis ($n=400$)

Item Pearson Correlation. (sig)	Food Waste Behaviour
Knowledge and Experience	0.541 (0.000)
Accessibility and Availability	0.206 (0.000)

5. Discussion

Reverse logistics is rarely discussed in recycling waste management (A. Jalil et al., 2016) and primarily focus on recapturing values from end-users back to the supply chain (Vlachos, 2014). In this study, it is perceived that women (Mainieri et al., 1997; Zalega, 2018) tend to participate in surveys that focus on environmental behaviours (i.e. recycling behaviour; waste behaviour; conserving energy behaviour) . This is an important finding because according to Schahn & Holzer (1990), they reported that gender as crucial in modifying environment behaviours. The objective of this study was twofold: (a) to investigate the relation of a personal factor which is knowledge and experience to the food waste behaviour among users in a public university and (b) to investigate the relation of a situational factor which is accessibility and availability to the food waste behaviour among users in a public university. Correlation analyses supported the hypotheses under study: Specific consumer knowledge and experience correlated food waste behaviour as well as accessibility and availability correlated the behaviour with the weakest strength in comparison to the latter (Derqui & Fernandez, 2017) which the author suggests that engagement among tertiary students are considered necessary to influence the recycling food waste behaviour effectively. A practical design of situational factors such as composting pit; secondary food take-back point and organic refuse system allow students to be more attentive in refuse their snacks and meals (Karim Ghani et al., 2015). Whereby, the study showed a significant correlation between situational factor (accessibility and availability) with food waste behaviour (A. Jalil et al., 2016). On the other hand, the personal factors that focus on the end users' knowledge and experience on how to dispose of the food waste after they consume can bring impact to the food waste behaviour. The finding showed that there is a strong relationship between knowledge and experience with food waste behaviour. This factor exerted the positive relation with significant value on users' behaviour hence, students likely to change their food waste behaviour if they are exposed to positive engagement and reinforcement in the tertiary setting (Karim Ghani et al., 2015). According to Derqui and Fernandez in their study, the level of food waste knowledge of the tertiary students in university level is still low (2017) due to the low awareness activities that provide the right knowledge on organic waste especially food waste. Thus, it is crucial to focus on this factor so that it can bring a revolution to tertiary education that focuses on future sustainable behaviour and conservation attitude (Abdul Ghafar, 2017).

6. Conclusion

The finding of the study generates a clear picture of how the critical factor has a significant relationship with food waste behaviour among users. The study has determined the knowledge and experience, as well as accessibility and

availability, are the essential factors when addressing the food waste behaviour of the users. Therefore, the tertiary institution should take action in combating food waste behaviour and strengthen the users' knowledge on sustainable behaviour that focuses on sustainable consumption and recycling or refusing sustainably of organic waste. The university setting is an example of a significant source for food waste especially the canteens and cafes. Melikoglu et al. argued when there are plenty of individuals dining at the same place, it has a significant impact when it comes to food waste (2013). Hence, it is essential to promote sustainable behaviour at the tertiary level.

Acknowledgements

This article is a partial report for the undergraduate final year research project.

References

- A Jalil, E. E., Grant, D. B., Nicholson, J. D., & Deutz, P. (2016). Reverse logistics in household recycling and waste systems: a symbiosis perspective. *Supply Chain Management: An International Journal*, 21(2), 245-258.
- A. Jalil, E. E. (2015). Reverse logistics and household recycling waste management. *Proceeding of the Asia Pacific Conference on Business and Social Science 2015, Kuala Lumpur* (pp. 1-14). *The Journal of Developing Area*.
- Abdul Ghafar, S. (2017). Food Waste in Malaysia : Trends , Current Practices and Key Challenges. *FFTC Agricultural Policy Platform, [online]* pp.1-10. Available at: http://ap.ffc.agnet.org/files/ap_policy/774/774_1.pdf [Accessed 22 Nov. 2017].
- AlBakri, D. (2016). Research shows Malaysians waste enough to feed millions daily [STAR online] Available at <https://www.thestar.com.my/news/nation/2016/05/31/food-and-money-down-the-drain-research-shows-malaysians-waste-enough-to-feed-millions-daily/> [Accessed 22 Jul. 2016].
- Aschemann-Witzel, J., de Hooge, I., Amani, P., Bech-Larsen, T., & Oostindjer, M. (2015). Consumer-Related Food Waste: Causes and Potential for Action. *Sustainability*, 7(6), 6457–6477. <https://doi.org/10.3390/su7066457>
- de Brito, M. P., & Dekker, R. (2004). A Framework for Reverse Logistics. *Reverse Logistics*, 3–27. https://doi.org/10.1007/978-3-540-24803-3_1
- Dowlathshahi, S. (2000). Developing a theory of reverse logistics. *Interfaces*, 30(3), 143–155. <https://doi.org/10.1287/inte.30.3.143.11670>
- FAO. (2017). SAVE FOOD: Global Initiative on Food Loss and Waste Reduction. Retrieved from *Food and Agriculture Organization of the United Nations*: <http://www.fao.org/save-food/resources/keyfindings/en/>
- Farr-Wharton, G., Foth, M., & Choi, J. H.-J. (2014). Identifying factors that promote consumer behaviours causing expired domestic food waste. *Journal of Consumer Behaviour*, 13(2), 393–402. <https://doi.org/10.1002/cb>
- Graham-Rowe, E., Jessop, D. C., & Sparks, P. (2014). Identifying motivations and barriers to minimising household food waste. *Resources, Conservation and Recycling*, 84, 15–23. <https://doi.org/10.1016/j.resconrec.2013.12.005>
- Haibin Chen, W. J. (2015). State of the art on food waste research: a bibliometrics study from 1997 to 2014, *Journal of Cleaner Product*. 1- 14.
- Hazen, B. T. (2011). Distribution and Consumer Research. Consumer reactions to the adoption of green reverse logistics, *The International Review of Retail*, 2-17.
- Karim Ghani, W. A. W. A., Rusli, I. F., Biak, D. R. A., & Idris, A. (2013). An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. *Waste Management*, 33(5), 1276–1281. <https://doi.org/10.1016/j.wasman.2012.09.019>
- Lai, K., Lim, S., Teh, P., & Yeap, K. (2017). An Artificial Neural Network Approach to Predicting Electrostatic Separation Performance for Food Waste Recovery. *Polish Journal of Environmental Studies*, 26(4), 1921–1926. <https://doi.org/10.15244/pjoes/68963>
- Mainieri, T., Barnett, E. G., Valdero, T. R., Unipan, J. B., & Oskamp, S. (1997). Green buying: The influence of environmental concern on consumer behaviour. *The Journal of social psychology*, 137(2), 189-204.
- Otterbring, T., & Gustafsson, A. (2012). Reasons for household waste with special attention to packaging_2012.pdf.
- Panayides, P. (2013). Coefficient alpha: Interpret with caution. *Europe's Journal of Psychology*, 9(4), 687–696. <https://doi.org/10.5964/ejop.v9i4.653>
- Papargyropoulou, E., Padfield, R., Rupani, P. F., & Zakaria, Z. (2014). Towards Sustainable Resource and Waste Management in Developing Countries : The Role of Commercial and Food Waste in Malaysia. *International Journal of Waste Resources*, 4(3), 2–7. <https://doi.org/10.4172/2252-5211.1000151>

- Refsgaard, K., & Magnussen, K. (2009). Household behaviour and attitudes with respect to recycling food waste - experiences from focus groups. *Journal of Environmental Management*, 90(2), 760–771.
<https://doi.org/10.1016/j.jenvman.2008.01.018>
- Segrè, A., Falasconi, L., A., P., & Vitturari, M. (2014). Background paper on the economics of food loss and waste. *Working Paper (FAO)*, 1–83.
- Silva, J. G., (2016). SAVE FOOD: Global Initiative on Food Loss and Waste Reduction. Retrieved from *FAO.org*:
<http://www.fao.org/save-food/news-and-multimedia/news/news-details/en/c/429182/>
- Sonnino, R., & McWilliam, S. (2011). Food waste , catering practices and public procurement : A case study of hospital food systems in Wales. *Food Policy*, 36(6), 823–829. <https://doi.org/10.1016/j.foodpol.2011.09.003>
- Sze, C., Lin, K., Pfaltzgra, A., Herrero-davila, L., Mubofu, E. B., Abderrahim, S., Thankappan, S. (2013). Environmental Science chemicals , materials and fuels . *Current situation and global perspective*, 426–464.
<https://doi.org/10.1039/c2ee23440h>
- Vlachos. (2014). Reverse food logistics during the product lifecycle, *International Journal of Integrated Supply Management*, 3-20.
- Wigmore, I. (2013, March). Supply Chain. Retrieved from *WhatIs.com*:
<http://whatis.techtarget.com/definition/supply-chain>
- Williams, H., & Wikström, F. (2011). Environmental impact of packaging and food losses in a life cycle perspective: A comparative analysis of five food items. *Journal of Cleaner Production*, 19(1), 43–48.
<https://doi.org/10.1016/j.jclepro.2010.08.008>
- Zalega, T., 2018. Sustainable Consumption In Consumer Behaviour Of Polish Seniors (Report From Own Research). *Acta Scientiarum Polonorum*, p.131.

Biography

Emy E A Jalil is a senior lecturer and a Director of Technology and Supply Chain Excellence Institute in School of Technology and Logistics Management, University of Utara Malaysia. She earned B.Science of Business. in Business Administration with Cum Laude from Oklahoma City University, USA and graduated her Masters in Logistics Management from the Sydney University, Australia and gained her doctoral degree in Management from University of Hull, UK. Currently, Dr A Jalil is a Chief-Managing-Editor for Journal of Technology and Operation Management. She has published journal and conference papers. Dr A Jalil had two on-going types of research funded by the Ministry of Education, Malaysia and completed three national research projects. Her research interests include logistics and supply chain that scope into Islamic practices in SC, urbanization, humanitarian, modern-day slavery, sustainability. She is a member of IEOM, CILT, ISWA and MLogM.