

THE MODERATING EFFECTS ON VOLUNTARINESS OF USE SOCIAL MOBILE APPLICATION IN THE RELATIONSHIPS BETWEEN HOUSEHOLDS BEHAVIOURAL FACTORS AND PREVENTING FOOD WASTE IN MALAYSIA

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Abstract

Food waste and food co-products waste create huge environmental, economic and social problems (Mourad, 2016): 1.3 billion tons of food are being lost or wasted annually (FAO, 2011) whilst packaging and non-consumable material associated with the food chain are added burdens to the consumer, the industry and the environment (Olsmats and Wallteg, 2009; Williams et al. 2012; Ferreira da Cruz et al, 2012; Ferreira da Cruz et al, 2014). In Malaysia, as reported by Bernama (2016, May 24) inside a day of 15,000 tones rubbish from food waste dumped by each family in Malaysia including 3000 tones that it still fit for consumption and should not be discarded (Bernama (May 24, 2016).Malaysians waste 15,000 tons of food daily. New Straits Times). Measures for addressing food waste vary widely, however, the common food waste (FW) strategies is Food Waste prevention (FOA, 2013). Yet even though waste prevention principally is to be prioritized, it is rarely an integral part of the local waste management (Bartl, 2014; Van Ewijk and Stegemann, 2014). At the same time, social mobile applications in recent years have been enabling new ways for preventing the food waste by enhancing a peer to peer and direct connection between givers and beneficiaries of food. Particularly when web platforms are associated with social networks, they can play an important role in promoting the community, stimulating the civic engagement and involving new members (Ganglbauer, Fitzpatrick, Subasi& Guldenpfennig, 2014).The present study use Smart PLS as testing method tools for analysis between variables voluntariness use social mobile applications and household's behaviors in preventing food waste . In the primary research the present study use an analysis method which is a quantitative study consisting of 530 households from entire Malaysia excluded Sabah and Sarawak. To summarize, the Composite Reliability ranged from 0.839 to 0888 which exceeds the recommended level of 0.7. Besides that, AVE values range between 0.512 and 0.571 that indicate a good level of construct validity of the measures used. The findings of this study highlight the contributions in literature, households, policy makers and telecommunications industry as far as food waste is concern.

Keywords: preventing food waste, voluntariness factors and household behavioral factors

Introduction

Every year there are a large amounts of the food available for human consumption are lost or wasted in the vary stages of the food supply chain especially during festive season in Malaysia.. Recent estimates suggest that globally food losses and waste amount to about 24 per cent of all food supplied for human consumption (Kummu, M., De Moel, H., Porkka, M., Siebert, S., Varis, O., & Ward, P. J. ,2012). Food losses refer to those losses in production, post-harvest and processing of food, while food waste represents losses at the distribution and consumption stages (Gustavsson, J., Cederberg, C., Sonesson, U., Van Otterdijk, R., & Meybeck, A. ,2011; Kummu, et al.,2012). In the higher income countries (e.g. in Europe), the biggest contributors to food waste are distribution and consumption (i.e. household level) while in the lower income countries (e.g. Sub-Saharan Africa) it is the agricultural and post-harvest stages which account for much of the food loss generated (Kummu, et al., 2012; Parfitt, J., Barthel, M., & Macnaughton, S. ,2010). Besides that, there is a growing recognition that these two problems (waste disposal and resource depletion) can be solved together through the utilization of waste as a resource, using green and sustainable technologies (Luque and Clark, 2013; Thi et al. 2016). At the same time, there is growing awareness that new consumption models are needed to minimize the amount of food wasted at the end of the supply chain, an issue particularly relevant in high-income countries where more than 40% of the food losses occur at retail and consumer levels (FAO, 2011).A number of prevention and mitigation measures, proposed by various countries, have been already put in place to reduce food waste (FAO, 2014b). However, along with such practical solutions, new waste technologies as well as alternative consumption models are urgently needed.

Implications Of Household Food Waste

Food waste has bad implications towards economic, environmental and social if not preventing. Food waste has substantial economic impact (Evans, 2011b; WRAP, 2011; Morrissey and Browne, 2004). The economic cost of global food wastage in 2007 was estimated at USD 750 billion (FAO, 2013). Quested et al. (2011) suggest that the food and drink wasted in United Kingdom homes that could have been eaten has a retail value of approximately £12 billion. WRAP's study estimates that each household throws away between £4.80 and £7.70 of food that could have been eaten each week, which amounts to £250-£400 a year or £15,000-£24,000 in a lifetime (WRAP, 2007). The food waste constitutes misfortunes at the dissemination and utilization stages (Gustavsson, Cederberg, Sonesson, van Otterdijk, & Meybeck, 2011; Kummu, et al., 2012). It also has been proved by Ministry of Housing & Local Government (2011) stated in the Table 1 which households is the main sources contributing food waste in Malaysia.

Table 1
Table for sources of food generated in Malaysia

ESTIMATION FOODS WASTE GENERATED IN MALAYSIAN SOURCES OF FOODS	RATE		GENERATION	
	TON DAY	/	TON YEAR	/
HOUSEHOLDS	8,745		3,192,404	
WET & NIGHT MARKETS	5,592		2,040,929	
FOODS COURTS/RESTAURANTS	5,319		1,941,608	
HOTELS	1,568		572,284	
FOOD & BEVERAGES INDUSTRIES	854		311,564	
SHOPPING MALLS	298		108,678	
HYPERMARKETS	291		106,288	
INSTITUTIONS	55		26,962	
SCHOOLS	45		21,808	
FAST FOODS/ CHAIN SHOPS	2521		808	
TOTAL	22,793		8,331,589	

SOURCES: (Ministry of Housing & Local Government, 2011)

Moreover, according a research done by Solid Waste Corporation Technology Research Division environmental control Officer Agustina Fithri Kasmaruddin and which highlighted in The Star Online (2016, 31 May), average Malaysian household throws away more than one month's salary on food they don't eat. It is showed that, the fact that a quarter of food is wasted during preparation, production and consumption, the value of food thrown into the trash can every month is equivalent to RM225. This would total a whopping RM2, 700 a year, which is more than RM2, 400, the mean monthly salary for an individual in an urban area, according to the Department of Statistics' Salaries & Wages Survey Report 2014 (Danial Albakri, The Star Online, 2016, 31 May). Figure 1 showed that the Malaysians generate 38,000 tons of solid waste per day in 2016, of which 15,000 tons come from food waste and the average of Malaysian spends a month for food.

Figure 1
Average Malaysian throws away per day



Sources: Solid Waste Corporation (2016)

Besides that, Gustavsson et al. (2011) and Lundqvist et al. (2008) highlight the economic value of the food produced throughout the Food Supply Chain. They suggest that avoidable food losses have a direct and negative impact on the income of both farmers and consumers. For the smallholders living on the margins of food insecurity, a reduction in food losses could have an immediate and significant impact on their livelihoods. For consumers affected by food poverty the priority is to have access to food products that are nutritious, safe and affordable. Food insecurity is often more a question of access (related to purchasing power and prices of food) than a supply problem. Improving the efficiency of the Food Supply Chain has the potential to bring down the cost of food to the consumer and thus increase access. Considering the magnitude of food losses in the Food Supply Chain, making profitable investments in reducing losses could be one way of reducing the cost of food.

Therefore, there is an urgently needed of empirical studies along with practical solutions towards preventing food waste. However, as presented in Table 2 shown, there is lack of empirical study on Asia including Malaysia in food waste.

Table 2

Recent policies, regulations and official plans addressing household food waste in some countries

Regulations, policies, and plans	Main content	Issuing date	Issuing division
Brazil			
National Policy on Solid Waste (Law 12.305/2010)	Closing of all open dumps by 2014. Separation and collection recyclable waste and wet organic waste are aimed at 36%, 53%, respectively, by 2031.	2010/08/02	Brazilian government
China			
- Food Security Law	-Regulations on safety issues of FWtreatment.	2009/02/28	Chinese government State Council
- State council circular to further enhance grain saving and FW reduction	-Detailed countermeasures on organizing, educating, supervising, and inspecting the work on food waste reduction in China.	2010/01/18	Ministry of Environmental Protection
- China's 12th Five-Year Plan (2011e2015) for Environmental Protection	-Detailed plan for household waste collection and treatment (a safe treatment rate of 80% in urban areas by 2015).	2011/12/15	
Malaysia			
Solid waste Management Act and Public Cleansing 2007	Segregating household waste at home by separated bins include organic bin and recyclable waste material bin.	Gazetted on 2007/08/30 and enforced on 2011/09/01	Malaysian government
Thailand			
National 3Rs Strategy and the 3Rs Act	The 3Rs Strategy aims to increase organic waste utilization by 50% before 2026.	Draft (be issued soon)	Pollution Control Department

Turkey - The by-law on Landfill of waste (No:27533 2012/03)	The law aimed to decrease the amount oflandfilled FW by operating compostingfacilities and facilities for electricityproduction from methane gas.	2010/03/26	Turkish government
The EU Landfill Directive (99/31/EC) will be carried out by 2025	The EU Landfill Directive will be carried outby 2025 for reducing of biodegradablewaste amounts.	1999/04/26	European Parliament

Sources: Thi, N. B. D., Kumar, G., & Lin, C. Y. (2015)

Voluntariness Use Social Mobile Applications

Voluntariness use Social Mobile Applications refers to whether or not an individual is mandated to use a particular technology (Venkatesh& Morris, 2000). Venkatesh et al. (2003) explained that the majority of past technology acceptance research has focused on technology where participants primarily volunteer to use it. Voluntariness were proven to moderate social influence, with older women under mandatory conditions with little experience having the strongest effect (Venkatesh et al., 2003). According to the Unified Theory of Acceptance and Use of Technology (UTAUT) model, voluntariness moderates the effect of social influence on intention to use (Venkatesh et al., 2003). Other than social influence, a meta-analysis study (Wu J, Lederer A, 2009) found that voluntariness also moderates the effects of ease of use and usefulness on the intention to use a new information technology. While the present study measure and focuses on actual use which is the voluntariness of use social mobile applications in preventing food waste instead of intention to use because there is limited empirical evidence of the moderating voluntariness on actual use in the previous studies (Wu J, Lederer A, 2009).

Previous studies had discussed on the adoption of social mobile application. For an example, Bucci et al. (2010) examined social mobile application such as a fridge that alerts users about product expiration dates, suggests recipes, sends shopping lists via Short Message Service or email, and posts messages to household members contributing to preventing food waste. Thieme et al. (2012) examined an adoption on social mobile applications such as BinCam, a camera placed in a bin alerting consumers of their activities in preventing food waste.

Therefore, present study examined the effect of voluntariness use social mobile applications that assist household's behaviors in order to preventing food waste in Malaysian context . The present study suggested voluntariness use social mobile applications assist the households behaviors in preparing too much of foods especially while hosting an open house for the festive season. It contributed in reducing the statistics during festive seasons such as Eid where the food waste increasing about 1,000 tons to 9,000 tons per day comparing to 8,000 tons per week (Bernama, 19 June 2015). Besides that, the moderator also alerting the households behaviors with considering

the usefulness of shopping list during preparation, production and consumption to avoiding them throws away more than one month's salary on food they don't eat.

Another solution to assist household's behaviors is food sharing. Sharing food is not a new practice. Social mobile applications such as Food bank application is a types of establishments operate by sharing food to those who need it, rather than allowing it to be wasted. Some establishments also provide further benefits to their members to increase community engagement in educating members. For example, casseroleclub.com is a social enterprise that brings together cooks and connects them with people interested in cooking, to increase social engagement and preventing food waste. Recent technological advancements have improved the ability to share food. For example, Ganglbauer et al. (2014) explored the voluntariness use social mobile application such as FoodSharing.de platform to facilitate food sharing amongst consumers, farmers, organizations and retailers in order to preventing food waste in Austria and Germany.

Their findings showed that the voluntariness use social mobile application which is the FoodSharing.de platform successfully facilitated the sharing of food amongst large numbers of participating people, as evidenced in 17,000 active users sharing just under 1,800 food baskets within their online community. Their research showed that voluntariness use social mobile applications could assist or facilitate in the process of food sharing between communities. Similarly, Grimes and Harper (2008), and Wei and Nakatsu (2012) provide further support for using technology to promote the sharing of food by bringing people together for social interaction and entertainment. While the present study explored the engagement of voluntariness use social mobile applications to facilitate the process of food sharing between communities in order to preventing food waste.

Results

Voluntariness Use Social Mobile Application

In the present study, seven items was adapted from Venkatesh et al. (2003) adoption of mobile technologies scale to measure voluntariness use social mobile application. The result of the study by Venkatesh et al. (2003) indicates that male users tend to be influenced by performance expectation when forming their voluntariness toward mobile technology usage ($\beta_{\text{Male}} = 0.674$, $t\text{-value} = 4.074$; $\beta_{\text{Female}} = 0.006$, $t\text{-value} = 0.052$), while social influence was the most important factor shaping attitude towards using mobile device ($\beta_{\text{Male}} = 0.266$, $t\text{-value} = 2.272$; $\beta_{\text{Female}} = 0.323$, $t\text{-value} = 2.310$). Additionally, the effect of effort expectancy had relatively higher strength in the female group ($\beta_{\text{Male}} = 0.195$, $t\text{-value} = 2.196$; $\beta_{\text{Female}} = 0.210$, $t\text{-value} = 2.146$). All of the antecedents including performance expectation, effort expectation, and social influence show stronger effects on explaining voluntariness toward using mobile technology. Researcher results are as follows indicated of results as previous researchers. The outcomes as table below of this research were almost as according to previous research.

Table 3
Reliability and Validity of Constructs (n=530)

Latent variables	No. of Indicators	Average variance extracted	Composite reliability
Preventing Food Waste	7	0.512	0.839
Voluntariness Use Social Mobile Applications	6	0.571	0.888

Table 4
Structural Model Assessment with Moderator

Hypotheses	Relation	Beta	SE	T-Value	Findings
H5(a)	Attitudinal Factors* Voluntariness Use Social Mobile Applications-> Preventing Food Waste	0.088	0.050	1.782**	Supported
H5(b)	Habit*Voluntariness Use Social Mobile Applications -> Preventing Food Waste	0.100	0.050	2.049**	Supported

Note: ***Significant at 0.01 (1-tailed), **significant at 0.05 (1-tailed), *significant at 0.1 (1-tailed).

As indicated in Table 3, the composite reliability coefficient of each latent construct ranged from 0.839 to 0.888, each exceeding the minimum acceptable level of .70 (Bagozzi & Yi, 1988; Hair et al., 2011). Likewise, as indicated in Table 3, the values of the average variances extracted range between .512 and .571, suggesting acceptable values. Besides that, Table 4 also showed that, Hypothesis 5(a) predicted that is moderating effects between attitudinal factors and preventing food waste. Result (Table 4) indicated that the interaction terms representing attitudinal factors x voluntariness use social mobile applications ($\beta = 0.088$, $t = 1.782$, $p < 0.01$) was statistically significant with positive relationship effects and the relationship is significant. Hence, Hypothesis 5(a) was supported. Next is examining the relationship on moderating effects between habit and preventing food waste. Result (Table 4) indicated that the interaction terms representing habit x voluntariness use social mobile applications ($\beta = 0.1000$, $t = 2.049$, $p < 0.01$) was statistically significant with positive relationship and the relationship is significant. Hence, Hypothesis 5(b) was supported.

Summary

From this research and with the previous findings on social mobile applications showed in table 3 and 4 above with the voluntariness use that applications it's useful to encourage household behaviors. Its means, with voluntariness use social mobile applications assist to alerting the households with their attitudes with considering the usefulness of shopping list during preparation, production and consumption to avoiding those throws away more than one month's salary on food they don't eat. One of the contributing factors towards food waste as mentioned by Porpino, G. (2016) households experience problem consumers reinventing new meals of their leftovers. Therefore, with the voluntariness use social applications, its assist households to facilitate the process of food sharing between communities by establishments operate by sharing food to those who need it, rather than allowing it to be wasted.

Besides that, with Voluntariness use social mobile applications present an excellent opportunity to advance the work of behavioral economics theory because of the sheer volume of users, 56% of adults, and the frequency with which people use this technology and thus, the opportunity to reshape households habits by making healthy decisions "easy" through a commonly used product (A. Smith,2013). This ubiquity provides a major opportunity to influence behavior to have good eating consumption and able to preventing food waste, typically at a lower cost of implementation compared to other technologies (K. H. Ly, P. Carlbring, and G. Andersson, 2012; M. J. Boschen and L. M. Casey, 2008). To understand the significance of voluntariness use social mobile applications for encouraging consumption of healthy or local food, however an appropriate research design grounded in behavioral economics must be implemented.

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