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Research Article

Acceptance and Satisfaction of Food Waste Mobile Application in a Developing Country: Insights from Extended UTAUT2 and IPMA

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ABSTRACT

Food waste is a major global problem and has prompted the development of digital solutions such as food waste mobile applications (FWMA). However, factors influencing the user adoption of these applications, especially in developing countries, remain unexplored. The purpose of this study is to analyze existing behavior towards FWMA and modeling factors that influence acceptance of FWMA in the developing country - Indonesia, while also observing efforts to improve its effectiveness and user satisfaction. To achieve this, an acceptance model is developed using the Extended Unified Acceptance and Use Theory 2 (UTAUT2 Extended) model. Moreover, the Importance-Performance Matrix Analysis (IPMA) framework is used to identify areas for improvement and prioritize efforts to increase customer satisfaction in the application of the FWMA. A preliminary sample of 79 respondents completed an online questionnaire consisting of 30 questions and using a five-point Likert scale with anchor values of strongly agree and strongly disagree. The results show that the average frequency of purchases made by respondents via the FWMA system is relatively low, i.e., three or less per month, and that the majority of respondents learnt about the FWMA system from social media and their friends. As far as demographic data is concerned, women are more likely to use the FWMA than men. In particular, according to the UTAUT2 Extended Model, factors influencing satisfaction with the use of FWMA include social influence, habit and trust; furthermore, satisfaction and different food choices influence the intention to use the use of FWMA. Finally, the IPMA results reinforce the focus on increasing satisfaction through diversified food choices by providing a framework for developers and policy makers to support the uptake of the FWMA in developing economies by building trust, promoting habits and strategically increasing food diversity.

Keywords: Acceptance, satisfaction, Food Waste Mobile Application, Indonesia, extended UTAUT2, IPMA

INTRODUCTION

The global issue of food waste has been increasing recently. Food waste is a critical global challenge, with over one-third of produced food never consumed [1], [2], or approximately 17 percent of global food production is wasted [3], [4]. It is representing an annual economic loss of $936 billion [5] and contributing significantly to environmental degradation [1]. Not only relates to economical issue, food waste also relates to social and environmental issue. From the social point of view, the Food and Agriculture Organization of United Nations (FAO) stated that nearly 690 million people of the world population are hungry. Moreover, almost 750 million people are exposed to severe levels of food insecurity. Worst, two billion people in the world do not have regular access to sufficient food. This lack of food all over the world is in contrast with over 1.3 billion tons of food are annually wasted at the global level. For the highlight, in long term, the food waste cause food insecurity and malnutrition. High quantities of food waste come

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with negative consequences on environments. The environmental consequences stem from wasted resources and greenhouse gas emissions, as a result of both production and decomposition of wasted food. In more detail, FAO stated that food waste is contributed to 8% of global greenhouse gas emissions, 20% of freshwater consumption, and 30% of global agricultural land use [5].

Huang et al. [6] review different meaning of food surplus, food waste, and food loss. Food surplus refers to overproduction of food in agricultural production processes and post-harvest oversupply. Food waste occurs at the end of the food supply chain, both retail and consumption. The waste can be found in restaurants due to misestimate the purchase quantity, excessive amounts of vegetables and fruits for promotions; and waste due to approaching dates and validity periods. Whereas food loss refers to any food that is wasted during post-harvest processing or transportation of agricultural products at an early stage of the food supply chain. In addition, Food and Agriculture Organization (FAO) defined food waste as 'the masses of food lost or wasted in the part of food chains leading to "edible products going to human consumption" [4].

Problems of food waste are differing across regions [2]. Developed regions, such as Europe, North America and industrialized Asia, waste more food than developing countries [4]. In developed and high-income countries, most food waste is created by retail and end-consumers as a consequence of overconsumption such as buying [7], [8], preparing [9], and serving too much food [4], [10], [11]. Whereas in low-income countries poor infrastructure, especially for storage, inefficient technologies and climate conditions lead to wastage at post-harvest and processing stages. In addition, Huang et al. [6] review that to reduce food waste, studies have been launched, and their recommendations include household storage, cooking guidance and waste recycling.

Some efforts have been made to overcome food waste. First, reducing food waste can be done for example by composting food waste [12] and anaerobic digestion (see [13] for an example). Another option is foods made from surplus ingredients, so called value-added surplus products (VASP) [1]. It can be a promising solution to this crisis if appropriately marketed to consumers. However, the key to commercializing these foods lies in understanding and guiding consumers' perceptions of such foods that will make them more acceptable to consumers. The road of VASP is however, still takes time and effort. In addition, a study by McCharty et al. [14] stated that consumers who are price conscious, convenience oriented, status seeking and concerned about the consequences of food waste are more willing to buy VASP than others.

The distribution of food waste is absolutely one of the leading solutions to the food waste problem and important factor of circular economy [15]. On chain of the food distribution is food donation. As stated by Sanyal et al. [16], food donation is a necessity for today's society in order to counter the food waste. However, this effort heavily relies on volunteers who deliver the food waste to recipients over various distances. Volunteer availability is an issue that is dependent on several different factors and plays an important role in the success of food donation.

Beside donation, selling is another solution to food waste [2]. Business models evolve continuously due to both changes in the market and advent of technology, resulting in emergence of new exciting trends. The emergence of food sharing websites and mobile applications have the potential to radically disrupt food commodity lifecycles from production through to disposal [17]. However, the reduction of food waste through the application depends on consumers' shopping behaviour and their willingness to adopt businesses that sell surplus food [2].

While valuable, these solutions regarding food distribution often face scalability and logistical challenges. Digital technology, however, offers a promising avenue to overcome these hurdles, leading to the emergence of Food Waste Mobile Applications (FWMAs). Hong et al. [18] review digital application that offers leftover food information from various stake holders such as bakeries, restaurants, grocery stores, and other food suppliers including house wives to the public. The ultimate goal of this digital application is saving food that will likely go to waste. Apostolidis et al.

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[19] state that such digital application of food waste through mobile application is food waste mobile applications (FWMAs).

A FWMA is an online platform that connects food suppliers or donors with organizations or individuals who can benefit from the excessive food [20], [21]. Excessive food here refers to food that is still safe and edible but would otherwise go to waste due to reasons such as overproduction, expiration dates approaching, or cosmetic imperfections. The purpose of a FWMA is to reduce food waste by redirecting excessive food to those in need or finding alternative uses for it. These applications act as intermediaries, facilitating the redistribution of excessive food and ensuring that it reaches individuals, charities, food banks, or other organizations that can utilize it [22], [23]. Tracxn [24] closely track the startup ecosystem from across the world and have come across a whole lot of interesting new themes which are gaining popularity. Globally there are 166 FWMAs. Such FWMA are for examples *Olio*, *Karma*, *Too Good To Go*, *NoWaste*, *FoodCloud*, *Nosh*, and *Kitche*. All of them have provided digital solutions aimed at minimizing food waste by facilitating the sharing of surplus food.

As a promising technology, FWMA has been developed and implemented in several countries in particular in developed country for example Australia [25], [26], [27]; UK [19], and Italy [28]. Although the FWMA is recognized as a growing tool in reducing food waste particularly at the household level, more specific and detail of global percentages of food waste app usage are not readily available. However, some reviews suggest that these FWMA can raise awareness about food waste, and more importantly, lead to a reduction in household food waste.

While FWMAs are being developed and deployed, a critical gap remains in understanding the factors driving consumer willingness to adopt them, particularly outside Western contexts. This aligns with the call by Hong et al. [18] for more quantitative studies across diverse cultures. Specifically, in the Indonesian context—a country with a severe food waste problem—the determinants of FWMA acceptance remain unexplored.

Indonesia is the country with the most food waste production in Southeast Asia [29]. Annually, the total food waste reaches 20,93 million tons. Even worse, at the world level, Indonesia ranks second in food waste. A review stated that the big contribution to wasted food comes from hotels, restaurants, catering, supermarkets, and most importantly, the behavior of people who like to leave their food or uneaten [30]. Therefore, combating the food waste in Indonesia is crucial.

To ensure the effectiveness of such technology, acceptance plays an important role. The acceptance of technology refers to the willingness and readiness of individuals or groups to adopt and use a particular technological innovation [31]. It involves their attitudes, beliefs, and behaviors towards technology, as well as their perceptions of its usefulness, ease of use, and potential benefits. Several factors influence the acceptance of technology, and various theories and models have been developed to understand this phenomenon. One widely recognized model is Unified Theory of Acceptance and Use of Technology (UTAUT).

The Unified Theory of Acceptance and Use of Technology (UTAUT) [32] is a robust model that explains technology adoption through four key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. UTAUT identifies four main constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to the degree to which an individual believes that using a particular technology will enhance their job performance or make tasks easier and more efficient. Effort Expectancy refers to the perceived ease of use and the degree of effort required to learn and operate the technology. Social Influence refers to the influence of influential individuals or groups on the user's decision. Facilitating Conditions refers to the extent to which individuals perceive that the necessary technical and organizational infrastructure is in place to support the use of the technology [32], [33]. The development of UTAUT, that is UTAUT 2, incorporates three new constructs—hedonic motivation, price value, and habit—into the original UTAUT framework to improve its ability to predict user behavior.

While UTAUT as well as UTAUT2 effectively identifies which factors influence acceptance, it does not guide practitioners on where to prioritize improvement efforts for maximum impact. To address this managerial need, we integrate the Importance-Performance Matrix Analysis (IPMA), which visually maps the importance and performance of each UTAUT or UTAUT 2 construct, thereby pinpointing critical areas for enhancement.

A tool used in business and marketing research to evaluate the performance of different factors, attributes or features of a product or service is Importance-Performance Matrix Analysis (IPMA) [34]. It helps identify areas of improvement and prioritize efforts for enhancing customer satisfaction. The IPMA is based on the assumption that customers evaluate a product or service based on its importance to them and their perception of its performance. The IPMA builds upon Partial Least Squares Structural Equation Modeling (PLS-SEM) by incorporating performance data alongside importance. It is providing a more nuanced understanding of what needs attention. By plotting these two dimensions on a matrix, it provides a visual representation of the relationship between importance and performance. The IPMA provides a framework for prioritizing improvement efforts based on customer needs and expectations. It helps businesses allocate resources effectively, focusing on areas that will have the most significant impact on customer satisfaction and loyalty.

The IPMA analysis is conducted through attribute selection, importance rating, performance rating, plotting the matrix, and quadrant analysis [34]. Attribute selection refers to identifying the key attributes or features that are relevant to product or service. Importance Rating include asking customers or respondents to rate the importance of each attribute on a scale, usually ranging from low to high importance. Performance rating refers to asking customers to rate the performance of each attribute on a scale, usually ranging from low to high performance. This provides insights into how well the product or service is meeting customer expectations for each attribute. Plotting the matrix including creating a two-dimensional matrix with the importance rating on one axis (usually the y-axis) and the performance rating on the other axis (usually the x-axis). Last, quadrant analysis involves analyzing the distribution of the attributes within the matrix, which can be divided into four quadrants. Quadrant 1 at upper right represent high total effect and performance; Quadrant 2 at upper left represents low total effect and high performance; Quadrant 3 at lower left represents low total effect and performance; whereas Quadrant 4 at lower right represents high total effect and low performance' construct or items.

Considering the importance of FWMA in Indonesia, the purpose of this study is to observe factors that influence acceptance of one FWMA in Indonesia using extended UTAUT2 model. In addition, to identify areas of improvement and prioritize efforts for enhancing customer satisfaction when using FWMA, IPMA framework is applied. This study is particularly important to reduce food waste in Indonesia which alarming. This paper addresses the gap in observing application of the FWMA in Indonesia and effort that should be conducted to elevating the use of FWMA in reducing food waste in Indonesia. Result of this study can be used as a benchmark of similar studies in other developing countries.

METHOD

Respondents

Seventy-nine Indonesian students (mean age = 24.35 years, SD = 5.27 years, 27 males, 52 females) involve voluntarily in the study by filling out an online questionnaire. The sampling method applied is convenience sampling. The online questionnaire was posting and blasting on social media to gather respondent's attention and willingness to fill in. The respondents were asked their opinion about one local FWMA in Indonesia that is Surplus Indonesia. The student respondents in particular students live in dormitory or apartment, are chosen as they are targeted segment of FWMA, familiar with such mobile application, and their food waste shows a remarkable number.

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Questionnaire

An online questionnaire based on extended UTAUT2 model [22] which was developed for food delivery application mode was used. The extended UTAUT2 consists of the original seven constructs of UTAUT 2 that wee Price Value, Social Influence, Habit, Trust, Convenience, Satisfaction. Three construct that were relevant to FWMA were added: Application Quality, Various Food Choices, and Intention. Price Value (PV) can be defined as perception of customers about the trade-offs between the perceived benefits of FWMA and the monetary cost of using the FWMA. Social Influence (SI) refers to an individual perceives of the degree of approval of a certain behavior by important people surrounded for example family and close relatives. Habit (H) can be defined as an automatic behavior that is formed through process of learning or experience of individual for a long period of time. Trust (T) refers to the extent to which consumers belief that a particular FWMA will bring the best benefit to them. Convenience (C) can be defined as the total time as well as effort of an individual that is invested to obtain a service or purchase a product. Quality (Q) refers to multidimensional aspect relate to negative or positive responses to the use of FWMA and include three aspects that are system quality, information quality, and service quality. Satisfaction (S) refers to the extent to which the customers feel according the use of the product, in which the more customers are satisfied, the more they are likely to use the service or product in the future again. Various Food Choice (VFC) can be defined as the available option of food, encompasses processes and decisions involved in selecting, preparing, and consuming food. Last, the intention (I) refers to a person's motivation to perform a specific behavior.

The questionnaire was adapted from [22]. It was pre-tested with a small group of students (n=30) to ensure clarity and contextual relevance. The internal consistency and reliability of the scales were confirmed with the study's data, showing Cronbach's Alpha values above 0.7 for all constructs. Some items with Cronbach Alpha less than 0.7 but more than 0.5 were included as they were considered as moderate reliable. All constructs consisted of 3 items, except for Quality which contained 6 items due to its multidimensional aspect relates to system quality, information quality, and service quality. The Likert scale which is commonly used to measures respondents' attitudes or opinions by indicate their level of agreement or disagreement with each statement using a numbered scale was used. The scale ranged from 1 (strongly disagree) to 5 (strongly agree). The conceptual model can be seen in Figure 1.

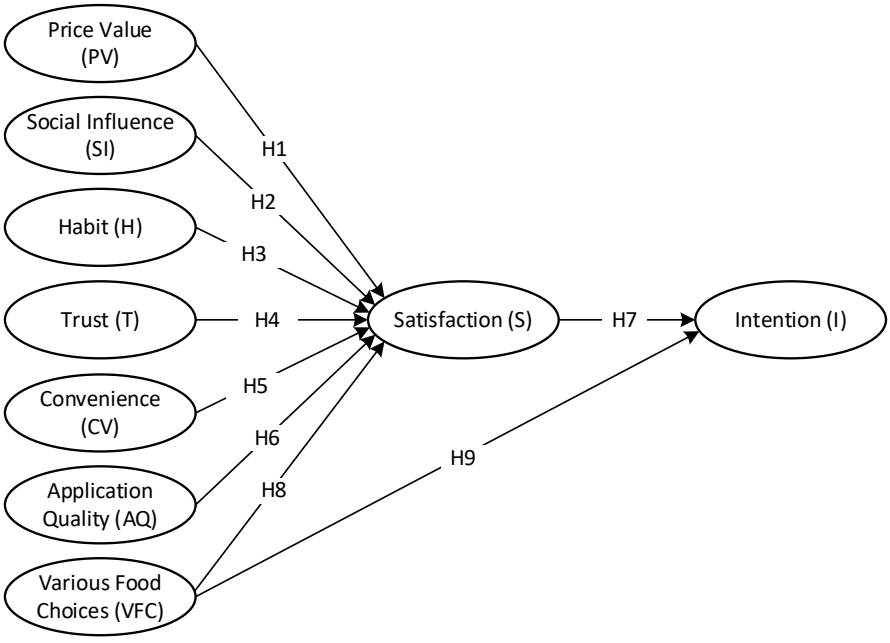

Figure 1. The conceptual model of intention to use food surplus

Table 1. Intention to use FWMA as a function of demographic data

Demographic data		Percentage	Intention to use (out of 5)	Statistical test
Age	18-25	73%	4.02 (0.79)	t (77) = - 1.25, p = 0.21
	26-40	27%	4.25 (0.13)	
Gender	Male	34%	3.81 (0.82)	t (77) = - 2.34, p = 0.02*
	Female	66%	4.2 (0.68)	
Occupation	Student	53%	3.98 (0.80)	t (77) = - 1.32, p = 0.19
	Non student/worker	47%	4.20 (0.67)	
Marital status	Single	83%	4.01 (0.76)	t (77) = - 1.91, p = 0.06
	Married	17%	4.44 (0.61)	

*Significant with α = 0.05

Data analysis

Demographic data was analyzed using descriptive statistic. Partial Least Square-Structural Equation Modeling (Smart PLS-SEM version 4.0.), which is a statistical technique used to analyze relationships between observed and latent (unobserved) variables was applied in modeling process. The IPMA was executed using the built-in function in SmartPLS. The importance values (total effects) and performance values (rescaled latent variable scores from 0 to 100) for each construct were plotted on a two-dimensional matrix to identify priority areas for improvement.

RESULT AND DISCUSSION

Descriptive and Demographic Findings

Table 1 presents the intention to use the FWMA across key demographic groups. All categories have comparatively high mean intention scores (above 3.8 on a five-point scale), suggesting that respondents are generally in favor of FWMA adoption. But only in terms of gender are statistically significant differences found. According to t (77) = - 2.34, p = 0.02*, female respondents report a significantly higher intention to use FWMA than male respondents, indicating that gender significantly influences adoption intention in the Indonesian context.

On the other hand, differences by age, occupation and marital status are not statistically significant ($p<0.05$), although some descriptive trends are noteworthy. Older respondents (26-40 years), non-students and married individuals consistently report slightly higher intention scores than their counterparts. These patterns suggest that greater economic independence and household responsibility can have a positive impact on openness to the use of the FWMA, although these effects are not strong enough to be statistically significant in the current sample.

Despite relatively high intention scores, actual usage frequency remains low. Nearly 44.2% of respondents reported never purchasing food through the FWMA, about 30% indicated making only one purchase per month, around 11.43% reported buying two to three times monthly, and less than 2.89% stated they purchased more than three times per month. This gap between relatively high intention scores and low actual usage highlights a critical adoption challenge in developing-country contexts, where favorable attitudes do not necessarily translate into frequent behavioral engagement. Most respondents report learning about the FWMA through social media (55.71%) and friends (25.71%), highlighting the importance of informal communication channels and peer influence in awareness-building.

Measurement Model Evaluation

The reliability and validity of the measurement model was assessed prior to the interpretation of the structural relationships. The reliability figures for the indicators presented in Table 2 show that most items are above the

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Table 2. The reliability of the scale

Indicator	Reliability	Indicator	Reliability	Indicator	Reliability	Indicator	Reliability
PV1	0,574	AQ1	0,656	H3	0,742	S3	0,861
PV2	0,906	AQ2	0,648	T1	0,878	VFC1	0,717
PV3	0,938	AQ3	0,802	T2	0,800	VFC2	0,793
SI1	0,864	AQ4	0,785	T3	0,847	VFC3	0,756
SI2	0,880	AQ5	0,737	CV1	0,733	I1	0,876
SI3	0,724	AQ6	0,693	CV2	0,843	I2	0,798
H1	0,819	S1	0,857	CV3	0,825	I3	0,795

Table 3. The measurement model of intention to use FWMA

Construct	Composite reliability	AVE
Price Value	0,858	0,677
Social Influence	0,864	0,682
Habit	0,814	0,594
Trust	0,880	0,710
Convenience	0,843	0,643
Application Quality	0,867	0,522
Satisfaction	0,906	0,762
Various Food Choice	0,800	0,571
Intention	0,863	0,679

commonly accepted thresholds and that only a small number of indicators show a moderate level of reliability. Given the exploratory nature of the FWMA research in the context of developing countries, the inclusion of indicators of moderate reliability is still acceptable.

Convergent validity is supported by average variance extracted (AVE) values above the minimum value of 0.5 for all constructs (Table 3). Notably, satisfaction and trust show particularly high AVE values (0.762 and 0.710 respectively), which suggests that these constructs are well captured by the indicators. Overall, the measurement model shows sufficient reliability and validity to provide a good basis for the subsequent analysis of the structural model.

Structural Model Quality and Predictive Relevance

The quality of the structural model is evaluated using R^2 and Q^2 values. As shown in Figure 2, in terms of satisfaction, the model has strong predictive relevance ($Q^2 = 0.47$) and explains 66% of the variance ($R^2 = 0.66$). Similarly, the model has acceptable predictive relevance ($Q^2 = 0.34$) and explains 52% of the variance in Intention ($R^2 = 0.52$). These results show that the extended UTAUT2 model has a moderate-to-strong explanatory power in identifying the main factors influencing FWMA satisfaction and usage intention. The corresponding Q^2 values further demonstrate adequate predictive relevance, confirming that the Extended UTAUT2 model provides a theoretically and empirically sound framework for explaining FWMA adoption behavior in Indonesia.

The structural findings show that satisfaction with FWMA usage is strongly influenced by Social Influence, Habit, and Trust. This result emphasizes how social support, routine formation, and perceived reliability of the platform shapes FWMA adoption. Additionally, Satisfaction and Various food choices were found as key determinants of Intention, emphasizing the crucial role of positive user experience in motivating continued and future use.

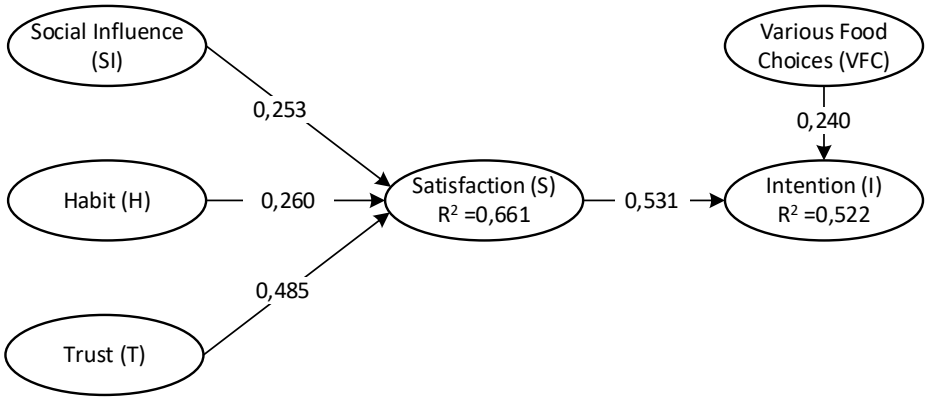

Figure 2. The empirical model of intention to use food surplus application

Importance–Performance Matrix Analysis (IPMA)

A The results of the IPMA, shown in Figures 3 and Figure 4, and detailed in Table 4, provide actionable insights beyond the structural model, considering together the importance (total impact) and performance of each construct and indicator. At the level of the individual construct, none of the variables fall into quadrant IV (high importance - low performance), indicating that none of the main constructs is a critical weakness that requires immediate intervention. However, the IPMA at item level reveals further scope for improvement. In particular, one indicator under Various Food Choice—specifically the availability of diverse main-course options such as rice-based meals—shows a high total effect on intention but relatively low performance. This result reflects the mismatch between user expectations and the current application offerings. Given that rice is a staple food in Indonesia, the limited availability of rice-based meals may reduce the perceived utility and relevance of the FWMA, thus discouraging adoption intentions despite positive views of the concept of the application.

Discussion and Implications

Observing behavior in terms of acceptance, and satisfaction of food waste mobile application (FWMA) in Indonesia as a representative of developing countries. Result shows that average buying of respondents in FWMA is quite low, three times or less in a month. Whereas most respondents got information about FWMA from social media and

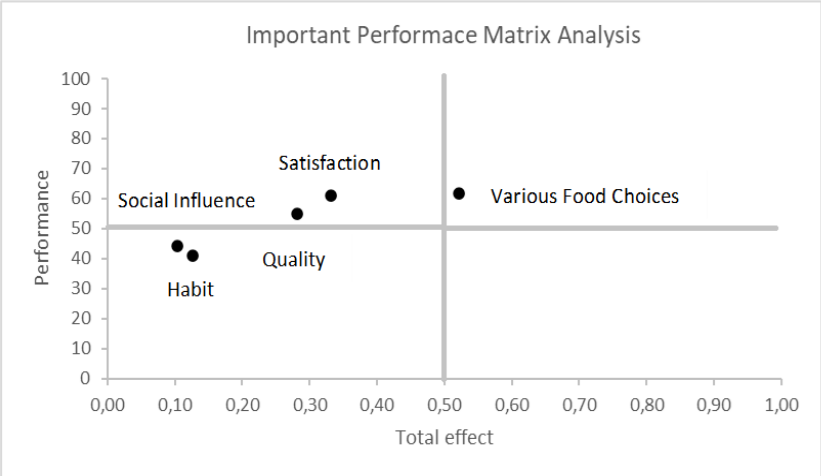

Figure 3. Important Performance Matrix Analysis as a function of constructs

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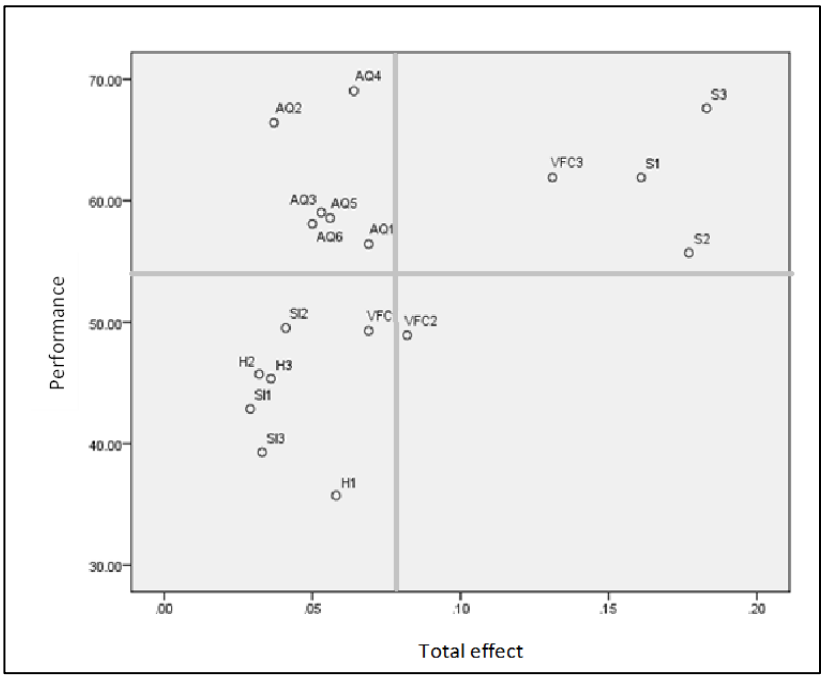

Figure 4. Important Performance Matrix Analysis as a function of items

friend. With regards to demographic data, women use FWMA more frequently than older and man respondents. Most importantly, based on the UTAUT2 model, factors that influence satisfaction in using FWMA are social influence, habit, and trust. The extended factors show that satisfaction and various food choice also influence intention to use the FWMA.

The fact that average purchasing behaviour on FWMA in developing countries is low, is in contrast with the study by Pandey et al. [23] which shows that in developed country, such as Denmark, respondents buy surplus meals very often (27.6%) and 7% buy surplus meals daily. This result is also supported by Tracxn [24] that globally there are 166 FWMA companies, and the list of the 10 biggest ones are all in developed countries. Explanation of this difference could be that in developed countries compared to developing countries, customers often have the opportunity to buy products at discounted prices due to its approaching expiration dates, packaging changes, or surplus production.

The fact that most respondents got information about FWMA from social media and friend is as expected. As stated by Kim et al. [26] and Zamri et al. [27], people can learn and search about food surplus applications through various channels and sources. For example, people can get information from local government or municipality resources, as

Tabel 4. Total effect and performance of each item of questionnaire

Items	Total Efect	Performance	Items	Total Efect	Performance
SI1	0,029	42,857	Q4	0,064	69,048
SI2	0,041	49,524	Q5	0,056	58,571
SI3	0,033	39,286	Q6	0,050	58,095
H1	0,058	35,714	S1	0,161	61,905
H2	0,032	45,714	S2	0,177	55,714
H3	0,036	45,357	S3	0,183	67,619
Q1	0,069	56,429	VFC1	0,069	49,286
Q2	0,037	66,429	VFC2	0,082	48,929
Q3	0,053	59,048	VFC3	0,131	61,905

well as nonprofit organization as their websites often provide information on food waste reduction initiatives and organizations operating in the area. People may learn about food surplus applications through word of mouth, recommendations from friends, family, or community members who have utilized these services. Last but not least, social media and online applications is another main resource of surplus food applications information.

The result that woman respondents are higher in using FWMA than older and man respondents is as expected. Pandey et al. [23] found that sociodemographic including gender indirectly influence intention by their effects on attitudes, and subjective norms, whereas gender and education seem to directly influence buying excessive meal behavior. As stated by Vercillo [35], women are primarily responsible for food production and for feeding their families. Although insignificant; age, occupation, and marital status play roles in acceptance of FWMA. The higher acceptance among mature, employed, and married respondents may be related to their economic independence, allowing them more freedom in how they choose to spend their income.

The results of this study based on the UTAUT 2 model indicate that satisfaction with using FWMAs is influenced by social influence, habit, and trust. As stated by [1] social influence can be direct, through recommendations, or indirect, through perceptions of how others view the app and the positive social impact of its use. With regards to habit, Huang et al. [6] mentioned that the food waste situation is critical in some societies and can be attributed to the culture and consumption habits of this societies. Habit is an automatic behavior formed through learning or individual experience over time. When the customers found that the technology provided benefits and pleasing outcomes, they tended to use it more often, leading to habit creation. Habit plays a crucial role in motivating existing customers to continue using a technology. Additionally, it significantly influences those close to these customers to adopt the technology as well. ([7], [8], [9], [21]). A clear example of this is the critical food waste situation in the United States, which can be attributed to the country's consumption habits. The fact that trust influence intention to use food surplus is as expected. As stated by Chotigo and Kadano [22], trust is essential in the business field because it provides customers with a sense of safety. Trust can be defined as the consumers' belief that a chosen store will bring the best benefit to them [36]. Trust was found to be important in predicting customer adoption of a technology [36],[37],[38],[39].

Outside the UTAUT2 model, satisfaction and various food choice influence intention to use the FWMA. Satisfaction plays a significant role in influencing the intention to use a FWMA. When users are satisfied with their experience using the application, they are more likely to continue using it and recommend it to others [40]. Satisfaction can impact the intention to use a FWMA by providing a positive user experience, which in turn fosters repeat usage and loyalty. The effect of various food choices on the intention to use a FWMA can vary based on individual preferences and needs. However, there are some general factors to consider in food choices, that are availability of preferred food items, food safety and quality, affordability and value, unique or hard-to-find food items, and personal values and sustainability [41]. It's important for a FWMA to understand the diverse food preferences and needs of its target audience. By considering these factors and tailoring their offerings accordingly, the application can attract a wider user base and increase the intention of users to utilize their services.

Result of IPMA shows that there were no constructs fall into Quadrant IV, which would represent high total effect with low performance, suggesting areas of potential improvement. However, further analysis showed *that* Various Food Choice (VCF) item no 2, which stated 'The application offers a wide variety of main courses (e.g., rice-based meals)', was found to be highly important for intention but had low performance. This is in accordance with the current condition of the FWMA where the majority of types of food sold on the application are bread and cakes. Considering Indonesian have rice as staple food, variation of rice on food available in the application is a must [42]. Various effort can be implemented to enhance food variety within a FWMA, for example by focusing on providing diverse options for users to manage, share, or donate surplus food. Such effort includes educational resources about

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food storage and meal planning. In addition, increasing food choice variation can be achieved by integrating some features for examples options for donating to charities, local food sharing networks, information on food preservation techniques, as well as suggestion of recipe using ingredients that close to the expiration.

This study provided new knowledge and revealed how FWMA can be adopted by consumers and reduce food waste in Indonesia as one of the developing countries. While this insight is valuable, this study has limitations and further research is needed. First, only respondents from large city were involved. Further research involving respondents from broader area such as medium and small cities, as well as rural area will enrich the analysis. Another limitation of this study is the limited sample size. The research was conducted with a small sample of seventy-nine respondents, which may restrict the generalizability of the findings to a larger population. With a larger sample size in the future research, more diverse perspectives and variations within the population could have been captured, providing a more representative picture of the phenomenon and would help validate and enhance the generalizability of the results [43],[44]. Lastly, this study did not consider environmental concern. Although Pandey et al. [23] found that environmental objective knowledge had no significant influence on attitude towards waste meals, however, some literature hypothesized the important role of environmental concern on food waste behavior. Therefore, future research must include the environmental factors. Similar reason for considering social factors of food waste among society. The use of other method than IPMA can be considered as well. Several other methods can be used to evaluating performance and identifying areas for improvement such as Combined Importance-Performance Map Analysis (cIPMA), Improvement-Gaps Analysis (IGA), and Notational Analysis. Each method offering a unique perspective on performance evaluation and improvement.

This present study gives theoretical and practical implications. In the context of theoretical implications, the present study exhibited the low use of FWMA in Indonesia. General pictures might be found in other developing countries. Most importantly, the study shed light on the mechanisms of satisfaction in using FWMA that are social influence, habit, and trust. Furthermore, the study also validated the critical role of satisfaction and various food choice on intention to use the FWMA.

Regarding practical implications, the results of this study can help marketers formulate the proper strategies for the successful operation of FWMA. Marketers should focus particularly on social influence, trust, and habit to drive customer satisfaction, which is of paramount importance to promoting technology use. The role of social media in the success of FWMA can not be neglected as well. This study showed considerable interest of respondents in accessing such apps through social media platforms. As customers can easily access social media platforms wherever they may be, marketing plans should focus more on promotional campaigns or marketing advertising via social media. This effort can help to convince people to use the FWMA in particular in elevating people's awareness of the FWMA. To develop habitual responses from customers, marketers should plan the formation of customer habits for example by maintaining its performance and increasing the accessibility of the FWMA. Last, to build customer trust, marketers should demonstrate credibility and availability as well as ensure the security and reliability of their FWMA.

CONCLUSION

This study identified that user satisfaction with the FWMA, a key precursor to continued use, is primarily driven by Social Influence, Habit, and Trust. Furthermore, the intention to use the application is directly influenced by user Satisfaction and the availability of Various Food Choices. The IPMA further pinpointed that a specific lack of staple food options is a critical area for improvement. This study's findings are limited by its sample size and its focus on an urban, student population. Future research should validate this model with a larger, more demographically diverse sample across multiple cities in Indonesia and other developing nations. Furthermore, incorporating

constructs like 'Environmental Concern' could provide a more holistic understanding of adoption drivers. This study provides a validated model for assessing FWMA acceptance in a developing economy context. By integrating extended UTAUT2 with an IPMA, it offers a dual perspective—identifying not only *what* drives adoption but also *where* managers should prioritize improvements, such as expanding food variety to include local staples. Therefore, such studies in FWMA are really appreciated. Result of this study can be used to inform policymakers, marketers, business professionals, and practitioners to reduce food waste in similar settings. Furthermore, because the regulations and legislation that can help to reduce food waste directly and indirectly is scarce or even absent in developing countries, the involving and active participation of members of community in particular through social media, will plays an important role in reducing food waste. For FWMAs to succeed in developing countries, strategies must extend beyond technical functionality to build trust, cultivate habitual use, and critically, ensure the food offerings align with local dietary preferences, thereby turning a sustainability tool into a practical daily resource.

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CONFLICT OF INTERESTS

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

[1] S. Bhatt, J. Lee, J. Deutsch, H. Ayaz, B. Fulton, and R. Suri, "From food waste to value-added surplus products (VASP): Consumer acceptance of a novel food product category" *Journal of Consumer Behavior,* vol. 17, pp. 57– 63, 2017, doi: 10.1002/cb.1689.

[2] L. Ruetgers, "Selling surplus food as a solution to food waste understanding how businesses selling surplus food commercially can be adopted by consumers and reduce food waste". Coventry University. Dissertation. 2002, Available at https://pureportal.coventry.ac.uk/en/studentTheses/selling-surplus-food-as-a-solution-to-food-waste.

[3] UNEP, "Food waste index report [WWW Document], 2021, Available at https://www.unep.org/resources/report/unep-food-waste-index-report-2021, 10.28.21.

[4] FAO, "Global Food Losses and Food Waste" [online] Düsseldorf. 2021, Available at http://www.fao.org/docrep/014/mb060e/mb060e00.pdf.

[5] H. Jamaludin, H.S.E. Elmaky, and S. Sulaiman, "The future of food waste: Application of circular economy" *Energy Nexus,* vol. 7, p. 100098, 2022, doi: 10.1016/j.nexus.2022.100098.

[6] C.H. Huang, S. M. Liu, and N.Y. Hsu, "Understanding global food surplus and food waste to tackle economic and environmental sustainability" *Sustainability, vol. 12, p.* 2892. 2022, doi: 10.3390/su12072892.

[7] M.L. Spiker, H.A.B. Hiza, S.M. Siddiqi, and R.A. Neff, "Wasted food, wasted nutrients: Nutrient loss from wasted food in the United States and comparison to gaps in dietary intake", *Journal oaf Academic Nutrition Diet*, vol. 117, pp. 1031–1040, 2017, doi: 10.1016/j.jand.2017.03.015

[8] J. Aschemann-Witzel, A. Giménez, and G. Ares, "Consumer in-store choice of suboptimal food to avoid food waste: The role of food category, communication and perception of quality dimensions", *Food Quality Preferences,* vol.68, pp. 29–39, 2018, doi: 10.1016/j.foodqual.2018.01.020.

[9] S. Talwar, P. Kaur, R. Yadav, A., Bilgihan, and A., Dhir, "What drives diners' eco-friendly behaviour? The moderating role of planning routine" *Journal of Retail and Consumer Service vol.* 63, p. 102678, 2021, doi: 10.1016/j.jretconser.2021.102678

[10] S. Baglioni, B. de Pieri, and T. Tallarico, "Surplus food recovery and food aid: the pivotal role of non-profit organisations: Insights from Italy and Germany", *Voluntas, vol.* 28, pp. 2032–2052, 2017, doi: 10.1007/s11266-016-9746-8.

[11] A. Chalak, C., Abou-Daher, J. Chaaban, and M.G. Abiad, "The global economic and regulatory determinants of household food waste generation: A cross-country analysis" *Waste Management, vol.* 48, pp. 418–422, 2016, doi: 10.1016/j.wasman.2015.11.040.

[12] Z.X. Keng, S. Chong, C.G. Ng, N.I. Ridzuan, S. Hanson, G. Pan, P.L. Lau, C.V. Supramaniam, A. Singh, C.F. Chin, and H.L. Lam, "Community-scale composting for food waste: A life-cycle assessment-supported case study" *Journal of Cleaner Production, vol.* 261, p. 121220, 2020, doi: 10.1016/j.jclepro.2020.121220.

[13] J. Jin, S. Sun, D. Yang, W, Sheng, Y. Ma, W. He, and G. Li, "Anaerobic digestion: An alternative resource treatment option for food waste in China". *Science of Total Environment, vol.* 779, 2021, doi: 10.1016/j.scitotenv.2021.146397.

[14] B. McCarthy, A.B Kapetanaki, and P. Wang, "Completing the food waste management loop: Is there market potential for value-added surplus products (VASP)?" *Journal of Cleaner Production, vol.* 256, p. 120435, 2020, doi: 10.1016/j.jclepro.2020.120435.

[15] C. Sundgreen, "Circular supply chain relationships for food redistribution Caroline Sundgren", *Journal of Cleaner Production, vol.* 336, p. 130393, 2022, doi: 10.1016/j.jclepro.2022.130393

[16] S. Sanyal, S. Mukhopadhyay, and F. Xhafa, "Enhanced incentive schemes for volunteers to distribute surplus food in smart cities" *Smart Cities, vol.* 91, p. 104409, 2023, doi: 10.1016/j.scs.2023.104409.

[17] J. Harvey, A. Smith, J. Goulding, and I.B. Illodo, "Food sharing, redistribution, and waste reduction via mobile applications: A social network analysis", *Industrial Marketing Management , vol. 8*8, pp. 437-448, 2020, doi: 10.1016/j.indmarman.2019.02.019.

[18] J. Hong, N, Kafa, and A. Jaegler, "Exploring barriers and motivations in the adoption of food waste mobile applications", *International Transaction in Operation Research*, vol. 0, pp. 1–25, 2024, DOI: 10.1111/itor.13587

[19] C. Apostolidis, D. Brown, D. Wijetunga, and E. Kathriarachchi, "Sustainable value co-creation at the Bottom of the Pyramid: using mobile applications to reduce food waste and improve food security" *Journal of Marketing Management*, vol. *37, pp.* 856–886, 2021, doi: 10.1080/0267257X.2020.1863448

[20] A.A. Alalwan, "Mobile food ordering apps: An empirical study of the factors affecting customer e-satisfaction and continued intention to reuse", *International Journal of Information Management, vol.* 50, pp. 28–44, 2020, doi: 10.1016/j.ijinfomgt.2019.04.008.

[21] S.L. Wong, C.C. Hsu, and H.S. Chen, "To buy or not to buy? Consumer attitudes and purchase intentions for suboptimal food" *International Journal of Environmental Research and Public Health, vol.* 15, p. 1431, 2018, doi: 10.3390/ijerph15071431.

[22] J. Chotigo, and Y. Kadono, "Comparative analysis of key factors encouraging food delivery app adoption before and during the covid-19 pandemic in Thailand", *Sustainability, vol. 13, No.* 4088, pp. 1-25, 2021, doi: 10.3390/su13084088.

[23] S. Pandey, M. Budhathoki, K. Feng, M. Thomsen, and H.C. Reinbach, "Who buys surplus meals? An exploratory survey in Danish canteens" *Foods*, vol. *12*, p. 1035, 2023, doi: 10.3390/foods12051035.

[24] Tracxn, "Tracking Market Activity," *Tracxn*. [Online]. Available: https://w.tracxn.com/offerings/tracking-market-activity

[25] E. Keegan, and J.K. Breadsell, "Food waste and social practices in Australian households" *Sustainability*, vol. *13, no.* 6, p. 3377, 2021, doi: 10.3390/su13063377.

[26] J. Kim, K. Knox, and S. Rundle-Thiele, Theory application in food waste behaviour programs: a systematic literature review, *Australian Journal of Environmental Management, vol. 29, no.* 4, pp. 344–367, 2022, doi: 10.1080/14486563.2022.2140211.

[27] G.B. Zamri, N.K.A. Azizal, S. Nakamura, K. Okada, N.H. Nordin, N.A. Othman, F.N.M.D. Akhir, A. Sobian, N. Kaida, and H. Hara, "Delivery, impact and approach of household food waste reduction campaigns," *Journal of Cleaner Production, vol.* 246, p. 118969, 2020, doi: 10.1016/j.jclepro.2019.118969.

[28] V. Amicarelli, G. Lagioia, S. Sampietro, and C. Bux, "Has the COVID-19 pandemic changed food waste perception and behavior? Evidence from Italian consumers" *Socio-Economic Planning Science, vol.* 82, Part A, p. 101095, 2022, doi: 10.1016/j.seps.2021.101095.

[29] United Nations Environment Programme. Food Waste Index Report, 2021. Available at https://www.unep.org/resources/report/unep-food-waste-index-report-2021.

[30] Haryanti, N. Indonesia is the largest contributor of food waste in ASEAN. 2023. Available at https://infid.org/en/indonesia-penyumbang-sampah-makanan-terbanyak-se-asean/.

[31] F.D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology" *MIS Quarterly*, vol. 13, no. 3, pp, 319-340, 1989,

[32] V. Venkatesh, M.G. Morris, G.B. Davis, and F.D. Davis, "User acceptance of information technology: Toward a unified view" *MIS Quarterly, vol.*27, no.3, pp. 425–478, 2023, doi: 10.2307/30036540.

[33] I. Ajzen, "The theory of planned behavior" *Organizational Behavior and Human Decision Process*, vol. 50, no. 2, pp. 179-211, 1991, doi: 10.1016/0749-5978(91)90020-T.

[34] S. Hauff, N.F. Richter, M. Sarstedt, and C.M. Ringle, "Importance and performance in PLS-SEM and NCA: Introducing the combined Importance-Performance Map Analysis (cIPMA)" *Journal of Retailing and Consumer Service, vol.*, no. 78, p. 103723, 2024, doi: 10.1016/j.jretconser.2024.103723.

[35] S. Vercillo, "Food waste – What do women have to do with it? 2016, Available at https://foodwastestudies.com/2016/03/18/food-waste-what-do-women-have-to-do-with-it/.

[36] H., Chae, S. Kim, J. Lee, and K. Park, "Impact of product characteristics of limited edition shoes on perceived value, brand trust, and purchase intention; focused on the scarcity message frequency" *Journal of Business Research, vol, 120*, pp. 398–406, 2020,

[37] H.C. Wu, C.C. Cheng, and C.H. Ai, "A study of experiential quality, experiential value, trust, corporate reputation, experiential satisfaction, and behavioral intentions for cruise tourists: The case of Hong Kong" *Tourism Management, vol. 66*, pp. 200–220, 2018,

[38] J.D. Zhao, J. S. Huang, and S. Su, "The effects of trust on consumers' continuous purchase intentions in C2C social commerce: A trust transfer perspective", *Journal of Retailing and Consumer Service, vol. 50*, pp. 42–49, 2019.

[39] C. Jiang, R.M. Rashid, and J. Wang, "Investigating the role of social presence dimensions and information support on consumers' trust and shopping intentions", *Journal of Retail and Consumer Service, vol. 51*, pp. 263–270, 2019,

[40] A.K. Kar, "What affects usage satisfaction in mobile payments? Modelling user generated content to develop the "digital service usage satisfaction model", *Information System Frontier, vol,* 23, pp. 1341–1361, 2021, doi: 10.1007/s10796-020-10045-0.

[41] F. Fernqvist, S. Spendrup, and R. Tellström, "Understanding food choice: A systematic review of reviews", *Heliyon*, vol, 10, no, 12, p. e32492, 2024, doi: 10.1016/j.heliyon.2024.e32492.

[42] A. Widyanti, I. Sunaryo, and A.D. Kumalasari, "Reducing the dependency on rice as staple food in Indonesia - A behavior intervention approach", *Journal of the International Society for Southeast Asian Agricultural Sciences*, vol. 20, no. 1, pp. 93–103, 2014.

[43] N. Ansori, A. Widyanti, and Yassierli, "The role of safety silence motives to safety communication and safety participation in different sectors of small and medium enterprises: Investigation results on two kinds of industries in indonesia". *Safety and Health at Work*, vol. 12, No. 2, pp. 192–200, 2021, https://www.sciencedirect.com/science/article/pii/S2093791120303425

[44] N. Ansori, N., A. Widyanti, and Yassierli, "The influence of safety climate, motivation, and knowledge on worker compliance and participation: An empirical study of indonesian smes | La influencia del clima, la motivación y el conocimiento de seguridades en el cumplimiento y la participación de los trabajadores: Un estudio empírico de pymes en Indonesia", *Ingenieria e Investigacion*, vo;, 41, no. 3, p. e83763, 2021, doi: 10.15446/ing.investig.v41n3.83763

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