



Digital Lifestyle and Food Waste Behavior: The Role of Camera Eats First in Cafes and Restaurants in Batam City, Indonesia

Eryd Saputra*, Rezki Alhamdi

Manajemen Kuliner, Politeknik Pariwisata Batam, Batam, 29425, Indonesia

*Correspondence: eryd@btp.ac.id

SUBMITTED: 28 September 2025; REVISED: 20 October 2025; ACCEPTED: 22 October 2025

ABSTRACT: *Camera eat first* referred to the habit of photographing food before consumption for sharing on social media. This phenomenon drove shifts in consumer behavior, potentially leading to increased food waste. The objective of this study was to analyze the influence of attitude, emotion, and perceived behavioral control on food waste behavior, with camera eat first included as a mediating variable. A quantitative approach was employed, involving a sample of 340 respondents who were visitors to cafés and restaurants in the Harbour Bay area of Batam. Data were collected using a five-point Likert scale questionnaire and analyzed through Structural Equation Modeling–Partial Least Squares (SEM-PLS) using SmartPLS software, as well as Fuzzy-Set Qualitative Comparative Analysis (fsQCA). The findings revealed that emotions and perceived behavioral control exerted a positive and significant effect on food waste behavior, whereas attitude and camera eat first did not show significant influence. Furthermore, camera eat first was not confirmed as a mediator in the relationships among the studied variables. Complementary results from fsQCA highlighted that the combination of attitude, emotion, and perceived behavioral control constituted the most consistent configuration in explaining food waste behavior. Overall, the study concluded that food waste behavior was more strongly shaped by internal psychological factors than by digital lifestyle trends. Consequently, strategies to reduce food waste should prioritize strengthening self-control, enhancing emotional awareness, and promoting responsible consumption practices, while also accounting for the dynamics of social media engagement in contemporary society.

KEYWORDS: Food waste behavior; camera eat first; emotional; attitude; perceived behavioral control.

1. Introduction

As global attention to the Sustainable Development Goals (SDGs) increased, numerous studies were conducted by academics and practitioners. These included research on reducing single-use plastics [1], improving energy efficiency [2], enhancing waste management [3, 4], and promoting plant-based food consumption [5]. Furthermore, the issue of food waste had also

risen in recent years [6]. Food waste had serious environmental, social, and economic impacts [7, 8]. However, many consumers seemed unaware of the seriousness of the food waste problem [9]. Consumers generally did not take action to reduce food waste unless they had a deep understanding of the problem and effective solutions to address it [10].

According to a joint study by the National Development Planning Agency (Bappenas), Waste4Change, and the World Resources Institute, food waste in Indonesia reached 115–184 kilograms per capita annually between 2000 and 2019 [11]. The economic impact was estimated at IDR 213–551 trillion per year, with food waste contributing an average of 7.29% of annual greenhouse gas emissions [11]. Furthermore, the United Nations report *Think Eat Save*, part of the *Food Waste Index Report 2024*, identified Indonesia as the largest food waste producer in Southeast Asia, generating approximately 14.73 million tons annually [12]. Therefore, reducing food waste needed to become a central focus of mitigation strategies, particularly through interventions targeting household consumption, food service providers, and the retail sector [13].

For mitigation strategies to be effective, their design needed to be grounded in empirical research. Previous studies showed that food waste occurred in various settings, including households [14], cafés [15], tourist destinations [16], and even cruise ships [17]. Research on food waste behavior was also approached from religious perspectives [18]. In addition, several studies examined food waste among tourists. For instance, [19] found that tourists tended to waste more food during travel compared to everyday life, often motivated by the desire to upload food photos on social media [16, 20].

The *camera eat first* phenomenon referred to people who took photos of their food before or while eating [21]. This behavior was found to exacerbate food waste [22], as the habit of uploading food photos often encouraged individuals to order more food than they could consume, simply to capture visually appealing images [21]. However, previous research remained limited in explaining how digital lifestyle trends such as social media activity and camera-first habits explicitly influenced food waste, particularly in the service sector such as cafés and restaurants. This gap was crucial to examine because the modern culinary sector increasingly relied on digital exposure, where visual images and experiences often drove overconsumption.

Food waste behavior could also be analyzed through the Theory of Planned Behavior, as demonstrated in studies [23–27]. This theory posited that behavior was influenced by attitude and perceived behavioral control [28, 29]. Attitudes reflected support or opposition toward specific behaviors [30], while positive and negative emotions were also explored for their impact on consumer food waste behavior [8, 31, 32]. Hence, further research was needed to identify the specific factors shaping food waste across different cultural contexts [33, 34], especially by incorporating the digital lifestyle dimension as a new factor in explaining food waste behavior in the food service industry.

Research on food waste grew significantly in recent years, with various studies examining influencing factors such as lifestyle [18], weight management [28], student behavior [35], over-purchasing [30], and digital practices like uploading food on social media [21]. However, most of these studies were conducted outside Indonesia. In the Indonesian context, research remained limited, focusing primarily on hotel chefs' practices in managing food waste [36] and youth behavior analyzed through cluster analysis [37]. Given that Indonesia ranked among the highest social media users globally, the practice of photographing food before eating

for aesthetic or social validation purposes was highly relevant to the food waste discourse. Few studies had explored the intersection of digital practices (*camera eat first*) and food waste in Indonesia. Harbour Bay, as a tourism hub, offered a unique cultural setting compared to other regions. This study aimed to examine how psychological and behavioral factors of *camera eat first* influenced food waste, providing insights for waste mitigation strategies in the food service industry.

2. Materials and Methods

2.1. Research location.

This research was conducted in Batam City, specifically in the Harbour Bay area, which was well known as one of the city's culinary centers. The location was selected because it hosted a wide variety of cafés and restaurants frequently visited by both tourists and local residents, making it a representative setting for examining the *camera eat first* phenomenon and food waste behavior. Data collection was carried out directly at the research site over the period from early to late August 2025.

2.2. Respondents and measurement scale.

The respondents in this study were visitors who dined at cafés and restaurants located in the Harbour Bay area of Batam City. To ensure data representativeness, the sample was evenly distributed, consisting of 50% café visitors and 50% restaurant visitors. The sampling technique employed was non-probability sampling, specifically accidental sampling, in which respondents were selected based on their availability and willingness to participate at the time of data collection. The research instrument used was a structured questionnaire employing a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), to measure respondents' perceptions of each research variable.

2.3. Analysis method.

This study employed a quantitative approach using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) technique. The collected data were analyzed using SmartPLS software. The first stage of analysis involved evaluating the measurement model (outer model), which included tests of convergent validity (> 0.7), construct reliability (> 0.6), and Average Variance Extracted (AVE) (> 0.5). Subsequently, the structural model (inner model) was assessed to examine the relationships among variables, including R-squared values, t-statistics, and p-values, using the bootstrapping technique with 5,000 subsamples [38].

In addition, Fuzzy-Set Qualitative Comparative Analysis (fsQCA) was utilized to identify combinations of factors that influenced food waste, providing a more comprehensive understanding of the phenomenon [8, 21]. This approach allowed for the exploration of alternative pathways contributing to food waste, thereby supporting the formulation of more effective mitigation strategies.

The integration of SEM-PLS and fsQCA was conducted to gain deeper insights into the relationships among variables. SEM-PLS was used to test direct and indirect (linear) relationships among constructs, while fsQCA complemented these results by examining combinations of conditions that could produce similar behavioral outcomes. Thus, the two methods complemented each other analytically: SEM-PLS provided variance-based results,

whereas fsQCA offered configuration-based insights, jointly strengthening the empirical validity of this study's findings.

2.4. Research instruments.

The research stages began with observation, data collection, survey data processing, and analysis and evaluation of the results [39]. This study examined perceived behavioral control, emotions, attitudes, and the mediating role of camera eat first behavior on food waste. Table 1 presents the variables and statements used in this study. Measurement items were obtained from previous studies and then revalidated to align with the research objectives through a Focus Group Discussion (FGD) involving nine participants, consisting of lecturers and culinary practitioners familiar with the topics of food waste behavior and digital lifestyles. The FGD results indicated that most statements were relevant and easily understood by respondents; however, some terms were adjusted to be more contextualized to reflect the habits of people in cafés and restaurants. This process was carried out to ensure the accuracy of the data obtained and to effectively address the research hypotheses..

Table 1. Questionnaire statements.

Variable	Statement
Food waste Behavior	always try to finish the food on my plate [27].
	I am willing to reduce food waste in the future [8]
	I plan to reduce food waste [8]
	From a social perspective, I believe reducing food waste is the right attitude toward those who are less fortunate [26].
Perceived behavioral control	I am committed to minimizing food waste when dining at restaurants [32].
	Finishing the food on my plate is usually easy for me [27].
	I can finish all the food on my plate if I want to [27].
	I am able to estimate the appropriate portion of food [24].
Attitude	I feel uncomfortable when uneaten food is discarded [25].
	I was raised with the belief that food should not be wasted [25].
	I believe that food should not be thrown away unnecessarily [25].
	In my opinion, throwing away food is a bad action [24].
Emotional	I often feel uncomfortable with myself when wasting food [32]
	I feel guilty when I throw away food [32].
	Every time I waste food, I feel regretful [32].
	I feel ashamed because wasting food has lowered my quality of life [8]
Camera Eat First	I feel happier when uploading food photos on social media [21]
	I enjoy taking pictures of food and sharing them on social media [21].
	Even when I am full, I still buy food just to photograph and upload it on social media [21].

Based on Table 1, the research instrument was developed by adapting indicators that had been validated in previous studies. The variable Food Waste Behavior (FWB) was adapted from [8, 26, 27, 32], emphasizing individuals' behaviors and commitments to minimizing food waste. The variable Perceived Behavioral Control (PBC) referred to [24, 27], highlighting individuals' perceptions of their ability to regulate food consumption behavior. The variable Attitude (ATT) was adapted from [24, 25], focusing on respondents' beliefs and moral values regarding food waste. The variable Emotion (EM) was derived from [8, 32], emphasizing negative emotions such as guilt, regret, and discomfort associated with discarding food. Finally, the variable Camera Eat First (CEF) was adapted from [21], which illustrated respondents' tendency to associate food consumption with digital activities, particularly uploading food photos on social media.

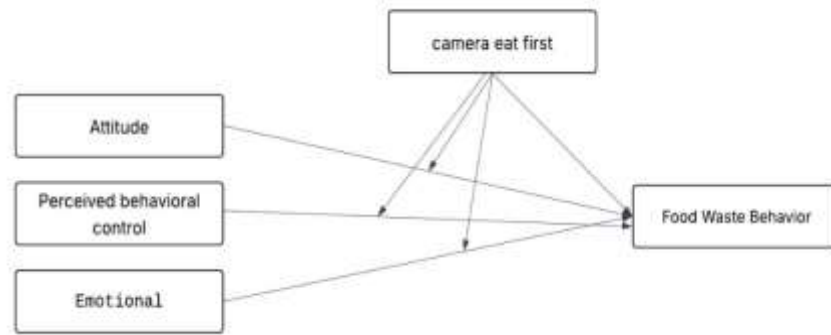


Figure 1. Conceptual framework.

Figure 1 presented the conceptual framework of this study, which examined the influence of attitude, perceived behavioral control, and emotional factors on food waste behavior, with camera eat first as a mediating variable. The camera eat first variable was included to capture how digital lifestyle practices mediated the relationship between psychological factors and food waste behavior.

2.5. Ethical considerations.

This research was conducted in accordance with ethical research principles. Prior to completing the questionnaire, each respondent was informed about the research objectives and participated voluntarily after providing informed consent. Respondents' identities were kept confidential, and all collected data were used solely for academic purposes.

3. Results and Discussion

After the survey was distributed and the data were collected, the next step was to analyze the characteristics of the respondents. The results indicated that the majority of respondents were in the 21–30 age group, totaling 180 individuals (53%). Respondents under the age of 20 accounted for 125 individuals (37%), while those aged 31–40 represented 35 individuals (10%). No respondents were recorded in the age group above 41 years. These findings suggested that the study participants were predominantly young adults, who are generally more active in digital activities and modern lifestyle trends. In terms of gender, female participation was substantially higher than male participation. A total of 235 respondents (69%) were female, compared to 105 respondents (31%) who were male. This composition highlighted that women were more engaged in the study, consistent with the tendency of females to show greater interest in culinary activities and digital social interactions. Regarding visit frequency, 214 respondents (63%) reported visiting the Harbour Bay area more than once, while 126 respondents (37%) were first-time visitors. This distribution indicated that most respondents were already familiar with Harbour Bay, suggesting that their perceptions of the culinary experiences at the research site were relatively more established compared to new visitors. A summary of the respondents' characteristics is presented in Table 2.

Table 2. Characteristics of the respondents.

Characteristics of the Respondents	Frequency	Percentage
Age		
< 20 Years	125	37%
21-30 Years	180	53%
31-40 Years	35	10%
>41 Years	-	-
Gender		
Male	105	31%
Female	235	69%
Visit Frequency to Harbour Bay		
First-time Visitor	126	37%
More than Once	214	63%

After the data were collected, a factor loading analysis was conducted to assess the quality of the research instrument. Convergent validity was evaluated based on the outer loading values, Composite Reliability (CR), Average Variance Extracted (AVE), and Cronbach's Alpha for each construct. A summary of the indicator testing results is presented in Table 3.

Table 3. Factor loading.

Indicator	Mean	Outer loading	Composite Reliability	AVE	Cronbach Alpha	Standard Deviation
FWB1	4.33	0.795	0.899	0.641	0.859	0.866
FWB2	4.226	0.818				0.904
FWB3	4.255	0.877				0.836
FWB4	4.292	0.737				0.911
FWB5	4.179	0.769				0.877
PBC1	4.245	0.881	0.89	0.731	0.815	0.822
PBC2	4.208	0.795				0.898
PBC3	4.274	0.886				0.771
ATT1	4.179	0.715	0.877	0.641	0.812	0.888
ATT2	4.472	0.86				0.755
ATT3	4.5	0.871				0.768
ATT4	2.255	0.745				0.941
EM1	4.179	0.894	0.92	0.741	0.883	0.833
EM2	4.236	0.889				0.896
EM3	4.142	0.882				0.895
EM4	3.877	0.773				0.898
CEF1	3.396	0.731	0.884	0.719	0.820	1.271
CEF2	3.368	0.823				1.362
CEF3	1.943	0.973				1.287

Based on Table 3, the outer model analysis showed that all indicators had outer loading values above 0.70, indicating that they were valid in reflecting their respective constructs [38]. All constructs, food waste behavior, perceived behavioral control, attitude, emotion, and camera eat first, demonstrated composite reliability values above 0.87, Cronbach's alpha values above 0.81, and AVE values above 0.64, confirming adequate internal consistency and convergent validity. Only the camera eat first construct exhibited a higher standard deviation, suggesting greater variability in respondents' perceptions. Overall, the measurement model in this study was considered reliable and valid for further analysis in evaluating the inner model.

Table 4. Fornell Larcker.

	Attitude	Camera Eat First	Emotional	Food Waste Behavioral	Perceived Behavioral Control
Attitude	0.801				
Camera Eat First	0.560	0.650			
Emotional	0.65	0.580	0.861		
Food Waste Behavioral	0.652	0.563	0.551	0.8	
Perceiving Behavioral Control	0.691	0.551	0.434	0.746	0.855

Based on Table 4, the square root values of the Average Variance Extracted (AVE) presented on the main diagonal were higher than the correlations between constructs. Attitude ($\sqrt{\text{AVE}} = 0.801$), camera eat first ($\sqrt{\text{AVE}} = 0.650$), emotion ($\sqrt{\text{AVE}} = 0.861$), food waste behavior ($\sqrt{\text{AVE}} = 0.800$), and perceived behavioral control ($\sqrt{\text{AVE}} = 0.855$) all demonstrated adequate discriminant validity. Thus, the constructs in this research model were confirmed to measure distinct concepts in accordance with the study objectives. These findings indicated that all constructs met the criteria for discriminant validity [38].

Table 5. Hypothesis.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Conclusion
Attitude_ -> Camera Eat First_	-0.588	-0.246	0.415	1.417	0.157	Rejected
Attitude_ -> Food Waste Behavior	0.129	0.125	0.113	1.143	0.254	Rejected
Camera Eat First_ -> Food Waste Behavior	0.044	0.032	0.067	0.665	0.507	Rejected
Emotional_ -> Camera Eat First_	0.309	0.29	0.174	1.777	0.076	Rejected
Emotional_ -> Food Waste Behavior	0.222	0.235	0.107	2.082	0.038	Accepted
Perceived Behavioral Control_ -> Camera Eat First_	0.06	-0.019	0.156	0.385	0.7	Rejected
Perceived Behavioral Control_ -> Food Waste Behavior	0.569	0.565	0.097	5.877	0	Accepted

Based on Table 5, the relationship between attitude and camera eat first resulted in a path coefficient of -0.588, with a t-value of 1.417 and a p-value of 0.157 (>0.05), indicating a non-significant effect. This finding suggested that attitude did not influence individuals' tendency to engage in camera eat first behavior. The relationship between attitude and food waste behavior yielded a path coefficient of 0.129, with a t-value of 1.143 and a p-value of 0.254 (>0.05), indicating that attitude did not significantly affect food waste behavior. This phenomenon, known as the attitude–behavior gap, implies that believing food waste is wrong does not necessarily prevent individuals from engaging in it [26]. In other words, attitude alone was not a strong predictor of food waste behavior.

The relationship between camera eat first and food waste behavior produced a path coefficient of 0.044, with a t-value of 0.665 and a p-value of 0.507 (>0.05), indicating no significant effect. This finding contrasted with [21], who reported that the habit of posting food photos encourages overconsumption behavior. The discrepancy in results could be explained by the high variation in respondents' perceptions of camera eat first behavior, which was also reflected in the standard deviation of this construct in the model.

The relationship between emotion and camera eat first showed a path coefficient of 0.309, with a t-value of 1.777 and a p-value of 0.076 (>0.05). This indicated a positive but non-significant effect of emotion on camera eat first behavior. The finding approached significance, suggesting a moderate influence. This result supported the study of [31], which indicated that emotions—particularly those related to social validation—played a role in digital behaviors such as photographing and posting food, although their effects were not always consistent across contexts.

The relationship between emotion and food waste behavior yielded a path coefficient of 0.222, with a t-value of 2.082 and a p-value of 0.038 (<0.05), indicating a significant effect. This finding confirmed that emotion influenced food waste behavior, consistent with [8], who emphasized that negative emotions such as guilt, shame, and regret played a critical role in promoting or deterring food waste. Emotions also affected individuals' intentions regarding food waste [32], stemming from feelings of guilt and regret associated with discarding food. Similarly, [33] noted that guilt is a negative emotion arising from committing the act of food waste. This is particularly important because some individuals may dispose of food without experiencing guilt. Emotional responses generally include guilt and regret [32], which can foster empathy toward the environment and encourage pro-environmental behavior, including reducing future food waste [40].

The relationship between perceived behavioral control and camera eat first resulted in a path coefficient of 0.060, with a t-value of 0.385 and a p-value of 0.700 (>0.05), indicating a non-significant effect. This suggested that perceived behavioral control did not significantly encourage or inhibit camera eat first behavior. This finding was consistent with [27], who noted that behavioral control more strongly influences food waste than social media behavior.

Finally, the relationship between perceived behavioral control and food waste behavior produced a path coefficient of 0.569, with a t-value of 5.877 and a p-value of 0.000 (<0.01), indicating a significant effect. This finding confirmed that higher perceived behavioral control increased the likelihood of engaging in food waste. The result aligned with [24], who emphasized the role of behavioral control in shaping consumption behaviors, including food waste. Perceived behavioral control reflected the perceived ease or difficulty of reducing food waste [41]. This was supported by [25], who noted that perceived behavioral control represents the perceived ease or difficulty of performing a behavior, as outlined in the Theory of Planned Behavior. Moreover, perceived behavioral control measured the extent to which individuals believed they had the ability, resources, and opportunities to perform a behavior to reduce food waste [42].

Table 6. Mediation hypothesis.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ([O/STDEV])	P Values	Conclusion
Attitude_ -> Camera Eat First_ - > Food Waste Behavior	-0.026	-0.014	0.03	0.856	0.392	Rejected
Emotional_ -> Camera Eat First_ - > Food Waste Behavior	0.014	0.012	0.023	0.594	0.553	Rejected
Perceived Behavioral Control_ -> Camera Eat First_ -> Food Waste Behavior	0.003	0	0.011	0.232	0.817	Rejected

Table 6 shows that all mediation paths through camera eat first are not significant. The relationship between attitude and food waste behavior via camera eat first yielded a coefficient of -0.026, with a t-value of 0.856 and a p-value of 0.392 (>0.05), indicating that camera eat first does not function as a mediator. The relationship between emotion and food waste behavior via camera eat first produced a coefficient of 0.014, with a t-value of 0.594 and a p-value of 0.553 (>0.05), also showing a non-significant effect. Similarly, the relationship between perceived behavioral control and food waste behavior via camera eat first showed a coefficient of 0.003, with a t-value of 0.232 and a p-value of 0.817 (>0.05). Therefore, it can be concluded that camera eat first does not act as a mediating variable linking the effects of attitude, emotion, or perceived behavioral control to food waste behavior. This finding aligns with the Theory of Planned Behavior, which emphasizes the roles of attitude and behavioral control as direct predictors of behavioral intention rather than external lifestyle factors.

Attitude remains a crucial factor in shaping individuals' tendencies to avoid food waste. The results of this study indicate that attitude significantly influences food waste behavior, consistent with the findings of [43], who highlighted the impact of individual attitudes on behavioral intention regarding food waste. This result is further supported by [25], who reported that attitude affects the intention to engage in food waste, and by [21], who found a similar effect on actual food waste behavior. In addition, [24] emphasized the role of perceived behavioral control in shaping consumption behavior, including food waste. Perceived behavioral control reflects an individual's perception of the ease or difficulty of reducing food waste [41]. Overall, efforts to minimize food waste should prioritize enhancing emotional awareness and promoting portion control rather than focusing on social media practices such as camera eat first.

Table 7. Analysis of necessary conditions.

Antecedents	Consistency	Coverage
ATT	-510.070221	-0.154857
EM	-525.400513	-0.16712
PBC	-179.410583	-0.055642
CEF	-1451.61438	-0.534656

Table 7 shows that all antecedents (ATT, EM, PBC, and CEF) exhibit negative consistency values (ATT = -510.07; EM = -525.40; PBC = -179.41; CEF = -1451.61). The

analysis of necessary conditions indicates that none of the antecedents—attitude, emotion, perceived behavioral control, or camera eat first—meet the criteria to be considered necessary conditions for food waste behavior. The consistency values of all variables are well below the threshold of 0.90 [44], suggesting that food waste behavior is not driven by any single dominant factor. This finding aligns with the view that consumption-related behaviors, including food waste, represent complex phenomena influenced by the interaction of multiple psychological, social, and situational factors [6], [26]. Therefore, understanding food waste behavior requires an analytical perspective that emphasizes the configuration and interplay of conditions rather than the linear influence of individual variables.

Table 8. Results of the intermediate solutions.

Configurations	Raw Coverage	Unique Coverage	Consistency
~EM*PBC*~CEF	0.375174	0.0477686	0.992162
EM*PBC*CEF	0.460774	0.0528245	0.993983
ATT*~EM*~PBC*CEF	0.223849	0.00348687	0.803002
ATT*PBC*~CEF	0.620293	0.0170852	0.993855
ATT*EM*PBC	0.719317	0.0636334	0.996137

Based on Table 8, the fsQCA analysis identified five main configurations explaining food waste behavior. The absence of emotion, combined with the presence of perceived behavioral control and the absence of camera eat first (~EM PBC~CEF), yielded a raw coverage of 0.375 and a consistency of 0.992, emphasizing the role of perceived behavioral control when both emotion and camera eat first are absent. The combination of emotion, perceived behavioral control, and camera eat first (EM PBC CEF) produced a raw coverage of 0.460 and a consistency of 0.993, indicating a higher tendency toward food waste behavior. The configuration consisting of positive attitude, absence of emotion, absence of perceived behavioral control, and presence of camera eat first (ATT~EM~PBC CEF) showed a raw coverage of 0.223 and a consistency of 0.803, which is relatively lower than the other configurations. The combination of positive attitude and perceived behavioral control without camera eat first (ATT PBC~CEF) resulted in a raw coverage of 0.620 and a consistency of 0.993, representing a dominant pathway in explaining food waste behavior. The combination of positive attitude, emotion, and perceived behavioral control (ATT EM PBC) produced the highest raw coverage (0.719) and consistency (0.996), identifying it as the strongest and most consistent configuration predicting food waste behavior.

The fsQCA results indicate that multiple sufficient pathways can explain food waste behavior, with the most robust configuration being the combination of attitude, emotion, and perceived behavioral control. This suggests that food waste behavior tends to occur when individuals hold permissive attitudes, are influenced by emotional factors, and perceive control over their consumption behavior. This finding supports [43], who emphasized the role of individual attitudes in shaping behavioral intentions toward food waste, and [40], who highlighted that emotional factors foster empathy toward the environment and encourage pro-environmental behavior. Similarly, [24] underscored the importance of behavioral control in shaping consumption patterns, including food waste.

Another notable pathway involves the combination of emotion, perceived behavioral control, and camera eat first, which collectively promote food waste behavior. This is significant because, although SEM-PLS results showed no direct or mediating effect of camera eat first, fsQCA reveals its influence under specific contextual combinations. The findings suggest that digital lifestyle behaviors, such as photographing and uploading food, do not

directly cause waste but may interact with emotions and self-control. In such cases, camera eat first may amplify psychological effects—such as excitement or pride—that reduce self-regulation during food ordering. This supports [21], who noted that camera eat first can function as a digital lifestyle factor reinforcing overconsumption tendencies among certain groups.

Conversely, the configuration involving positive attitude and perceived behavioral control without camera eat first also demonstrates a strong and consistent pathway. This indicates that internal psychological factors alone can adequately explain food waste behavior, and that camera eat first acts as a contextual rather than a core determinant.

These findings have important implications for food waste management in restaurants and the culinary sector. Previous studies have shown that consumer behavior significantly affects restaurant food waste volume [45]. Based on the current findings, enhancing consumers' emotional awareness can be incorporated into restaurant waste reduction strategies through visual education initiatives such as “Eat What You Order” campaigns or moral reminders on menus [46]. Such behavioral approaches can motivate customers to choose portions according to their needs, assess consumption capacity, and contribute directly to waste reduction.

Moreover, insights from this study can inform restaurant waste auditing. Data related to emotional dimensions and perceived behavioral control can help identify critical points of waste generation throughout the consumption chain—from ordering to disposal [47]. Behavior-based waste audits enable restaurants to design more effective reduction measures, such as adjusting portion sizes, adopting adaptive menu systems based on demand, and optimizing food inventory management [48].

From a policy standpoint, these findings also inform waste management strategies in the tourism and culinary sectors. Government agencies and tourism managers can integrate behavioral insights into policy frameworks, such as introducing green certification programs for restaurants that monitor and manage food waste effectively [49]. This approach complements technical waste management systems with psychological and contextual dimensions of consumption behavior. Overall, this study confirms that reducing food waste in the culinary sector requires not only technical interventions but also behavioral strategies that enhance emotional awareness and self-control among consumers.

4. Conclusions

This study investigated the influence of attitude, emotion, perceived behavioral control, and the camera-eat-first phenomenon on food waste behavior among café and restaurant visitors in the Harbour Bay area of Batam. The SEM-PLS results revealed that only emotion and perceived behavioral control significantly affect food waste behavior, whereas attitude and camera-eat-first show no direct or mediating effects. These findings suggest that food waste behavior is primarily shaped by internal psychological factors—particularly emotional impulses such as guilt, regret, and shame—alongside individuals' perceived ability to regulate food portions. Complementary fsQCA results further indicate that the combination of attitude, emotion, and perceived behavioral control constitutes the most consistent configuration explaining food waste behavior. Although camera-eat-first was not significant in the SEM-PLS model, its presence in certain configurations highlights its potential role as a digital lifestyle factor that may amplify overconsumption tendencies. Overall, food waste emerges as a

complex behavioral issue influenced by the interaction of psychological, social, and digital factors rather than by any single determinant. Therefore, strategies to mitigate food waste should prioritize enhancing emotional awareness, improving portion control, and fostering responsible consumption education, while also considering the effects of digital culture in modern dining contexts. The study's limitations include the relatively narrow sampling scope and the exclusion of other relevant variables, such as social norms and cultural influences. Future research should address these aspects using broader and longitudinal designs to enhance the generalizability and depth of understanding regarding food waste behavior.

Acknowledgments

This research was funded by the Ministry of Higher Education, Science, and Technology of the Republic of Indonesia through the Beginner Lecturer Research Grant (No. 138/C3/DT.05.00/PL/2025).

Author Contribution

Eryd Saputra: conceptualization, methodology, data collection, writing, supervision, funding.
Rezki Alhamdi: conceptualization, methodology, data analysis, writing, funding.

Competing Interest

The author declares that there is no conflict of interest regarding the publication of this article.

References

- [1] Tosi Robinson, D.; Le Thi, H.A.; Pham, T.L.; Nguyen, Q.H.; Le, V.H.; Trinh, T.T. (2024). Land-based plastic leakage into the aquatic environment from municipal solid waste – Waste flow diagram applied to Tuy Hoa City, Phu Yen, Vietnam. *Waste Management*, 186, 226–235. <http://doi.org/10.1016/j.wasman.2024.06.014>.
- [2] Naumann, M.; Heß, M.; Hesselbach, J.; Thiede, A. (2025). Energy efficiency improvement for decarbonization in manufacturing industry: A review. *Energy Conversion and Management*, 338, 119763. <http://doi.org/10.1016/j.enconman.2025.119763>.
- [3] Montero-Vega, M.; Brenes-Peralta, L.P.; Baltodano-Zúñiga, D.; García-Barquero, M.E. (2024). Which factors determine food waste-related behavior? Perspectives from households for local policymaking in developing countries. *Cogent Food and Agriculture*, 10(1), 2341551. <http://doi.org/10.1080/23311932.2024.2341551>.
- [4] Dang, T.T.D.; Dang, T.H.A. (2025). Effect of tourism on waste discharge and treatment in Vietnam's Red River Delta. *Cleaner Waste Systems*, 11, 100311. <http://doi.org/10.1016/j.clwas.2025.100311>.
- [5] Koh, C.; Suhartanto, D.; Brien, A.; Andrianto, T.; Saputra, E.; Abnur, A. (2024). Attitudes and behaviour intention in consuming plant-based food: Evidence from young tourists in Indonesia. *Tourism and Hospitality Management*, 30(2), 259–268. <http://doi.org/10.20867/thm.30.2.9>.
- [6] Dhir, A.; Talwar, S.; Kaur, P.; Malibari, A. (2020). Food waste in hospitality and food services: A systematic literature review and framework development approach. *Journal of Cleaner Production*, 270, 122861. <http://doi.org/10.1016/j.jclepro.2020.122861>.
- [7] Aydin, H.; Aydin, C. (2022). Investigating consumers' food waste behaviors: An extended theory of planned behavior of Turkey sample. *Cleaner Waste Systems*, 3, 100036. <http://doi.org/10.1016/j.clwas.2022.100036>.

- [8] Fazal-e-Hasan, S.M.; Mortimer, G.; Ahmadi, H.; Abid, M.; Farooque, O.; Amrollahi, A. (2024). How tourists' negative and positive emotions motivate their intentions to reduce food waste. *Journal of Sustainable Tourism*, 32(10), 2039–2059. <http://doi.org/10.1080/09669582.2023.2264539>.
- [9] Bauerné Gáthy, A.; Kovácsné Soltész, A.; Szűcs, I. (2022). Sustainable consumption – examining the environmental and health awareness of students at the University of Debrecen. *Cogent Business and Management*, 9(1), 2105572. <http://doi.org/10.1080/23311975.2022.2105572>.
- [10] Tsai, W.-C.; Chen, X.; Yang, C. (2020). Consumer food waste behavior among emerging adults: Evidence from China. *Foods*, 9(7), 961. <http://doi.org/10.3390/foods9070961>.
- [11] Indonesia siap terapkan strategi pengelolaan food loss and waste untuk perkuat ekonomi sirkular dan ketahanan pangan nasional. *Waste4Change*. (Accessed on 1 April 2025) Available online: <https://waste4change.com/blog/indonesia-siap-terapkan-strategi-pengelolaan-food-loss-and-waste-untuk-perkuat-ekonomi-sirkular-dan-ketahanan-pangan-nasional/>.
- [12] Food Waste Index Report 2024. *UN Environment Programme*. Accessed on 1 April 2025) Available online: <https://www.unep.org/resources/publication/food-waste-index-report-2024>.
- [13] Barker, H.; Shaw, P.J.; Richards, B.; Clegg, Z.; Smith, D. (2021). What nudge techniques work for food waste behaviour change at the consumer level? A systematic review. *Sustainability*, 13(19), 11099. <http://doi.org/10.3390/su131911099>.
- [14] Habib, M.D.; Kaur, P.; Sharma, V.; Talwar, S. (2023). Analyzing the food waste reduction intentions of UK households: A Value-Attitude-Behavior (VAB) theory perspective. *Journal of Retailing and Consumer Services*, 75, 103486. <http://doi.org/10.1016/j.jretconser.2023.103486>.
- [15] Von Massow, M.; McAdams, B. (2015). Table scraps: An evaluation of plate waste in restaurants. *Journal of Foodservice Business Research*, 18(5), 437–453. <http://doi.org/10.1080/15378020.2015.1093451>.
- [16] Fathy, E.A.; Salem, I.E.; Zidan, H.A.K.Y.; Abdien, M.K. (2024). From plate to post: how foodstagramming enriches tourist satisfaction and creates memorable experiences in culinary tourism. *Current Issues in Tourism*, pp. 1–20. <http://doi.org/10.1080/13683500.2024.2405625>.
- [17] Li, N.; Wang, J. (2020). Food waste of Chinese cruise passengers. *Journal of Sustainable Tourism*, 28(11), 1825–1840. <http://doi.org/10.1080/09669582.2020.1762621>.
- [18] Wang, L.; Weng Wong, P.P.; Elangkovar, N.A. (2020). The influence of religiosity on consumer's green purchase intention towards green hotel selection in China. *Journal of China Tourism Research*, 16(3), 319–345. <http://doi.org/10.1080/19388160.2019.1637318>.
- [19] Çetin, K.; Süren, T. (2024). An investigation into the causes of food waste by tourists in all-inclusive resorts in Turkey. *Journal of Quality Assurance in Hospitality and Tourism*, 25(4), 677–699. <http://doi.org/10.1080/1528008X.2022.2135162>.
- [20] Wachyuni, S.S.; Yusuf, L. (2021). Camera eat first: Tourist motivation in sharing food photograph on Instagram. *International Journal of Tourism and Hospitality Review*, 8(1), 62–70. <http://doi.org/10.18510/ijthr.2021.815>.
- [21] Zhang, S.; Zhang, D. (2024). Factors affecting food waste at food festivals: The moderating effect of “Camera Eats First.” *Journal of Sustainable Tourism*, 33(2), 357–379. <http://doi.org/10.1080/09669582.2024.2345693>.
- [22] Yong, J.Y.Y.; Tong, E.M.W.; Liu, J.C.J. (2020). When the camera eats first: Exploring how meal-time cell phone photography affects eating behaviours. *Appetite*, 154, 104787. <http://doi.org/10.1016/j.appet.2020.104787>.
- [23] Panda, D.; Raut, S.K.; Rana, S.; Shamsudin, M.N. (2024). Household food waste reduction and leftover reuse intention: interplay of personal norms and mediating variables. *Journal of Foodservice Business Research*, pp. 1–30. <http://doi.org/10.1080/15378020.2024.2430063>.

- [24] Coşkun, A.; Yetkin Özbük, R.M. (2020). What influences consumer food waste behavior in restaurants? An application of the extended theory of planned behavior. *Waste Management*, 117, 170–178. <http://doi.org/10.1016/j.wasman.2020.08.011>.
- [25] Aktas, E.; et al. (2018). A consumer behavioural approach to food waste. *Journal of Enterprise Information Management*, 31(5), 658–673. <http://doi.org/10.1108/JEIM-03-2018-0051>.
- [26] Mondéjar-Jiménez, J.-A.; Ferrari, G.; Secondi, L.; Principato, L. (2016). From the table to waste: An exploratory study on behaviour towards food waste of Spanish and Italian youths. *Journal of Cleaner Production*, 138, 8–18. <http://doi.org/10.1016/j.jclepro.2016.06.018>.
- [27] Watanabe, E.A.D.M.; Freitas, M.G.M.T.D.; Demo, G. (2023). Food waste in restaurants: Evidence from Brazil and the United States. *Journal of International Food and Agribusiness Marketing*, 35(3), 283–304. <http://doi.org/10.1080/08974438.2021.1996500>.
- [28] Chen, F.; Jiang, S.; Gu, X.; Zhiwei, W.; Yang, L. (2024). External or internal beauty? A study on the mechanism influencing food waste behavior. *Journal of Environmental Planning and Management*, 67(6), 1367–1385. <http://doi.org/10.1080/09640568.2023.2168524>.
- [29] Long, F.; Aziz, N.A.; Chia, K.W.; Zhang, H. (2024). Clear your plate! The impact of cultural values and social influences on intention to reduce food waste among Malaysian consumers. *Cogent Business and Management*, 11(1), 2321796. <http://doi.org/10.1080/23311975.2024.2321796>.
- [30] Salem, M.; Wagner, R. (2025). Food waste under pressure: self-identity, attitudes, overbuying behavior, and consumers' perceived time pressure. *Journal of Foodservice Business Research*, pp. 1–33. <http://doi.org/10.1080/15378020.2025.2458336>.
- [31] Sharma, K.; Trott, S.; Sahadev, S.; Singh, R. (2023). Emotions and consumer behaviour: A review and research agenda. *International Journal of Consumer Studies*, 47(6), 2396–2416. <https://doi.org/10.1111/ijcs.12937>.
- [32] Chakraborty, D.; Mattila, A.S. (2025). The effect of self-conscious emotions of guilt and regret on consumers' intentions to reduce food waste. *Journal of Sustainable Tourism*, 33(9), 1871–1889. <https://doi.org/10.1080/09669582.2024.2406532>.
- [33] Attiq, S.; Danish Habib, M.; Kaur, P.; Junaid Shahid Hasni, M.; Dhir, A. (2021). Drivers of food waste reduction behaviour in the household context. *Food Quality and Preference*, 94, 104300. <https://doi.org/10.1016/j.foodqual.2021.104300>.
- [34] Chia, D.; Yap, C.C.; Wu, S.L.; Berezina, E.; Aroua, M.K.; Gew, L.T. (2024). A systematic review of country-specific drivers and barriers to household food waste reduction and prevention. *Waste Management and Research: The Journal for a Sustainable Circular Economy*, 42(6), 459–475. <https://doi.org/10.1177/0734242X231187559>.
- [35] Onur, M.; Özgen, L.; Keskin, E. (2025). Determining the correlations between intention to reuse food waste, food waste behaviour and the culinary creativity level. *International Journal of Gastronomy and Food Science*, 40, 101141. <https://doi.org/10.1016/j.ijgfs.2025.101141>.
- [36] Bhaskara, G.I.; Filimonau, V.; Kusumawardhana, I.; Darma Putra, I.N.; Sucita Yanthy, P.; Nur Hakim, I. (2024). Environmental habitus of chefs and food waste management in hospitality operations. *Journal of Sustainable Tourism*, 32, 1–27. <https://doi.org/10.1080/09669582.2024.2408008>.
- [37] Malau, L.R.E.; Rambe, K.R.; Wibowo, H.E.; Novanda, R.R.; Khaliqi, M. (2025). Understanding the heterogeneity in food wasting behavior among the Indonesian young generation: Cluster analysis. *Cleaner Circular Bioeconomy*, 12, 100165. <https://doi.org/10.1016/j.clcb.2025.100165>.
- [38] Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>.
- [39] Abdul Halim, H.; Mohamed Najib, M.Z.; Zainal Abideen, M.; Basri, H.F.; Muda, K. (2022). Study of household waste management and recycling awareness between residential areas in Kuala

- Nerang, Kedah, Malaysia. *Industrial and Domestic Waste Management*, 2(1), 39–45. <https://doi.org/10.53623/idwm.v2i1.70>.
- [40] Khorakian, A.; Baregheh, A.; Jahangir, M.; Heidari, A.; Saadatyar, F.S. (2024). Household food waste prevention behavior: The role of religious orientations, emotional intelligence, and spiritual well-being. *Journal of Environmental Planning and Management*, 67(1), 59–84. <https://doi.org/10.1080/09640568.2022.2097062>.
- [41] Soorani, F.; Ahmadvand, M. (2019). Determinants of consumers' food management behavior: Applying and extending the theory of planned behavior. *Waste Management*, 98, 151–159. <https://doi.org/10.1016/j.wasman.2019.08.025>.
- [42] Russell, S.V.; Young, C.W.; Unsworth, K.L.; Robinson, C. (2017). Bringing habits and emotions into food waste behaviour. *Resources, Conservation and Recycling*, 125, 107–114. <https://doi.org/10.1016/j.resconrec.2017.06.007>.
- [43] Melnyk, D.; Salem, M.; Ertz, M.; Wagner, R. (2025). Being the 'Better' student: Intentions to reduce food waste. *Discover Sustainability*, 6(1), 201. <https://doi.org/10.1007/s43621-025-01021-2>.
- [44] Schneider, C.Q.; Wagemann, C. (2012). *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*. Cambridge University Press. <https://doi.org/10.1017/CBO9781139004244>.
- [45] Papargyropoulou, E.; Wright, N.; Lozano, R.; Steinberger, J.; Padfield, R.; Ujang, Z. (2016). Conceptual framework for the study of food waste generation and prevention in the hospitality sector. *Waste Management*, 49, 326–336. <https://doi.org/10.1016/j.wasman.2016.01.017>.
- [46] Kallbekken, S.; Sælen, H. (2013). 'Nudging' hotel guests to reduce food waste as a win–win environmental measure. *Economics Letters*, 119(3), 325–327. <https://doi.org/10.1016/j.econlet.2013.03.019>.
- [47] Filimonau, V.; Todorova, E. (2020). Management of hospitality food waste and the role of consumer behavior. In *Food Industry Wastes* (2nd ed., pp. 451–466). Elsevier. <https://doi.org/10.1016/B978-0-12-817121-9.00021-8>.
- [48] Grainger, M.J.; et al. (2018). Model selection and averaging in the assessment of the drivers of household food waste to reduce the probability of false positives. *PLOS ONE*, 13(2), e0192075. <https://doi.org/10.1371/journal.pone.0192075>.
- [49] Filimonau, V.; De Coteau, D.A. (2019). Food waste management in hospitality operations: A critical review. *Tourism Management*, 71, 234–245. <https://doi.org/10.1016/j.tourman.2018.10.009>.



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