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Drivers of Young Consumers' Willingness to Reduce Food Waste and Buy Intelligent Packaging

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ABSTRACT

Objectives*: As food waste harms the sustainable environment and the economy, some innovations have been made to reduce this issue, such as intelligent packaging. However, the factors leading to consumer behavior to reduce food waste and buy intelligent packaging, particularly in developing countries, are still untapped. This study aims to examine the relationship between green perceived value, intention to reduce food waste, and willingness to purchase intelligent packaging.*
Methodology*: Indonesian young consumers were selected using purposive sampling method. Data of 230 eligible responses were analyzed using PLS-SEM.*
Findings*: The results showed that different elements of green perceived value had significant effects on the intention to reduce food waste and willingness to purchase intelligent packaging. Unlike the predicted relationship, the intention to reduce food waste was not significant enough to lead consumers to purchase intelligent packaging.*
Conclusion*: The presented study gives insights to businesspeople on which green perceived values are important for reducing food waste and encouraging consumers to buy intelligent packaging.*

Keywords*: Consumption Value Theory; Food Waste; Green Perceived Value; Green Marketing; Intelligent Packaging*

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INTRODUCTION

Increasing environmental degradation has led to the discussion of environmental preservation issues. One of the topics is food security which has positioned food waste (FW, hereafter) as an important item on the agenda for sustainable development (FAO, 2019). FW has raised concern due to its impacts on the environment and economy (Filimonau et al., 2020). The UN Environment Program stated around 931 million tons of food are wasted each year with 61 percent from household wastage (Marchant, 2021). FW has also become an issue in developing countries, such as Indonesia. FW contributes about 39.8 percent to all the types of waste in Indonesia (Agmasari, 2021) with a total of 184 kg FW per year per capita (Situmorang, 2021).

Understanding consumer behavior and FW management systems may prevent FW from happening (Ghinea & Ghiuta, 2019). Even though many behavioral studies have discussed factors that could affect FW (Aktas et al., 2018; Barone et al., 2019; Cammarelle et al., 2021; Young et al., 2020), only a few have related green perceived value (GPV, hereafter) with FW. Individuals' attitudes and behaviors are influenced by their values (Seligman & Katz, 1996), and these relationships in the environmental context have been proven in various studies (e.g., Nordlund & Garvill, 2002; Schultz & Zelezny, 2003; Shin et al., 2017; Tamar et al., 2021). Consumers are keener to buy green products if they perceive the value is high (Chen & Chang, 2012), and will be willing to pay more (De Medeiros et al., 2016; Zaidi et al., 2020).

One of the attempts to reduce FW is through innovative packaging by extending shelf life and preventing spoilage (Emblem, 2012). Innovative packaging, such as smart packaging, consists of active and intelligent packaging (Verghese et al., 2013). Active packaging uses three types of solution (scavengers, emitters, and adaptors) to ensure product quality and prolong shelf life (Robertson, 2012; Tiekstra et al., 2021), while intelligent packaging applies sensors or detection devices such as temperature indicators, nano sensors, and contamination indicators that record internal or external changes and alert users (Bouwmeester et al., 2009; Cruz et al., 2018).

Like other new technology, smart packaging should gain acceptance from consumers (Li et al., 2020). Tiekstra et al. (2021) found that intelligent packaging was more likely to be successful than active packaging as it enabled consumers to know real-time use-by or expiration data (Cammarelle et al., 2021). Despite its potential, studies of intelligent packaging in the FW context are still limited to developed economies (Cammarelle et al., 2021; Tiekstra et al., 2021; Young et al., 2020), and almost none have been used in developing countries. While the correlation between GPV and willingness to purchase green products has been examined (Chen & Chang, 2012; De Medeiros et al., 2016; Zaidi et al., 2020), none have examined FW and the intelligent packaging context. Therefore, this study aims to test the relationships between each element of GPV, intention to reduce FW, and willingness to purchase intelligent packaging.

LITERATURE REVIEW

Environmental Concern and Green Behavior

Environmental concern is a key factor in influencing behavioral intention (Saari et al., 2021). Fontes et al., (2021) suggests that consumer's purchase intention is influenced by environmental behavior which is caused by pro-environmental behavior engagement. Nielsen (2019) reported that almost third-quarter global consumers were enthusiastic to pay for products with recycled packaging and more environmentally friendly elements to avoid environmental damage. Ozaki et al. (2011) and Wang et al. (2017) confirmed the significant influence of

environmental concern on individuals' attitudes and purchase intentions towards green products, such as intelligent packaging, to reduce environmental damage. The relationships are as follows:
H1: Environmental concern directs to a greater Intention to reduce FW.
H2: Environmental concern directs to a greater willingness to purchase intelligence packaging.

Social Value and Green Behavior
Social value increases consumers' satisfaction when they buy a product (Dangelico et al., 2021). Green products provide the substantial potential of increasing customer satisfaction because of the norms formed by social groups that display the consumption behavior of green products (Biswas & Roy, 2015). It is one of the most effective factors in leading consumers to choose green products (Rahnama & Rajabpour, 2017). Mohd Suki and Mohd Suki (2015) found a substantial effect of social value on consumer concern for the environment by using green products. Consumers who are quite sensitive to environmental issues prefer to buy green products to help preventing the environment, even though the price is higher than non-environmentally friendly products (Zaidi et al., 2020). Given the context, this study proposes the following hypotheses:
H3: Social value directs to a greater Intention to reduce FW.
H4: Social value directs to a greater willingness to purchase intelligence packaging.

Generativity and Green Behavior
Generativity is closely related with altruism value which focuses on individuals' concern about the consequences of their behavior on others (Hiratsuka et al., 2018). Therefore, generativity can be associated with green consumption behavior (Shiel et al., 2020). Generative individuals prefer products that can help them reduce environmental damage, so that this can affect their intentions and purchasing behavior (Bragd et al., 2008). Zaidi et al. (2020) found that consumers with higher generativity were likely to consider products that are good and safe for future generations as a concern. Thus, this study expects the following relationships to be exist in the context of FW:
H5: Generativity directs to a greater Intention to reduce FW.
H5: Generativity directs to a greater willingness to purchase intelligence packaging.

Functional Value and Green Behavior
As consumers begin to realize their roles and responsibilities towards the environment, they start appreciating the functional value of green products (Cherian & Jacob, 2012). Dangelico et al. (2021), Woo and Kim (2019), and Maharum et al. (2017) reported the significance of functional value in stimulating consumers' willingness to buy green products. Consumers who feel they have a responsibility to reduce environmental issues, especially regarding FW, are more likely to buy food products wrapped in innovative packaging, such as intelligent packaging (Cammarelle et al., 2021). This study suspects its superior functional value will increase consumers' willingness to purchase intelligent packaging through the following hypothesis:
H7: Functional value directs to a greater willingness to purchase intelligent packaging.

Relationship between Green Behaviors

Consumers with a high intention to reduce FW will generate less FW (Mumtaz et al., 2022) and are more likely to purchase intelligent packaging (Cammarelle et al., 2021; Young et al., 2020). Their concern about the FW issue encourages them to use intelligent packaging due to its ability to provide information about the food quality and safety (Cammarelle et al., 2021; Emblem, 2012). Intelligent packaging has an indicator that can interact with internal and external factors in which it will generate responses according to the food's condition. The generated information serves not only for communication, but as a tool to reduce FW (Poyatos-Racionero et al., 2018). This study proposes the following hypothesis:

H8: Intention to reduce FW directs to a greater willingness to purchase intelligent packaging.

METHOD

This study focused on generations Y and Z because they have more awareness of the impact of their consumption decisions on the environment and higher pro-environmental responsibility than previous generations (Smith et al., 2012). Generation Y tends to try to reduce food waste as much as possible (Bravi et al., 2019), while generation Z has its own way to reduce food waste by trying to consume recycled food (Zhang et al., 2021). Despite their potential, there are still few studies focusing on these segments. Therefore, the sample was selected purposively by targeting young individuals who are aware of the FW issues but have produced FW either intentionally or not. The minimum sample size was 155 based on the sample-to-item ratio rule.

An online closed-ended questionnaire was performed to obtain data from the targeted individuals. The questions were adapted from several previous studies to ensure their validity. The GPV consists of four elements: environmental concern was measured by nine items from Wu et al. (2019), Li et al. (2019), and Biswas and Roy (2015); functional value and social value each were measured by five items from Woo and Kim (2019) and Biswas and Roy (2015); and generativity was measured by six items from Harmsel (2021). Six items for intention to reduce FW were adapted from Barone et al. (2019) and Aktas et al. (2018). Willingness to purchase intelligent packaging had six items adapted from Harmsel (2021). All items were measured by a 6-point Likert scale.

The partial least square-structural equation modeling (PLS-SEM) was utilized to test the significance of the proposed relationships. This study applied PLS-SEM to maximize the predictive ability of the consumption value theory when tested in the context of FW and innovative packaging in Asia. Moreover, this study has a relatively small sample size of 230 which makes PLS-SEM a panacea for the limitations (Sosik et al., 2009).

RESULTS AND DISCUSSION

Results

After cleaning the data, 230 of 270 responses could be used to test the hypotheses. This study was dominated by women and well-educated respondents (Table 1). Almost 60 percent of respondents had monthly income less than IDR5,000,000, which indicated that they had low to moderate purchasing power. It might because some of them were still studying or early in their career.

Table 1. Profile of the respondents

		Frequency	Percentage (%)
Gender	Male	46	20.00
	Female	131	56.96
	Rather not say	53	23.04
Age	16 – 25	169	73.48
	26 – 35	34	14.78
	36 – 45	27	11.74
Education	Primary or Middle School	1	0.43
	High School	33	14.35
	Diploma	21	9.13
	Undergraduate degree	150	65.22
	Postgraduate degree	25	10.87
Occupation	Employee	39	16.96
	Civil servant	15	6.52
	Entrepreneur	23	10.00
	Student	111	48.26
	Housewife	5	2.17
	Not Employed	12	5.22
	Others	25	10.87
Monthly Income*	IDR < 5.000.000	133	57.83
	IDR 5.000.000 - 9.999.999	52	22.61
	IDR 10.000.000 - 14.999.999	29	12.61
	IDR 15.000.0000 - 19.999.999	0	0.00
	IDR > 20.000.000 or more	16	6.96

**As of July 2022, IDR 1,000,000 equals USD70*

Six indicators had a factor loading less than 0.7. The remaining 28 indicators met the convergent validity requirements with a factor loading above 0.7 and an AVE (Average Variance Extracted) between 0.586 and 0.705. They were also reliable with composite reliability between 0.828 and 0.941 and Cronbach's alpha ranging from 0.692 to 0.927 as shown in Table 2. Discriminant validity was also met where all HTMT ratios were below 0.85 (Table 3).

Table 2. Results of the descriptive statistics, validity, and reliability test

Variable	Indicator	Mean	S.D.	Factor Loading	AVE	Composite Reliability	Cronbach's Alpha
Intention to Reduce FW	IRFW1	5.000	0.850	0.720	0.617	0.828	0.692
	IRFW2	5.326	0.886	0.823			
	IRFW3	5.430	0.729	0.810			
Environmental Concern	EC3	5.209	0.951	0.771	0.665	0.941	0.927
	EC4	4.996	1.006	0.868			

	EC5	5.109	1.014	0.862			
	EC6	5.078	0.943	0.833			
	EC7	5.165	0.982	0.846			
	EC8	4.952	1.120	0.730			
	EC9	5.074	1.063	0.842			
	EC10	4.843	0.996	0.759			
Functional Value	FV1	5.074	0.864	0.814	0.586	0.849	0.767
	FV3	5.152	0.817	0.704			
	FV4	5.191	0.785	0.716			
	FV5	5.017	1.034	0.820			
Social Value	SV1	4.765	1.045	0.849	0.705	0.905	0.860
	SV2	4.726	1.103	0.878			
	SV3	4.957	0.917	0.833			
	SV5	4.922	0.943	0.796			
Generativity	GN1	5.343	0.722	0.803	0.612	0.863	0.789
	GN2	5.400	0.714	0.793			
	GN3	5.296	0.769	0.724			
	GN4	5.396	0.622	0.805			
Willingness to Purchase	WP1	5.035	0.927	0.843	0.679	0.927	0.905
	WP2	5.126	0.912	0.802			
	WP3	4.904	0.978	0.826			
	WP4	4.878	1.031	0.820			
	WP5	4.917	1.041	0.857			
	WP6	4.926	0.941	0.792			

Table 3. Discriminant Validity (HTMT)

Variable	EC	FV	GEN	IRFW	SV	WP
EC						
FV	0.271					
GEN	0.656	0.251				
IRFW	0.558	0.489	0.492			
SV	0.232	0.756	0.142	0.224		
WP	0.229	0.760	0.198	0.333	0.614	

Table 4 shows that GPV could explain the variability of intention to reduce FW by 23.4 percent. From three GPV, environmental concern (β= 0.346; p-value < 0.001) and generativity (β= 0.168; p-value = 0.012) had a significant positive influence on intention to reduce FW, while the effect of social value was insignificant (β= 0.076; p-value = 0.127). Furthermore, GPV could explain the willingness to purchase intelligent packaging by 46.9 percent. Two GPV namely social value (β = 0.233; p-value = 0.001) and functional value (β = 0.491; p-value < 0.001) had a significant positive influence on the willingness to purchase intelligent packaging, while EC (β= 0.029; p-value = 0.302) and generativity (β= 0.016; p-value = 0.389) were

insignificant. Unlike the proposed hypothesis, intention to reduce FW had no considerable influence on willingness to purchase intelligent packaging (β= 0.033 and p-value = 0.324).

Table 4. Result of the hypothesis testing (n = 230)

Path	β	S.E.	t-value	p-value	Remark
H1: EC → IRFW	0.346	0.067	5.147	0.000	Supported
H2: EC → WPIP	0.029	0.056	0.520	0.302	Not Supported
H3: SV → IRFW	0.076	0.067	1.142	0.127	Not Supported
H4: SV → WPIP	0.233	0.072	3.238	0.001	Supported
H5: GEN → IRFW	0.168	0.074	2.255	0.012	Supported
H6: GEN → WPIP	0.016	0.057	0.281	0.389	Not Supported
H7: FV → WPIP	0.491	0.080	6.156	0.000	Supported
H8: IRFW → WPIP	0.033	0.072	0.455	0.324	Not Supported

Discussion

Between significant GPV on intention to reduce FW, environmental concern has a greater effect than generativity. Individuals with higher environmental concern tend to have a positive environmental attitude, which in turn increases their willingness to conduct pro-environmental behaviors (Clark et al., 2003). The positive impact of generativity on the intention to reduce FW is in accordance with Zaidi et al. (2020). Their study found that consumers with high generativity tended to consider products that are good for future generations as a concern. Against expectations, this study fails to prove the effect of social value on the intention to reduce FW, which contradicts the research by Mohd Suki and Mohd Suki (2015). The difference might be due to the different characteristics of respondents.

In terms of willingness to purchase intelligent packaging, the effect of functional value is stronger than social value. Even though both active and intelligent packaging may prolong product shelf-life, intelligent packaging has sensors that can inform consumers about the product changes and quality (Cruz et al., 2018). Due to these benefits, consumers prefer to buy intelligent packaging than active packaging (Cammarelle et al., 2021; Tiekstra et al., 2021) and are more willing to pay a premium price. While social value is insignificant in directing consumers to reduce FW, it has a positive effect on consumers' willingness to purchase intelligent packaging. Social identification creates pressure to gain acceptance in the society that will trigger individuals to buy green products (Zaidi et al., 2020). Although green products, such as intelligent packaging, are sold at a higher price than conventional products (Thøgersen & Ölander, 2003), consumers are willing to pay for these products if they help portray the consumers' pro-environmental image and fulfill the public expectations (Mai, 2019).

Contrary to the prediction, environmental concern has no significant effect on the willingness to purchase intelligent packaging. Generativity also does not have considerable influence on the willingness to purchase intelligent packaging, which does not support the assumption that generative individuals prefer products that can help them reduce environmental damage (Bragd et al., 2008). Generally, a stronger intention to reduce FW will lead to higher willingness to purchase green products due to their concern for the environment (Zaidi et al., 2020). Nevertheless, this study does not support the result of previous studies (Barbera et al., 2014;

Cammarelle et al., 2021; Prakash & Pathak, 2017), which might be due to the characteristics of respondents that are dominated by those aged 16-25 with low monthly income. On the other hand, green products are relatively pricey (Leszczyńska, 2015; Thøgersen & Ölander, 2003).

CONCLUSION

While it is believed that GPV encourages green behaviors, this study finds the significance of each green perceived value may differ. When tested in the context of FW and purchasing behavior toward intelligent packaging, EC and generativity affected consumer IRFW, while social and functional values influenced consumer willingness to purchase intelligent packaging. Even though intelligent packaging may prolong product life and alert the consumers about food product quality, this study found that consumer IRFW did not necessarily increase their willingness to buy intelligent packaging. This study confirmed the green behavior of consumers in developing countries is different from their developed country counterparts as reported by Cammarelle et al. (2021).

Furthermore, intelligent packaging is still quite uncommon in Indonesia and the price is significantly higher than conventional packaging. Thus, the demand for conventional packaging is still high than intelligent packaging. It verified Mufidah et al.'s (2018) argument that people in developed countries tended to have both the intention and action toward environmentally friendly behaviors compared with those in developing countries.

These findings are expected to be useful for F&B businesses that want to contribute to reduce FW and to produce as little waste as possible. The companies together with the government and NGOs should educate young people about environmental issues and their effect in the future. They must use simple yet effective communication campaigns to encourage young people to perform green behaviors in their daily life, either simple or complex actions such as avoiding FW, product recycling, using green products, and doing forestation. Since environmental concern and generativity are important to form consumer intention to reduce FW, a business with environmentally friendly image may attract consumers who have a sense of care for the environment and want to protect the mother nature and future generation (Zaidi et al., 2021).

In terms of green products, such as intelligent packaging, product functionality and social pressure may direct consumers to consider purchasing an environmentally friendly product. Therefore, a business that is planning to offer food products packaged in intelligent packaging can start increasing awareness regarding the advantages and value-added of intelligent packaging through the right promotions. The promotions will be more effective if they target the generations Y and Z who tend to be more serious and have responsibility on the environment than previous generations (Smith et al., 2012). The promotion contents to young consumers should be customized to the consumers' lifestyle and characteristics to show how intelligent packaging can help them reducing environmental problems, especially FW. Therefore, further studies may consider including price value or price sensitivity to obtain more comprehensive understanding of the studied phenomenon. Comparison studies of green behavior between consumers in developed and developing countries are also encouraged.

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