

Circular Economy in Services: Intention to Adopt Sustainable Packaging in Food Delivery

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1. Introduction

With the expansion of food delivery services, the demand for packaging has increased, intensifying the environmental impact due to the depletion of non-renewable resources, pollutant emissions, and excessive waste accumulation (European Commission, 2018). The production of packaging for food services requires significant amounts of natural resources, such as fossil fuels, contributing to climate change and biodiversity loss (Han et al., 2022).

The COVID-19 pandemic significantly impacted the food delivery services sector, leading to an increased demand for disposable packaging due to health and safety concerns (Sia et al., 2023). The global market size for food packaging was estimated at USD 362.9 billion in 2022, reaching USD 380.8 billion in 2023. The global food packaging market is expected to grow at an annual rate of 5.7% from 2023 to 2030, reaching USD 562.3 billion by 2030 (Grand View Research, 2023).

More than 42% of globally produced plastics are used in food packaging, representing approximately 141 million tons per year. In most cases, petroleum-based polymeric materials are used in the development of plastic packaging, making this industry intensive in greenhouse gas emissions and significantly contributing to the climate crisis (Jagoda et al., 2023).

It is known that only 2% of discarded plastic packaging is effectively recycled and reintroduced into the manufacturing process of new packaging (Phelan et al., 2022). Some plastic packaging is processed into secondary plastic, also known as open-loop recycling (Antonopoulos et al., 2021; Hsu et al., 2021), while the rest is sent to landfills, incinerated, or ends up in the natural environment (MacArthur et al., 2017).

The academic literature on how companies adopt sustainable packaging practices from a circular economy perspective is limited. Research has focused on very specific cases, restricted in terms of materials analyzed and types of packaging investigated. Additionally, the life cycle assessment perspective is the most used methodology to study the implications of packaging (Cozzolino and De Giovanni, 2023).

Despite the importance of this topic, there is still little research on the internal and external factors perceived as relevant by merchants for a transition from plastic packaging. Recent literature has mainly focused on designing or describing innovative business models that integrate the principles of the circular economy through informal evidence. Thus, the objective of this research is to measure the factors that influence the intention to adopt sustainable packaging to align with the principles of the circular economy in the food delivery service.

This research presents two contributions: the first is academic, offering a structural model that measures the intention to use sustainable packaging in food delivery, extending the application field of the Theory of Planned Behavior (TPB) by using it as a basis to measure the behavioral intention of managers. In addition to the traditional constructs of the TPB (Behavioral Intention, Attitude, Subjective Norms, and Perceived Behavioral Control), this study added relevant constructs to the sustainability area, such as Perceived Benefit, Awareness of Consequences, Environmental Knowledge, and Environmental Concern. This expansion of the theory allows for a more comprehensive and precise analysis of managers' behavioral intentions related to sustainability.

The second contribution, managerial and environmental, offers guidelines for entrepreneurs and policymakers, providing information to assist them in developing plans to encourage pro-environmental behavior in companies.

2. Literature Review and Research Hypotheses

Although the traditional components of the TPB model (attitude, subjective norms, and perceived behavioral control) have been successful in predicting human intentions and behaviors, many researchers argue that additional variables should be incorporated into the TPB model to increase its explanatory power (Botetzagias et al., 2015; Chen and Tung, 2010; Geiger et al., 2019; Khan et al., 2019; Singh et al., 2018; Tonglet et al., 2004). Ajzen (1991, p. 199) points out that "the theory of planned behavior is open to the inclusion of additional predictors". Thus, the TPB allows researchers to extend the model, considering the context and objectives of their studies. Researchers typically employ the determinants of the TPB model - attitude, subjective norms, and perceived behavioral control - to predict behavioral intention.

Ajzen (1991) defines subjective norms as the perceived social pressure to perform or not perform a specific behavior. An individual's behavioral intention is generally influenced by the expectations of the group or society to which they belong (Ajzen, 1991). Fishbein and Ajzen (2011) explain norms as injunctive norms, perceptions of what others consider correct behavior, and descriptive norms, perceptions of what others are actually doing.

It is worth noting that subjective norms related to the circular economy may vary in different contexts. The intention may be influenced by whether competing or similar organizations support the circular economy (Thoradeniya et al., 2015). Similarly, the intention may be influenced by whether internal individuals within the organization favor the circular economy (Khan et al., 2020). Moreover, family members, suppliers, customers, friends, and colleagues are part of the social group associated with subjective norms (Harjadi and Gunardi, 2022). If managers perceive that other companies in their sector are adopting sustainable packaging, it increases social pressure and the expectation that they should do the same. Therefore, subjective norms play an important role in influencing managers' intentions to adopt sustainable packaging, driving the transition to practices aligned with the principles of the circular economy (Gansser and Reich, 2023). Thus, subjective norms significantly impact green consumption intentions (Lavuri, 2021).

In this study, behavioral intentions are understood as a perceived probability or subjective probability of food trade owners or managers with delivery services adopting sustainable packaging to implement a circular economy model in the services offered. It is assumed that owners or managers with positive behavioral intentions are more likely to adopt sustainable packaging, contributing to the principles of the circular economy in their trade. In other words, it can be stated that owners or managers with positive intentions are more likely to contribute to the adoption of sustainable packaging and consequently adopt some of the principles of the circular economy. Thus, the following hypothesis is proposed:

H1. There is a positive relationship between subjective norm and intention to adopt sustainable packaging in food delivery.

Alongside subjective norms, Ajzen (1991, p. 188) defines perceived behavioral control as "the perceived ease or difficulty of performing the behavior." An individual's behavioral intention depends on their perceived ability or power to perform the behavior in question (Ajzen, 1991). Previous studies support the relationship between perceived behavioral control and behavioral intention (Boldero, 1995; Tonglet et al., 2004). It is worth noting that perceived behavioral control is a determinant of both behavioral intention and actual behavior (Fishbein and Ajzen, 2011).

Perceived behavioral control is concerned with how easy or difficult an individual evaluates the behavior in question based on their past experience and the difficulties and obstacles they assume to encounter. It refers to the degree of individual control over performing

specific behaviors; thus, self-efficacy and perceived control are two factors related to behavioral intention (Ajzen, 1991).

Regarding perceived behavioral control and pro-environmental behavior, this construct observes how easy or difficult an individual perceives performing a particular action. When people perceive pro-environmental behavior as challenging to implement, they are less likely to engage in nature and environmental protection. However, if they perceive pro-environmental behavior as favorable, simple, and easy to integrate into their daily routines, individuals are more likely to behave in such a way (Gansser and Reich, 2023).

The convenience of use, the degree of safety, and the capital and time costs of using recyclable packaging are within the scope of perceived behavioral control evaluation. Thus, there is a significant influence of perceived behavioral control on the intention to use recyclable packaging (Khan et al., 2019).

In this study, perceived behavioral control is established as the perceived power and knowledge of owners or managers to adopt sustainable packaging in food delivery to implement circular economy principles. It is assumed that owners or managers with strong perceived behavioral control are more likely to adopt sustainable packaging and circular economy practices in their trade. Thus, the following hypothesis is proposed:

H2. There is a positive relationship between perceived behavioral control and intention to adopt sustainable packaging in food delivery.

According to the TPB, behavioral intention towards actual behavior is collectively influenced by attitude, subjective norms, and perceived behavioral control (Ajzen, 1985). Ajzen (1991, p. 188) defines attitude as "the degree to which a person has a favorable or unfavorable evaluation or appreciation of the behavior in question." A positive attitude towards a behavior strengthens the intention to perform the behavior in question. Likewise, a negative attitude towards a behavior weakens the intention to perform the behavior in question (Ajzen, 1991). A positive attitude can encourage behavior, while a negative attitude can hinder it (Greaves et al., 2013).

Attitude refers to a person's positive or negative feelings about a behavior, i.e., the overall evaluation formed by the conceptualization of their assessment of that behavior (Ru et al., 2019). Attitude is an important predictor of behavioral intention (Kumar, 2019; Song et al., 2023).

Previous studies support the relationship between attitude and behavioral intention (Khan et al., 2019; Tonglet et al., 2004). Khan et al. (2020) show that environmentally conscious owners or managers successfully implemented circular economy principles in their organizations. The results of Wang et al. (2021) study show that the intention to use recyclable express packaging is strongly influenced by attitude. Thus, regarding pro-environmental behavior, if there is a positive attitude towards sustainability, there is a positive influence on the intention to change behavior towards nature and environmental protection (Gansser and Reich, 2023).

In this study, it is assumed that owners or managers with positive attitudes towards adopting sustainable packaging are more likely to intend to adopt sustainable packaging in food delivery, contributing to the principles of the circular economy. Thus, the following hypothesis is proposed:

H3. There is a positive relationship between attitude and intention to adopt sustainable packaging in food delivery.

Awareness of consequences refers to a cognitive or instrumental element in a person. This element is based on the end user's awareness or understanding of the behavior's outcomes (Koshta et al., 2022). Awareness of consequences is related to understanding the impacts of human activities on the environment. Studies provide strong scientific evidence of environmental consequences, such as biodiversity loss, climate change, pollution, consumption, and depletion of natural resources (Kumar, 2019).

Awareness of consequences refers to the perception of negative consequences that occur when an individual does not act in an environmentally correct manner regarding a situation. It refers to responsibility for the negative consequences of not acting in an environmentally correct manner (Kim, 2023).

Awareness of consequences refers to an individual's awareness of environmental consequences, which leads to engagement in a particular behavior (Schwartz, 2012). When a person is aware of the consequences of their behavior, they feel a strong obligation to behave in a certain way (Park and Ha, 2014). Awareness of consequences is positively related to various pro-environmental behaviors (Song et al., 2023).

Awareness of consequences is positively associated with the intention of waste separation (Wang et al., 2019). Similarly, when individuals understand the positive consequences of using reusable packaging, they feel morally obligated to use reusable packaging (Song et al., 2023). Awareness of consequences is an important determinant of recycling intention (Tonglet et al., 2004). The use of sustainable packaging affects the state of the environment (Duan et al., 2019), and thus obliges individuals to consider the consequences of their actions, which positively reflects on the intention of pro-environmental behavior (Wang et al., 2021). Thus, the following hypothesis is proposed:

H4. There is a positive relationship between awareness of consequences and intention to adopt sustainable packaging in food delivery.

Awareness of consequences and perceived benefit are two essential concepts in studies analyzing human behavior and individual choices. Awareness of consequences refers to understanding and perceiving the implications resulting from an action or decision. In other words, it is the ability to anticipate the outcomes of a choice before making it (Liobikienė and Juknys, 2016).

Research in this area shows that awareness of consequences plays a crucial role in decision-making. Individuals with greater awareness of the possible ramifications of their actions tend to be more cautious and thoughtful in their choices. They consider not only the immediate effects but also the long-term impacts their decisions may have on themselves and others (Xuan et al., 2023), in the case of this research, the use of packaging and waste generation in the environment.

Perceived benefit, on the other hand, refers to the subjective evaluation a person makes regarding the gains or advantages they expect to obtain from a particular action or decision. It is influenced by factors such as past experiences, personal expectations, values, and individual beliefs (Bozorgparvar et al., 2018).

Studies investigating perceived benefit demonstrate that it plays a significant role in motivating and choosing behaviors. When an individual perceives that an action or decision can bring significant benefits, whether in terms of personal satisfaction, improved quality of life, or achieving desired goals, they are more likely to engage in that activity (Bozorgparvar et al., 2018). This includes benefits such as reducing environmental impact, promoting sustainability, improving brand image, and personal satisfaction in contributing to a more sustainable future (Abuabara et al., 2019; Ma et al., 2020).

Individuals with greater awareness of environmental consequences tend to be more inclined to perceive the benefits of pro-environmental behavior (Xia et al., 2019). They recognize the negative environmental impacts associated with a particular activity and understand the importance of reducing natural resource consumption, minimizing waste generation, producing clean energy, and decreasing environmental footprint (Apaolaza et al., 2022).

Understanding the interaction between awareness of consequences and perceived benefit is essential for understanding how people make decisions and make choices. These factors can influence a variety of behaviors, from simple day-to-day decisions to complex choices involving significant risks and rewards. Understanding the relationship between awareness of consequences and perceived benefit is crucial for understanding pro-environmental behavior concerning the adoption of sustainable packaging in food delivery. Thus, the following hypothesis is proposed:

H5. There is a positive relationship between awareness of consequences and perceived benefit of adopting sustainable packaging in food delivery.

Investigating the relationship between perceived benefit and attitude in adopting sustainable packaging is essential for identifying the factors that influence pro-environmental behavior. Perceived benefit refers to the subjective evaluation of gains and advantages associated with a particular action or decision (Bozorgparvar et al., 2018), while attitude reflects a person's favorable or unfavorable disposition towards a specific action or practice (Ru et al., 2019).

Research has demonstrated that perceived benefit plays a crucial role in forming attitude. When an individual perceives clear benefits, such as reducing environmental impact, conserving natural resources, and minimizing waste generation, they tend to develop a positive attitude towards pro-environmental behavior. Additionally, the perception of benefits can include factors such as personal satisfaction in contributing to environmental preservation (Bozorgparvar et al., 2018; Kim et al., 2014; Park and Ohm, 2014).

This study assumes that attitude is a determining factor in adopting sustainable packaging as it influences individual behavior. When individuals have a favorable attitude towards sustainable packaging, they are more likely to make conscious choices in selecting and opting for sustainable packaging instead of conventional options. Thus, the following hypothesis is proposed:

H6. There is a positive relationship between perceived benefit and attitude towards adopting sustainable packaging in food delivery.

The relationship between environmental knowledge and perceived benefit is essential to understand how knowledge affects the perception of benefits related to sustainable practices. Environmental knowledge refers to an individual's level of understanding and awareness of environmental issues (Safari et al., 2018; Zsóka et al., 2013), while perceived benefit encompasses the subjective evaluation of gains and advantages associated with specific actions or behaviors (Bozorgparvar et al., 2018).

Environmental knowledge is considered an essential element in influencing individuals' decision-making regarding environmental sustainability (Choi and Johnson, 2019). Increasing environmental knowledge can enhance the perception of individual and collective benefits of adopting sustainable behaviors (Yadav and Pathak, 2016). Individuals with greater knowledge have a clearer understanding of the negative impacts of unsustainable actions, which can reinforce the perception of benefits from adopting sustainable practices.

Environmental knowledge relates to the actions developed in businesses to reduce environmental impact, and based on that, owners and managers are willing to modify their processes and business strategies, even though they have little perception of the benefits of their sustainable practices (Gadenne et al., 2009).

Knowledge allows for a deeper understanding of environmental problems and the connections between individual actions and environmental impacts. Thus, individuals with greater knowledge are better able to identify the environmental benefits derived from pro-environmental behaviors, positively influencing perceived benefit. Thus, the following hypothesis is proposed:

H7. There is a positive relationship between environmental knowledge and perceived benefit of adopting sustainable packaging in food delivery.

It is known that people's behavior has an important influence on the environment. Recent research shows that attitudes shape and influence behavioral intention, and people more concerned about the environment are more likely to engage in pro-environmental behaviors than those less concerned about the environment (Aprile and Fiorillo, 2017). Therefore, identifying and understanding the determinants of people's environmental concern is one of the main conditions necessary to make public policies and promote people's engagement in pro-environmental behaviors (Liu and Bai, 2014).

Regarding the definition of environmental concern, there is no uniform viewpoint. However, most researchers refer to environmental concern as attitudes about environmental issues or perceptions that such issues are important (Cruz, 2017). For example, Schultz (2001) defines environmental concern as the degree to which people are concerned about the consequences of environmental problems for themselves, others, and the biosphere.

Environmental concern can be defined as a multidimensional construct formed by attitudinal, behavioral, and cognitive elements. To assess the real level of individuals' environmental concern, it would be necessary to evaluate their concern or interest in the topic, as well as their past, current, and future behaviors, behavioral intention, and how much they understand the impact of their actions on the environment. Green consumers, conscious consumers, or pro-environment consumers tend to include ecological sustainability in their decision-making processes, in addition to traditional attributes such as quality and price. This has a broader scope and includes aspects such as recycling and the use of various technologies. Environmental concern plays an important role in shaping individuals' attitudes, influencing their purchasing choices (Trivedi et al., 2018; Yarimoglu and Binboga, 2019).

Based on behavior and attitude theories, numerous studies have sought to demonstrate the relationship between environmental concern and pro-environmental behavior (Bretter et al., 2022; Cesarina Mason et al., 2022; Delistavrou et al., 2023; Ye et al., 2022). Generally, the hypothesis tested in these studies is that the likelihood of consuming environmentally sustainable products increases as individual environmental concern increases. Pro-environmental behavior consists of consuming goods and services that respect resources in a way that ensures the satisfaction of present needs without compromising the satisfaction of future generations' needs (Brundtland, 1987), thus enabling sustainable consumption (Dunlap et al., 2000; Walker and Okpala, 2017).

Environmental concern can be conceptualized as individuals' concern about the degradation of natural resources and pollution (Trivedi et al., 2018). It occupies a prominent place in the theoretical frameworks used to predict pro-environmental behavior.

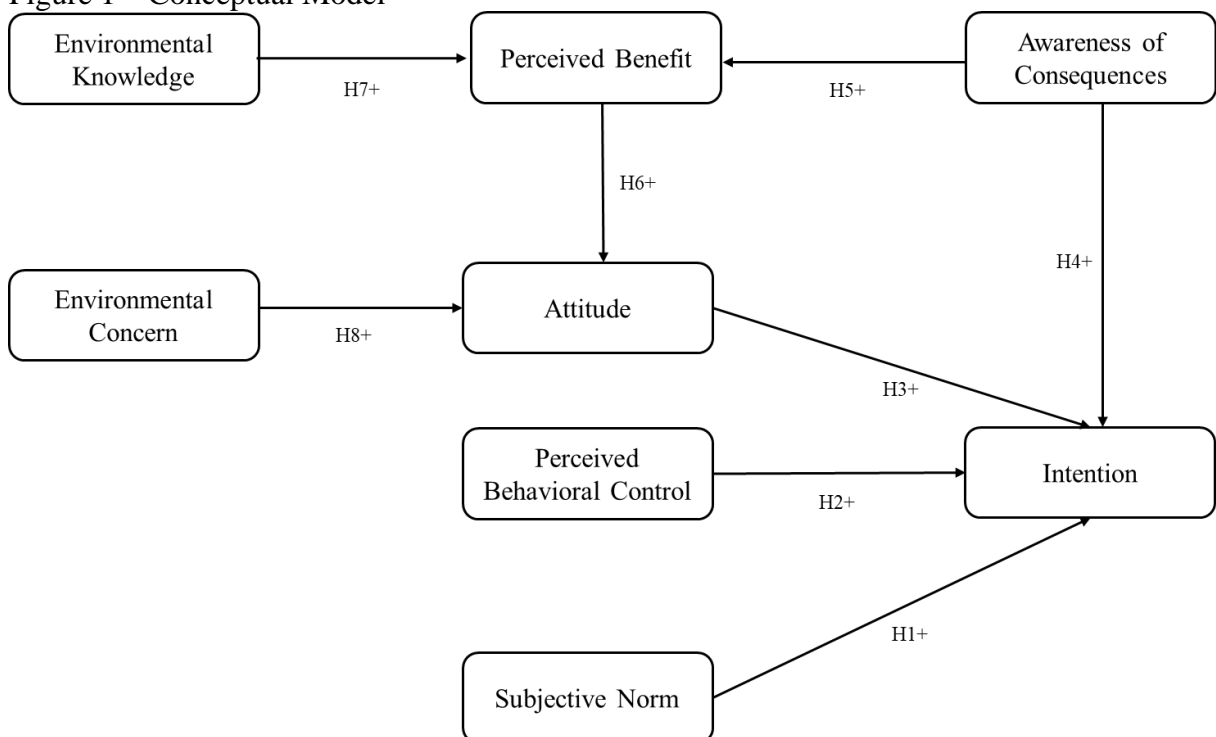
Environmental concern indicates a sense of urgency and triggers the activation of several consequent and iterative steps, such as attention, motivation, evaluation, and defense, through which an individual seeks corroboration to activate a specific behavior, such as

adopting sustainable packaging (Trivedi et al., 2018; Yarimoglu and Binboga, 2019). Thus, the following hypothesis is proposed:

H8. There is a positive relationship between environmental concern and attitude towards adopting sustainable packaging in food delivery.

With the hypotheses established, it was possible to develop the conceptual model that served as a guide to compose the structural model. Thus, this study proposes integrating variables found in studies on the adoption of circular economy principles in businesses, analyzing various types of constructs. Figure 1 represents the conceptual model for analyzing the intention to adopt sustainable packaging in food delivery, thus contributing to the implementation of circular economy principles.

Figure 1 – Conceptual Model



Source: Authors (2024).

The theoretical research model aims to measure the factors influencing the intention to adopt sustainable packaging to align with the principles of the circular economy in food delivery services.

The model's foundation was based on scientific research in the field of environmental sustainability, using the concepts presented in the base theory of this study: the Theory of Planned Behavior (TPB), supplemented with new constructs related to sustainability, such as environmental knowledge, perceived benefit, awareness of consequences, and environmental concern.

3. Method

This research is causal in nature, as it tests the relationships between constructs linked by unidirectional arrows through structural equation modeling. Structural Equation Modeling is the most recommended method, given its capability to analyze causal relationships within the model and to verify whether the independent variables explain the dependent variable (Hair et al., 2016).

3.1 Research Instrument

The questionnaire of this research was divided into two sections: the first consists of the main body of the questionnaire, including the scales for each variable; the second section concerns the respondents' personal information. The measurement items for each variable in the model were referred to validated scales widely used in the relevant literature and were modified to fit the specific context.

Awareness of consequences primarily referenced the measurement items of Apaolaza et al. (2022). Attitude referred to the research of Chen, Yang, and Smith (2016), Wang and colleagues (2018), Tonglet and colleagues (2004), and Khan et al. (2019). Subjective norm and perceived behavioral control primarily referenced the scales of Wang and colleagues (2018). Environmental Knowledge referred to the research of Mostafa (2007), Yadav and Pathak (2016), Zhidebekkyzy et al. (2022). Environmental Concern primarily referenced the scales of Trivedi, Patel, and Acharya (2018). Intention referenced the measurement items of Khan and colleagues (2020) and Nadlifatin and colleagues (2016). Perceived benefit referred to the research of Bozorgparvar et al. (2018), Ma et al. (2020), Park and Ohm (2014). According to Finstad (2010), the 7-point Likert scale demonstrated greater accuracy in the authentic evaluation of participants; thus, this type of scale was chosen for this research.

3.2 Data Collection

Data collection occurred between May 28 and June 29, 2023. In total, there were 803 (eight hundred and three) questionnaire views; of these accesses, 496 (four hundred and ninety-six) started the response, but not all completed the questionnaire until the end. Thus, 315 (three hundred and fifteen) respondents who completed the questionnaire were considered for analysis. Data were collected through a survey (Calais, 2007), in which observed variables of the constructs were transformed into a questionnaire with 37 (thirty-seven) statements. Additionally, 7 (seven) questions related to the respondent's social profile were included: main area of activity in food trade via delivery, company size, geographical location, age, gender, education level, and marital status. The average response time was 8 minutes and 55 seconds.

The analysis was conducted in only one country, Brazil, to avoid distortions due to different national regulations, aids, and subsidies that governments may introduce to support the adoption of circular economy principles in packaging. Franchise businesses were not considered in this sample as they generally follow guidelines and policies established by a corporate head office.

4. Results

The research results were divided into three stages: the first brings the evaluation of the measurement model; the second presents the evaluation of the structural model; the third exposes the analysis of the structural paths (Γ) and the hypothesis tests.

4.1 Measurement Model Analysis

This research used Structural Equation Modeling to measure the model. The SmartPLS 4 software was used. The first aspect to be observed in measurement models is the convergent validity obtained by observing the Average Variance Extracted (AVEs) (Table 1) (Ringle et al., 2014).

Table 1 – Average Variance Extracted

Construct	Average Variance Extracted (AVE)
Attitude	0,644
Perceived Benefit	0,731
Environmental Knowledge	0,585

Awareness of Consequences	0,581
Perceived Behavioral Control	0,590
Intention	0,841
Subjective Norm	0,637
Environmental Concern	0,496

Source: Authors (2024).

Note: Data from the research outputs analyzed in SmartPLS.

It can be seen that not all AVE values are above 0.50, indicating no convergent validity for the environmental concern construct. Thus, the model adjustment analysis begins as proposed by Ringle et al. (2014), evaluating the measurement model and eliminating the observed or measured variables of the constructs with AVE <0.50. Analyzing the variables of the Environmental Concern construct, it was found that item PRA3 had values <0.50.

Thus, item PRA3 was excluded from the model, and a new test was conducted, resulting in the Environmental Concern construct obtaining AVE=0.574. After verifying convergent validity through AVE values, the external loadings were evaluated, which are the factor loadings of the indicators on their respective constructs (Hair et al., 2014).

Since all AVEs showed convergent validity and the factor loading of these indicators was >0.60, it was decided to keep them in the measurement model. Subsequently, the Composite Reliability (CR) (ρ - Dillon-Goldstein rho) (Ringle et al., 2014) was observed, in which all indices showed adequate values.

The next step of the analysis involved evaluating the Discriminant Validity (DV) of the SEM (Ringle et al., 2014). The DV test was conducted using two methods recommended by Hair et al. (2014). The first is observing cross-loadings of the indicators, the criterion of Chin (1998). It can be observed that all factor loadings had higher indicators in their respective constructs; thus, the DV was confirmed by the cross-loadings method.

The second method uses the Fornell and Larcker (1981) criterion, which advises comparing the square roots of the AVE values of each construct with the Pearson correlations between the constructs (or latent variables). The square roots of the AVEs should be greater than the correlations between the constructs. The DV by the Fornell criterion is presented in Table 2.

Table 2 – Discriminant Validity - Fornell Criterion

	ATD	PBN	PBC	AWC	EKD	INT	SBN	ENC
Attitude	0,803							
Perceived Benefit	0,594	0,855						
Perceived Behavioral Control	0,274	0,342	0,768					
Awareness of Consequences	0,491	0,468	0,156	0,763				
Environmental Knowledge	0,365	0,4	0,541	0,206	0,765			
Intention	0,527	0,658	0,45	0,407	0,427	0,917		
Subjective Norm	0,544	0,502	0,329	0,297	0,331	0,598	0,798	
Environmental Concern	0,6	0,633	0,28	0,492	0,4	0,54	0,445	0,757

Source: Authors (2024).

Note: Data from the research outputs analyzed in SmartPLS.

With the DV guaranteed, the measurement adjustments are concluded, and the structural model analysis begins. The first aspect observed in the structural model evaluation phase was the bootstrapping histograms. This analysis was conducted to evaluate the presence of outliers. A histogram for each structural coefficient is presented in the bootstrapping output, showing unimodal histograms.

Checking for collinearity in the structural model is fundamental, as the estimation of path coefficients in structural models is based on ordinary linear regressions of each of the endogenous latent variables on their corresponding constructs.

As in multiple regression, path coefficients could be biased if estimation involves significant levels of collinearity among predictor constructs. The absence of multicollinearity is an important step to verify for the reliability of regression models. When there is a strong correlation between two or more predictors in a regression model, multicollinearity may exist. The greatest difficulty occurs when there is perfect collinearity between predictors, making it impossible to obtain singular estimates of the regression coefficients. Thus, the VIF value was checked. By VIF, there is an indication of a strong relationship between one predictor and another. Literature points to the acceptance of $VIF < 5$ (Field, 2009; Hair et al., 2016).

It is observed that all relationships had a VIF value < 5 , and thus other aspects are observed, such as the Pearson coefficients (R^2), which indicate the portion of variance of the endogenous variables explained by the structural model (Ringle et al., 2014). According to Cohen (1988), $R^2=2\%$ is considered a small effect, $R^2=13\%$ a medium effect, and $R^2=26\%$ a large effect. All R^2 values present a large effect (Table 3).

Table 3 – R^2 of Constructs

Constructs	R^2	Adjusted R^2
Attitude	0,437	0,433
Perceived Benefit	0,315	0,311
Intention	0,497	0,491

Source: Author (2024).

Note: Data from the research outputs analyzed in SmartPLS.

The structural model consists of a series of linear regressions, thus the significance of these relationships should be evaluated sequentially (Ringle et al., 2014). For this reason, the bootstrapping module employing the re-sampling technique was used to obtain Student's t-tests.

For the evaluation, a minimum sample number of 5000 should be considered, while the number of cases should be exactly the same as observed in the original sample (Hair et al., 2011). The critical values of the two-tailed t-test are 1.65 (significance level = 10%), 1.96 (significance level = 5%), and 2.58 (significance level = 1%). The path coefficients, t-tests, and significance of the relationships in the structural model are presented in Table 4.

Table 4 - Path Coefficients

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	t-Statistics (O/STDEV)	p-Values
ATD -> INT	0,171	0,174	0,067	2,560	0,010
PBN -> ATD	0,357	0,360	0,065	5,525	0,000
PBC -> INT	0,255	0,257	0,051	5,000	0,000
AWC -> BNP	0,402	0,404	0,066	6,084	0,000
AWC -> INT	0,173	0,173	0,062	2,817	0,005
EKD -> PBN	0,317	0,321	0,061	5,166	0,000
SBN -> INT	0,370	0,366	0,064	5,819	0,000
ENC -> ATD	0,374	0,376	0,067	5,608	0,000

Source: Authors (2024).

Note: Data from the research outputs analyzed in SmartPLS4.

It is noted that the structural model results in the Bootstrapping module are greater than 1.96; thus, all hypotheses were confirmed.

5. Discussions

The path coefficients of the model conclusively demonstrated that all hypotheses formulated in this research were confirmed. These results revealed significant findings regarding the adoption of sustainable packaging in food delivery services, demonstrating how these practices can favor the circular economy in services.

5.1 Subjective Norm

According to the TPB (Ajzen, 1991), subjective norms are one of the main determinants of behavioral intention. This theory postulates that people are influenced by how their actions are perceived by others and what behaviors are socially acceptable. In the specific context of food delivery services, subjective norms play a crucial role. When food trade owners or managers perceive social pressure to adopt sustainable packaging, they tend to be more likely to consider and implement these practices. The perception that other relevant actors, such as customers, competitors, or even the community, value and support the adoption of sustainable packaging can exert a powerful influence on their decision-making (Harjadi and Gunardi, 2022), as was proven by observing H1 in this research.

The perception of the family of food trade owners or managers plays a relevant role in adopting sustainable packaging in delivery services. When the family supports and values sustainable practices, social pressure to adopt sustainable packaging intensifies, as owners or managers seek to align their commercial actions with the values and expectations shared in the family environment (Al-Swidi et al., 2014; Ham et al., 2015). This result corroborates the study conducted by Harjadi and Gunardi (2022), which shows that the values and norms of family members are strongly linked to pro-environmental behavioral intention.

Another important aspect is the opinion and influence of friends, as they can also impact the intention to adopt sustainable packaging. If close friends of food trade owners or managers value sustainability and demonstrate support for sustainable practices, this can increase perceived social pressure, and thus, friends' influence encourages behavior change regarding packaging use in food delivery services (Wang et al., 2018).

Moreover, the perception of owners or managers that customers value and prefer sustainable packaging can influence their intention to adopt, as they want to meet consumers' expectations and maintain their customer base. Sustainability can be considered a competitive differentiator and an effective business strategy (Abuabara et al., 2019). By offering sustainable packaging, they can position themselves as socially responsible companies and attract conscious consumers who value these practices and are willing to support brands that share their values.

The social pressure exerted by consumers can trigger a cascading effect in the food trade with delivery services. As more establishments adopt sustainable packaging in response to customer preferences, a greater demand for sustainable solutions is created, encouraging innovation in this sector. This, in turn, can lead to technological advances and more ecological practices throughout the supply chain, contributing to a positive environmental impact in the long term (Thoradeniya et al., 2015).

The role of suppliers needs to be observed, as their actions can also exert pressure on food trade owners or managers regarding adopting sustainable packaging for delivery services. If suppliers offer sustainable packaging options or encourage their use, this can influence owners' or managers' perceptions of the importance and feasibility of adoption. By adopting sustainable initiatives in their operations and processes, suppliers can encourage their

commercial partners to follow the same path, creating a cascading effect of positive changes along the supply chain (Dubey et al., 2019).

The perception of subjective norms from collaborators also plays a role in the intention to adopt sustainable packaging in food delivery services. If collaborators are aware and engaged in sustainable issues, they can influence owners' or managers' perceptions, creating an internal culture of environmental responsibility. The perceived social pressure from collaborators can increase motivation to adopt sustainable packaging, seeking to align team values and promote a conscious work environment (Khan et al., 2020).

Song et al. (2023) investigated the relationship between subjective norms and pro-environmental behavior. The results revealed that subjective norms exert a strong influence on sustainable behavior, indicating that people are motivated to adopt environmentally responsible actions based on perceived social expectations. Khan, Ahmed, and Najmi's (2019) research showed that subjective norms are a crucial predictor of the intention to recycle plastic waste behavior (Wang et al., 2019). It examined residents' intention to participate in online recycling and highlighted the significant impact of subjective norms on recycling intentions.

5.2 Perceived Behavioral Control

Empirical studies have proven the existence of a relevant interaction between perceived behavioral control and intention (Khan and Rundle-Thiele, 2019; Khan et al., 2020; Singh et al., 2018). Moreover, it was found that perceived behavioral control is a significant predictor of the intention to adopt sustainable packaging in food delivery services. Owners and managers who feel more confident in their ability to adopt sustainable packaging in this context are more likely to express a positive intention in this direction, as H2 predicted.

In the specific context of food delivery services, it is important to highlight that perceived behavioral control can be influenced by several factors, such as the availability of sustainable packaging options, ease of access to these options, and the decision-maker's confidence in their ability to make changes in their choices. Knowing where to buy, having the resources – time and money – to purchase, and having the choice to adopt sustainable packaging are crucial factors that affect the intention to adopt (Wang et al., 2018).

5.3 Attitude

The attitude of owners or managers towards sustainable packaging also plays a crucial role in their intention to adopt. Those with a favorable attitude towards sustainable packaging are more likely to express an intention to adopt sustainable packaging in food delivery, confirming the third hypothesis H3, which stated there is a positive relationship between attitude and intention to adopt sustainable packaging in food delivery.

Investing in sustainable packaging represents an advantageous strategy not only from an environmental standpoint but also economically, as it promotes ecologically responsible and potentially profitable business practices (Abuabara et al., 2019; Ma et al., 2020). By opting for sustainable packaging, companies can demonstrate their commitment to sustainability, earn consumer trust, and stand out in the market. Sustainable packaging offers a range of benefits, as besides reducing environmental impact, it can also help improve the company's image, attract conscious consumers, and add value to products. Additionally, by adopting sustainable packaging, companies can prepare for future sustainability demands and regulations (Abuabara et al., 2019; Ma et al., 2020).

5.4 Awareness of Consequences

Awareness of consequences, especially concerning global warming, plays a crucial role in the intention to adopt sustainable packaging by food trade owners or managers with delivery services, confirming H4. The study conducted by Ayalon et al. (2016) explored business

attitudes and behaviors towards sustainability. The results indicated that awareness of the consequences of global warming and understanding the associated risks were key factors that drove companies to adopt sustainable practices, including environmentally friendly packaging.

Moreover, it was discovered that awareness of consequences is positively related to perceived benefit. This means that food trade owners or managers with delivery services who have a greater awareness of environmental consequences perceive greater benefits in adopting sustainable packaging, thus validating the fifth hypothesis H5.

Awareness of consequences is a fundamental factor when making decisions in favor of sustainability. Studies have deepened the analysis of the relationship between awareness of consequences, perceived benefit, and the adoption of sustainable practices. For example, a study conducted by Khan, Ahmed, and Najmi (2019) investigated the factors influencing the adoption of sustainable practices, with a particular focus on plastic waste recycling.

5.5 Perceived Benefit

Perceived benefit is a key factor in the decision-making process related to adopting sustainable practices (Bozorgparvar et al., 2018; Kim et al., 2014; Park and Ohm, 2014). When food trade owners or managers perceive significant advantages in adopting sustainable packaging, such as reducing environmental impact, well-being, and improving the trade's image (Abuabara et al., 2019; Ma et al., 2020), they tend to develop a more favorable attitude towards these packages, confirming H6.

Another relevant aspect is that using sustainable packaging can improve the trade's image. Consumers are increasingly aware of environmental issues and value companies that demonstrate a commitment to sustainability. This perceived benefit can lead to adopting sustainable packaging by companies. Moreover, a positive corporate image regarding sustainability can result in a competitive advantage and greater customer loyalty (Abuabara et al., 2019; Ma et al., 2020).

5.6 Environmental Knowledge

Environmental knowledge refers to the understanding and awareness of environmental impacts and sustainable practices and solutions. When food trade owners or managers possess more in-depth knowledge of environmental issues, they can better understand the benefits associated with adopting sustainable packaging, confirming H7.

In the specific context of food delivery services, the environmental knowledge of food trade owners or managers plays an important role in perceiving the benefits of adopting sustainable packaging. Those with a broader knowledge of environmental issues, such as the importance of reducing waste and conserving natural resources, are better able to identify the benefits associated with adopting sustainable packaging.

5.7 Environmental Concern

The results indicated that individuals with greater environmental concern were more likely to adopt behaviors that contribute to environmental protection. Several studies have shown the positive relationship between environmental concern, attitude, and adopting sustainable practices. For example, a study conducted by Tarrant and Cordell (1997) examined the relationship between environmental concern and the intention to adopt sustainable behaviors in restaurants. Another study conducted by Dunlap et al. (2000) investigated the relationship between environmental concern and adopting pro-environmental behaviors in the general population.

In the food trade with delivery services, the environmental concern of owners or managers plays a crucial role in a favorable attitude towards adopting sustainable packaging. Those with greater environmental concern recognize the importance of reducing the

environmental impact of food delivery services and are more willing to adopt sustainable packaging as part of their commercial practices, thus confirming H8.

6. Conclusion

This research used the Theory of Planned Behavior (TPB) to investigate the factors influencing the adoption of sustainable packaging in food delivery services, aiming to align with the principles of the circular economy.

The results highlighted the importance of elements such as subjective norm, perceived behavioral control, attitude, awareness of consequences, perceived benefit, environmental knowledge, and environmental concern in the decision to adopt sustainable packaging. The research emphasizes that these factors play crucial roles in business decision-making regarding sustainability in food delivery services.

Moreover, the research underscores the relevance of the circular economy in the context of adopting sustainable packaging. It highlights benefits such as waste reduction, promotion of recycling, minimization of environmental impact, and encouragement of innovation in the packaging industry.

The study contributes theoretically by expanding the use of the TPB to measure managers' behavioral intention concerning sustainability. Thus, the model was extended, and constructs like environmental knowledge, environmental concern, awareness of consequences, and perceived benefit were observed. This identifies the TPB's flexibility in accommodating additional constructs and highlights its effectiveness in analyzing management decisions on environmental issues.

However, the research points out limitations such as the sample's representativeness concentrated in São Paulo. Recommendations for future research include investigating barriers to adopting sustainable packaging and including other relevant actors, such as consumers and suppliers.

Finally, the research points to the importance of adopting sustainable packaging in food delivery services, connecting it to the principles of the circular economy, and highlights the crucial role of companies in this process, not only as beneficiaries but as agents of positive change for building a more sustainable future.

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