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Green products from industrial symbiosis: Are consumers ready for them?

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ABSTRACT

Industrial symbiosis (IS) can support the transition towards the circular economy: accordingly, wastes produced by a company can be used by other companies as an alternative to raw materials or directly used to create new products, sold on B2C markets. This paper aims at analyzing consumers' perception towards electronic products (e.g., laptops, smartphones, tablets) generated via the IS approach (hereafter mentioned as "IS products") and understanding which factors influence the consumers' purchase intention and willingness to pay a premium price for them. By relying on the Theory of Planned Behavior integrated with the Theory of Consumers' Decision-Making Process, we study the influence of environmental concern, perceived consumer effectiveness, social influence, perceived safety, functionality expectations, and green perceived utility. A survey was conducted involving 1.224 Italian consumers. Results highlight that perceived consumer effectiveness and social influence positively affect both purchase intention and willingness to pay a premium price for IS products, while green perceived utility, perceived safety, and functionality expectations positively affect only purchase intention. Results of this paper offers to managers insights useful to understand consumers' behavioral intention towards IS products and to develop appropriate production and marketing strategies.

1. Introduction

The last global environment outlook accurately describes how climate change poses a serious challenge to economic development, creating risks to natural systems and human society (Ekins et al., 2019). Alongside the climate change problem, the consumption of natural resources and the production of wastes is becoming increasingly alarming, due to population growth and the increase in per capita consumption rates (World Bank, 2019). Consequently, the traditional production and consumption model must evolve towards a circular one, able to reduce the consumption of raw materials by the economic systems and close the resource loop to minimize waste production (Korhonen et al., 2018). In this regard, industrial symbiosis (IS) is one of the most impactful strategies able to support the transition towards the circular economy (Domenech et al., 2019).

IS involves multiple companies in a collective approach to competitive advantage (Chertow, 2000). Accordingly, one company can replace – totally or partially – production inputs with wastes generated by other companies (Lombardi and Laybourn, 2012; Sun et al., 2020). These wastes can be used as an alternative to raw materials or directly used to create new products to be sold on B2C markets (Albino and Fraccascia, 2015). By implementing IS, companies can create environmental benefits for the society while achieving economic benefits from reducing their production costs, simultaneously (Taddeo et al., 2017). Driven by these potential benefits, the attention received in the literature by IS has drastically increased in recent years (Mallawaarachchi et al., 2020). So far, the literature has addressed IS from the company perspective, e.g., analyzing case studies to highlight the benefits created by the IS practice (e.g., Neves et al., 2020) and the dynamics undertaken by the involved companies (Schlüter et al., 2020), drivers and barriers to the IS implementation (Mortensen and Kørnøv, 2019), as well as investigating the impact of operational (Fraccascia, 2019; Herczeg et al., 2018) and social issues (Hewes and Lyons, 2008) on the IS practice. However, scant attention has been devoted so far to investigating IS from the perspective of consumers, i.e., who is going to buy goods produced via the IS approach (henceforth IS products). In particular, consumers' perception of IS products (e.g., in terms of product quality compared to traditional products) remains unclear. Such a literature gap deserves ad-hoc investigation; in fact, IS products can be successful only if consumers are willing to buy them. In this regard, understanding which factors

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influence consumers' willingness to buy IS products and to pay a premium price for them can be of high importance for companies and can even be a driver towards the further implementation of IS.

During the past few years, the research on consumer behavior towards environmentally-friendly products (hence forward, green products) has been characterized by a rapid growth (Adrita, 2020; Alzubaidi et al., 2021; Aschemann-Witzel and Stangherlin, 2021; Chou et al., 2020; Dangelico et al., 2021; Gu et al., 2015; Hameed et al., 2019; Ogiemwonyi et al., 2020; Ruangkanjanases et al., 2020; Testa et al., 2020). In this regard, green consumer behavior can be defined as "*the purchase of eco-friendly products that do not harm the environment, conservation of natural resources, and a move towards recycled products*" (Gilal et al., 2020). Apart from the intention to buy green products, some studies highlighted that consumers may even be willing to pay more for them, recognizing their value in protecting the natural environment and/or perceiving them as higher quality products (e.g., Dangelico et al., 2022, 2021; Herrmann et al., 2022; Sogari et al., 2016). Green consumer behavior has been addressed by several studies in the literature, which focused on green products in general (Alzubaidi et al., 2021; Dangelico et al., 2021) or specific green product categories, such as sustainable clothing (e.g., Dangelico et al., 2022; Park and Lin, 2020; Rausch and Kopplin, 2021), sustainable footwear (e.g., Baier et al., 2020; Yadav et al., 2022), sustainable food (e.g., Carfora et al., 2019; Dorce et al., 2021; Grasso and Asioli, 2020), electric and hybrid cars (e.g., Lin and Shi, 2022; Pradeep et al., 2021; Sahoo et al., 2022), eco-friendly packaging (e.g., Koch et al., 2022; Nguyen et al., 2020; Testa et al., 2020), beauty products (e.g., Amberg and Fogarassy, 2019; Lavuri et al., 2022) - see Table 1. However, there are no studies that specifically address green consumer behavior towards IS products.

This paper contributes to this research topic by investigating the determinants of consumers' behavioral intention towards IS products, in terms of consumer purchase intention and willingness to pay a premium price for IS products. Specifically, as a further element of novelty from the theoretical perspective, the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the Theory of Consumers' Decision-Making Process (TDMP) (Engel et al., 1968) are integrated to study consumer purchase intention and willingness to pay a premium price for IS products, as they provide a more comprehensive view of the phenomenon. Two categories of IS products have been considered in this study: (1) electronic products (e.g., laptops, smartphones, tablets) whose shell is made of industrial plastic wastes – in the remainder referred to as "IS plastic products" – and (2) electronic products whose battery contains substances extracted by industrial wood wastes, which replace chemical substances – in the remainder referred to as "IS wood products". To this aim, a survey has been conducted involving 1.224 Italian consumers between November 2020 and February 2021.

Table 1
Product categories for which sustainable consumer behavior has been studied, with some references[1].

Product	Examples	References
Sustainable clothing	Recycled, organic, made of alternative vegetable matter, upcycled	Dangelico et al. (2022), Park and Lin (2020), Rausch and Kopplin (2021)
Sustainable footwear	Shoes made with recycled or biodegradable materials	Baier et al. (2020), Yadav et al. (2022)
Sustainable food	Food with upcycled ingredients, organic food	Asioli and Grasso (2021), Carfora et al. (2019), Dorce et al. (2021)
Electric/hybrid cars	Electric cars, hybrid cars	Lin and Shi (2022), Pradeep et al. (2021), Sahoo et al. (2022)
Eco-friendly packaging	Packaging made with recycled or renewable materials, that uses non-hazardous materials throughout the life cycle, or that is easy to recycle	Kock et al. (2022), Nguyen et al. (2020), Testa et al. (2020)
Beauty products (cosmetic products)	Cosmetics with organic or natural ingredients	Amberg and Fogarassy (2019), Lavuri et al. (2022)

The results highlight that perceived consumer effectiveness and social influence positively influence both purchase intention and willingness to pay a premium price for IS products, while green perceived utility, perceived safety, and functionality expectations positively affect only purchase intention.

The remainder of the paper is organized as follows. Section 2 presents the theoretical background and research hypotheses. Section 3 addresses the methodology used, while Section 4 presents the achieved results. The paper ends with discussion in Section 5 and implications, limitations, future research directions, and conclusions in Section 6.

2. Theoretical background and research hypotheses

2.1. Theoretical background

To study consumers' behavioral intention towards IS products, we used and integrated two theories relevant to explaining consumer behavior - the TPB (Ajzen, 1991) and the TDMP (Engel et al., 1968) - since they focus on different but complementary aspects of consumer behavior. Their integration would provide a more comprehensive view of the phenomenon under investigation.

The TPB is a social-cognitive model aimed at studying consumers' behavioral intentions, through the identification of the main factors influencing an individual's intention to perform a given behavior towards an issue or an action (Alzubaidi et al., 2021; de Leeuw et al., 2015). This theory conceptualizes the idea that specific behavior is affected by three independent situation-specific beliefs: *attitude towards the behavior* (referring to how consumers consider the consequences of an action and the relative favorable or unfavorable evaluation), *subjective norms* (referring to the social pressure perceived by consumers to behave in a certain way), and *perceived behavioral control* (referring to the perceived ease or difficulty to perform a given behavior) (Ajzen, 1991; Bamberg, 2003; Vermeir and Verbeke, 2008). These three variables have been proven effective to predict the purchase intention of sustainable products (Robinson and Smith, 2002) and are useful to study green consumers' purchasing behavior (Albayrak et al., 2013). Several extensions of the TPB model have been developed to study green consumer behavior (e.g., Alzubaidi et al., 2021; Dangelico et al., 2021). The TPB model and its extensions have been used to study the factors influencing consumers' intention to purchase green products, as well as the willingness to pay a premium price and the purchase frequency for these products (Alzubaidi et al., 2021; Chen and Hung, 2016; Dangelico et al., 2021; Laroche et al., 2001; Leroux and Pupion, 2018; Moser, 2015; Yun and Lee, 2015).

In this paper, according to previous studies, *environmental concern* is used as a proxy of *attitude towards the behavior* (Alzubaidi et al., 2021; Bamberg, 2003; Choi and Kim, 2005; Lee et al., 2014; Vermeir and Verbeke, 2008), *social influence* is used as a proxy of *subjective norms* (Alzubaidi et al., 2021; Eze and Ndubisi, 2013; Gleim et al., 2013; Moser, 2015; Pisitsankkhakarn and Vassanadumrongdee, 2020), and *perceived consumer effectiveness* is used as a proxy of *perceived behavioral control* (Alzubaidi et al., 2021; Chang, 2011; Choi and Kim, 2005; Joshi and Rahman, 2015; Vermeir and Verbeke, 2008). These three constructs have been included in our model.

The TDMP is based on the concept that, during the purchasing decision process – i.e., when the consumer is assessing whether to buy the product and how much he/she is willing to pay – consumers balance risks and benefits related to purchasing that product (Essoussi and Linton, 2010; Mugge et al., 2017). In the context of green consumer behavior, Magnier et al. (2019) developed a model where a series of perceived benefits and risks predict purchase intention and willingness to pay a premium price for products made of recycled plastics. Based on that study and given the specific type of products considered in our

study, we included in our model risks related to *perceived safety*, as well as risks associated with *functionality expectations* and the *green perceived utility* (i.e., the environmental benefits associated with the product).

In the following, hypotheses are developed regarding the effect of each of the above-mentioned risks and benefits on the purchase intention and the willingness to pay a premium price for IS products.

2.2. Research hypotheses

In this section, we develop the hypotheses related to the impact of environmental concern (Section 2.2.1), perceived consumer effectiveness (Section 2.2.2), social influence (Section 2.2.3), perceived safety (Section 2.2.4), functionality expectations (Section 2.2.5), and green perceived utility (Section 2.2.6) on purchase intention and willingness to pay a premium price for IS products.

2.2.1. Environmental concern

Environmental concern has been defined as "*the whole range of environmentally related perceptions, emotions, knowledge, attitudes, values, and behaviors*" (Bamberg, 2003). Environmental concern is critical in determining consumers' intentions and is considered as one of the most important variables influencing consumers' behavior, in particular green buying behavior (Alzubaidi et al., 2021; Bamberg, 2003; Chan, 1996; Felix et al., 2018; Lee et al., 2014; Polonsky et al., 2014). Polonsky et al. (2014) demonstrated that consumers with a high environmental concern are prone to behave in pro-environmental ways. Consumers' worries about the environment can influence consumers' perception of green products, which, in turn, impacts their purchase intention. When consumers are concerned about environmental problems, they are more inclined to buy products reflecting their concern (Choi and Kim, 2005), for instance products made from recycled materials (Kilbourne and Pickett, 2008), sustainable food (Grunert and Juhl, 1995; Kilbourne and Pickett, 2008; Vermeir and Verbeke, 2008), green products (Alhosseini Almodarresi et al., 2019), pro-environmental packaging (Koenig-Lewis et al., 2014), and organic cotton apparel (Hustvedt and Dickson, 2009). Consumers' worries about the environment can also enhance their willingness to pay a premium price for environmentally-friendly products (Laroche et al., 2001). This was investigated for several products, such as clothing (Wei et al., 2018), electric vehicles (White and Sintov, 2017), and fuel cell taxi (Mourato et al., 2004), among others.

Based on the above considerations, we hypothesize that:

H1a. Environmental concern positively influences the consumer's purchase intention for IS products.

H1b. Environmental concern positively influences the consumer's willingness to pay a premium price for IS products.

2.2.2. Perceived consumer effectiveness

Perceived consumer effectiveness is a domain-specific belief that it is worth it for the individual consumer to make efforts to preserve and improve the environment (Choi and Kim, 2005). Several studies found that perceived consumer effectiveness positively affects behavioral intention, i.e., that consumers are more likely to behave in pro-environmental ways whether they believe that their efforts can contribute to reducing environmental problems (Alzubaidi et al., 2021; Ellen et al., 1991; Gleim et al., 2013). For instance, Ellen et al. (1991) found that PCE is an important predictor of three types of environmental behavior, i.e., purchase of environmentally-friendly products, recycling, and contribution to environmental groups. Several studies highlighted that perceived consumer effectiveness positively affects purchasing intention of sustainable products (Choi and Kim, 2005; Gleim et al., 2013; Vermeir and Verbeke, 2008), organic food (Verhoef, 2005; Vermeir and Verbeke, 2008), and environmentally sustainable textiles and apparel (Kang et al., 2013). Moreover, perceived consumer effectiveness also significantly influences the willingness to pay a premium price. This relationship was investigated, for example, for carbon-labeled products (Zhao et al., 2018), pro-environmental wine (Barber et al., 2016), and organic cotton apparel (Ha-Brookshire and Norum, 2011).

Based on the considerations above, we hypothesize that:

H2a. Perceived consumer effectiveness positively influences the consumer's purchase intention for IS products.

H2b. Perceived consumer effectiveness positively influences the consumer's willingness to pay a premium price for IS products.

2.2.3. Social influence

Social influence is defined as the social pressure perceived by consumers when performing a certain behavior (Ajzen, 1991). Consumer habits and consumption patterns are largely influenced by the attitude of people deemed important to the consumer, like relatives, friends, associates, and colleagues (Hynes and Wilson, 2016). The strength of this influence depends on several factors, such as the type of the considered product, the consumer's susceptibility, and the coercive power of the group (Hoyer and MacInnis, 2004). Thus, consumers are likely to behave in a way that is accepted and shared by their social environments (Osterhus, 1997).

Several studies found that strong social norms are required to develop ecologically-responsible behaviors, such as using green energy (Bamberg, 2003; Ozaki, 2011; Welsch and Kühling, 2009), recycling home materials and composting garden wastes (Ozaki, 2011; Pickett-Baker and Ozaki, 2008), curbside recycling (Ewing, 2011), and using alternative fuel vehicles (Jansson, 2011).

Other studies demonstrated that social and reference groups have a positive impact on the consumers' purchase intention of green products (Eze and Ndubisi, 2013; Maichum et al., 2016; Paul et al., 2016), such as sustainable food (Salazar et al., 2013; Welsch and Kühling, 2009), recycled paper products (Liu et al., 2012), green furniture (Liu et al., 2012), energy and water-saving products (Liu et al., 2012), remanufactured products (Pisitsankkhakarn and Vassanadumrongdee, 2020; Wang et al., 2013), organic cotton apparel (Han and Chung, 2014), and electric vehicles (Featherman et al., 2021).

Social influence creates a social value, recognized within the consumer's reference group, which may significantly affect the propensity to pay a premium price for products. This outcome has been found for several products, such as green energy (Hojnik et al., 2021; Liobikienė and Dagiliūtė, 2021), organic food (Ahmed et al., 2019), and sustainable housing (Judge et al., 2019).

Based on the above considerations, we hypothesize that:

H3a. Social influence positively influences the consumer's purchase intention for IS products.

H3b. Social influence positively influences the consumer's willingness to pay a premium price for IS products.

2.2.4. Perceived safety

One important step in the consumer-buying process is the pre-purchase information search, when the consumer gathers information on the product as a result of the perception of a risk associated with the purchase (Mitchell, 1992). Concerning IS products, consumers may associate a risk related to low product safety. Perceived safety concerns the degree to which consumers perceive a product as harmless (Bauer et al., 2013; Wang and Tsai, 2019). The higher the perceived product safety, the lower the perceived safety risk associated with the product. Perceived safety plays a key role during the purchasing phase; in particular, the more the product is perceived as safe by a consumer, the higher the consumer's purchase intention (Jan et al., 2019). This has been highlighted for several products (Wong and Rinderer, 2020; Zhang et al., 2018), such as green products in general (Jan et al., 2019), organic personal care products (Ghazali et al., 2017), and organic food (Chryssochoidis, 2005). Furthermore, perceived safety positively impacts the willingness to pay a premium price for the product, as shown by previous studies on products made of ocean plastic (Magnier et al., 2019),

organic food (Soler et al., 2002; van Loo et al., 2013), and green rice (Tong et al., 2020).

Based on the considerations above, we hypothesize that:

H4a. Perceived safety positively influences the consumer's purchase intention for IS products.

H4b. Perceived safety positively influences the consumer's willingness to pay a premium price for IS products.

2.2.5. Functionality expectations

Another category of risks that may be associated with IS products is poor product functionality. Functionality expectation is related to consumers' perceived utility of a product and their perception of receiving the maximum benefit, in terms of physical attributes, performance, and functionality (Gonçalves et al., 2016; Hur et al., 2015). The higher the product functionality expectations, the lower the perceived functionality risk for the product. A good perception of functionality is an important driver of consumers' satisfaction, influencing consumers' behavior and increasing the product's value for money (Churchill and Surprenant, 1982; Hur et al., 2015; Magnier et al., 2019). Functionality expectation is one of the most important factors influencing consumers' purchasing habits of green products, since it positively impacts the consumer's choice (Gonçalves et al., 2016; Lin and Huang, 2012). The more consumers perceive these products are functional, the more they are willing to buy them. This has been proven, for example, for hybrid cars (Hur et al., 2015), products made of ocean plastic (Magnier et al., 2019), and green housings (Zhao et al., 2018). Moreover, functionality expectations also positively impact on the willingness to pay a premium price for green products. This has been proven, for instance, for recycled paper (Essoussi and Linton, 2010), remanufactured electronics products (Abbey et al., 2017), and biofuels (Zailani et al., 2019).

Based on the above considerations, we hypothesize that:

H5a. Functionality expectations positively influence the consumer's purchase intention for IS products.

H5b. Functionality expectations positively influence the consumer's willingness to pay a premium price for IS products.

2.2.6. Green perceived utility

The green perceived utility concerns the product environmental benefits perceived by the consumer, in terms of the positive or negative impacts of the product on the environment (Alamsyah et al., 2020). Green perceived utility affects the attitude towards green products' purchase (Chang, 2011); indeed, consumers are more likely to purchase green products when they are aware of the environmental benefits generated by these products (Te Liu and Tsaur, 2020; Wang and Hazen, 2016). This has been proved, for instance, for hybrid vehicles (Kahn, 2007) and green homes (Shaharudin and Nik Abdul Rashid, 2017). Moreover, consumers perceiving a higher green utility of products are more willing to pay a premium price. This has been proved, for instance, for organic cotton apparel (Ha-Brookshire and Norum, 2011), renewable-energy technologies (Nomura and Akai, 2004), and green furniture (Xu et al., 2020).

Thus, we hypothesize that:

H6a. Green perceived utility positively influences the consumer's purchase intention for IS products.

H6b. Green perceived utility positively influences the consumer's willingness to pay a premium price for IS products.

2.3. The theoretical model

Fig. 1 shows the theoretical model of this study. On the left side, there are the antecedents grouped in TPB and TDMP variables; on the right side, the consumer's propensity is represented by purchase intention and willingness to pay a premium price. Further, as usual in studies on consumer behavior, consumer socio-demographic characteristics are included as controls.

3. Research methodology

3.1. Sample and procedure

Primary data was collected through a survey addressed to Italian consumers between November 2020 and February 2021. This methodology is very common to study the antecedents of consumer behavior (e.g., Alzubaidi et al., 2021; Dangelico et al., 2022; Park and Lin, 2020; Testa et al., 2020). Two identical questionnaires were developed, aimed at collecting data on the purchase intention and willingness to pay a premium price for two different IS products, i.e., electronic products including parts made of recycled wood (IS wood products) or plastic (IS plastic products), respectively.[1] Each questionnaire was validated through a pre-test conducted on a sample of 20 respondents, aimed at highlighting whether the questions were clear enough to them, as well as to test the time required to complete the questionnaire. Only small changes were made after the pre-test, aimed at improving the clarity of some sentences. A convenience sampling was used as common in consumer behavior studies (Butt et al., 2017; Lin and Chen, 2006; Mohd Suki and Mohd Suki, 2019). The questionnaires were distributed online through social networks, instant messaging clients, and e-mails, using the snowball sampling method. Despite this method might not guarantee representation and be affected by sampling biases, a high number of responses mitigate these risks (Atkinson and Flint, 2001). The final sample of respondents was made of 1.224 consumers. Since all questions were mandatory, there are no missing values in the dataset.

3.2. The questionnaires

The questionnaires were divided into two sections: the former consists of several questions based on the TPB and the TDMP, while the latter focuses on socio-demographic characteristics of respondents.

Each construct in the first section was measured through a multi-item 5-point Likert scale. Each scale ranges from 1 = "strongly disagree" to 5 = "strongly agree". The *environmental concern* scale is made of six items (Polonsky et al., 2014), the *social influence* scale is made of three items (Alzubaidi et al., 2020), the *perceived consumer effectiveness* scale is made of four items (Kang et al., 2013), the *perceived safety* scale of three items (Magnier et al., 2019), the *functionality expectations* scale is made of three items (Homburg et al., 2015; Magnier et al., 2019), and the *green perceived utility* scale is made of three items (two items from Chang (2011) and Magnier et al. (2019), one item self-developed). *Purchase intention* is assessed through three items (Bamberg, 2003; Gleim et al., 2013) and *willingness to pay a premium price* is assessed through two items (Magnier et al., 2019).

The second section includes questions about socio-demographic characteristics of respondents: *gender* (a dummy variable codified as 0 for male and 1 for female) (Dangelico et al., 2021), *age* (from 1 = "18–24" to 6 = "over 65" years old) (de Marchi et al., 2020), *educational level* (from 1="Middle school or lower" to 5 = "Doctorate") (Alzubaidi et al., 2021), and monthly *household net income* (from 1 = "less than 1.500 €" to 4 = "over 4.500 €") (Magnier et al., 2019).

4. Results

This section is divided into two subsections: descriptive statistics (4.1) and the analytical approach (4.2).

[1] These specific types of materials have been considered as they are the focus of the research project XXX.

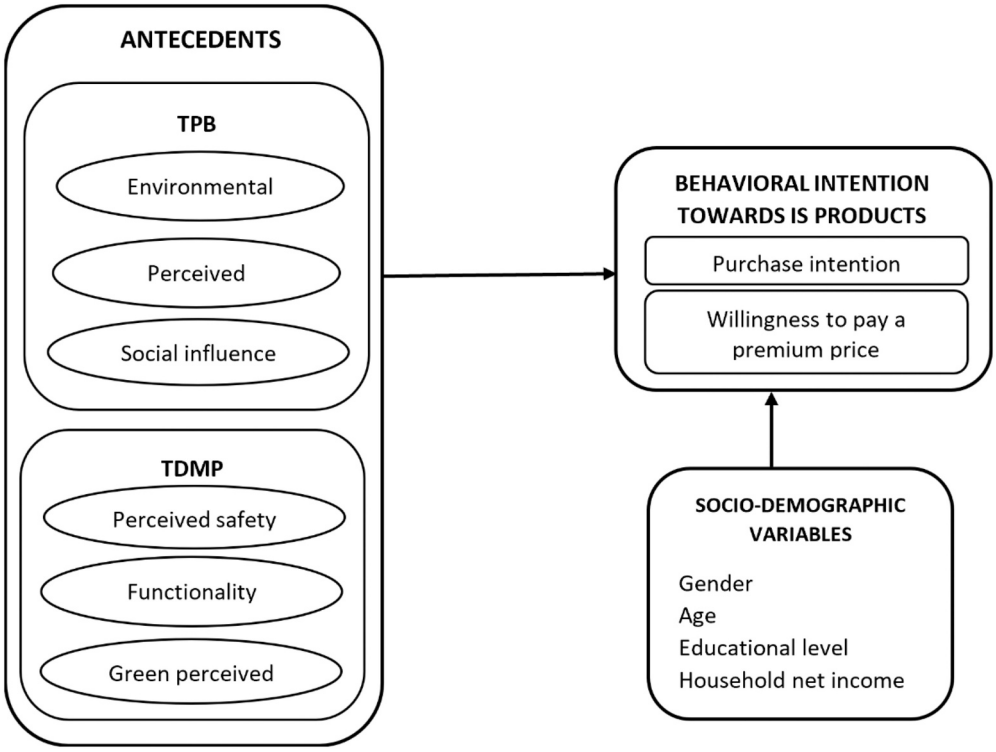

Fig. 1. Theoretical model of consumers' behavioral intention towards IS products.

4.1. Descriptive statistics

Table 2 displays the socio-demographic characteristics of the sample. 36 % of respondents are male and 64 % are female. The sample is mostly made by young and highly-educated people. More than 58 % of respondents are younger than 35 years old and about 63 % have at least a bachelor's degree. Around 24 % of respondents declared a monthly household net income lower than 1.500 euros, 42 % between 1.500 and 3.000 euros, 19 % between 3001 and 4.500, and 15 % higher than 4.500 euros.

Table 2
Socio-demographic characteristics of the sample.

	Frequency (percentage)
Gender	
Male	445 (36.36 %)
Female	779 (63.64 %)
Age (y.o.)	
18–24	335 (27.37 %)
25–34	380 (31.05 %)
35–44	158 (12.91 %)
45–54	150 (12.25 %)
55–65	159 (12.99 %)
over 65	42 (3.43 %)
Educational level	
Middle school or lower	37 (3.02 %)
High school	426 (34.80 %)
Bachelor's degree	312 (25.49 %)
Master's degree	421 (34.40 %)
Doctorate	28 (2.29 %)
Household net income (€)	
<1.500	291 (23.78 %)
1.500–3.000	519 (42.40 %)
3.000–4.500	232 (18.95 %)
>4.500	182 (14.87 %)

Table A1 in Appendix A displays the responses for each scale of the questionnaires on IS wood and plastic products. Overall, it can be noted that in both surveys around 90 % of respondents are concerned about the condition of the natural environment (environmental concern) and think that it is worth it for the individual consumer to make efforts to preserve and improve it (perceived consumer effectiveness). Moreover, almost 50 % of respondents agree on the fact people important to them, as well as people who influence their behavior, think they should use environmentally-friendly products (social influence).

Concerning the questions specific for each type of IS products, only moderate differences can be noted. For both IS products, >60 % of respondents agree that the considered products can contribute to effectively reducing pollution and problems related to landfill saturation (green perceived utility). The majority of respondents perceive these products as not dangerous. Indeed, approximately 85 % of respondents declared to perceive them as safe (perceived safety). Nonetheless, safety is perceived slightly higher in the case of IS plastic products. Concerning the functionality expectations, >90 % of respondents think that both types of IS products are capable of performing well, doing their job, and being functional (functionality expectations). Even in this case, the perceived functionality is slightly higher for IS plastic products. This is reflected in the purchase intention towards these products (>60 % of respondents stated that they would consider buying IS plastic or IS wood products) and the willingness to pay a premium price for them (>40 % of respondents declared to be willing to pay a premium price, for both types of product).

4.2. Analytical approach

A preliminary analysis of data was conducted, in particular through the multivariate outlier detection, using the Mahalanobis distance as distance metric (Hair et al., 2006). 93 outliers have been identified and removed, reducing the number of usable responses to 1.131. After that, a series of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted, while structural equation modeling was

used to test hypotheses. To evaluate model fit, Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Normed Fit Index (NFI), Standardized Root Mean Square Residue (SRMR), and Root Mean Square Error of Approximation (RMSEA) have been used. Since the χ^2 test is sensitive to sample size, significant values are expected for very large samples (Iacobucci, 2010; Hair et al., 2006); thus, we did not use this test to evaluate model fit.

4.2.1. Measure validation

First, two EFAs were conducted on IBM SPSS Statistics 25 data analysis package, using the principal axis method of factor extraction and the promax rotation. The first EFA was conducted on items referred to the antecedents of consumers' behavioral intention towards IS products. The results of the EFA highlighted the existence of six factors, with eigenvalue greater than one, accounting for 86.97 % of the variance (Kaiser–Meyer–Olkin [KMO] statistic 0.688; Bartlett statistic $\chi^2 = 3681.827$, df = 10, $p < 0.001$): (1) green perceived utility, (2) perceived safety, (3) functionality expectations, (4) perceived consumer effectiveness, (5) environmental concern, and (6) social influence.

The second EFA was conducted on items referred to consumers' behavioral intention towards IS products. The results of the EFA highlighted the existence of two factors, with eigenvalue greater than one, accounting for 72,59 % of the variance (Kaiser–Meyer–Olkin [KMO] statistic 0.863; Bartlett statistic $\chi^2 = 13{,}645.689$, df = 231, $p < 0.001$): (1) purchase intention and (2) willingness to pay a premium price. All the factor loadings exceed the value of 0.50, except for two items that have been deleted from the analysis: an item related to the perceived consumer effectiveness (with factor loadings 0.361) and an item related to the environmental concern (with factor loading 0.431).

In order to investigate whether the impact of the factors on the two dependent variables (purchase intention and willingness to pay a premium price) is different for the two considered IS products (wood or plastic products), some statistical analyses were conducted. In particular, using regression analysis, we have studied the impact of the factors and interaction terms, under the influence of a dummy variable "Wood or Plastic" (depending on the type of recycled material used for the IS product). A linear statistical test in parameters was then conducted, aimed at studying the significance of these factors and interaction terms. From the results, we can state that the factors influencing *willingness to pay a premium price* and *purchase intention* do not depend on the type of recycled material used. Thus, all collected data have been analyzed together, without distinguishing between the two types of products.

According to Gerbing and Anderson (1988), a two-step approach was adopted to analyze the data. First, the measurement model was studied, then the structural model was tested, using structural equation modeling. To study the properties of the items, as well as to estimate the reliability of the measurement model, a confirmatory factor analysis (CFA) was conducted on IBM SPSS AMOS 25.0. All items were tested using the method of maximum likelihood estimation. All indices (AGFI = 0.947, CFI = 0.978, NFI = 0.964, TLI = 0.974, SRMR = 0.034, and RMSEA = 0.036) show that the model adequately represents the data (Bagozzi and Yi, 1988; Byrne, 2001; Hair et al., 2006).[2]

Table 3 displays, for each factor, Cronbach's alpha, Average Variance Extracted (AVE), and Composite Reliability (CR), as well as, for each item, mean, standard deviation, and factor loading. All factor loadings exceed the value of 0.50, being the lowest 0.686. CR and Cronbach's alpha are above the recommended cut-off value of 0.70 for all constructs, being their lowest values 0.807 and 0.801, respectively. For all constructs, AVE is above 0.50, being the lowest 0.545. Thus, all constructs show evidence of good convergent validity and reliability (Alhosseini Almodarresi et al., 2019; Fornell and Larcker, 1981; Gleim et al., 2013; Hair et al., 2006).

Table 4 shows the correlation matrix and the AVE of each construct. Discriminant validity was tested following the Fornell and Larcker (1981) criterion. Since for each construct the AVE is higher than the squared correlation coefficient between each construct and other constructs, there is evidence of discriminant validity among all constructs.

4.2.2. Hypothesis testing

To test the hypotheses developed in Section 2, structural equation modeling methodology was adopted. The structural model includes all independent, dependent, and control variables. All indices (AGFI = 0.937, CFI = 0.971, NFI = 0.954, TLI = 0.963, SRMR = 0.034, and RMSEA = 0.037) show that the model adequately represents the data (Bagozzi and Yi, 1988; Byrne, 2001; Hair et al., 2006; Hu and Bentler, 1998).[3] Table 5 provides details of the results of the structural equation model.

Perceived consumer effectiveness ($\beta = 0.330$, $p < 0.01$), *social influence* ($\beta = 0.171$, $p < 0.01$), *perceived safety* ($\beta = 0.129$, $p < 0.01$), *functionality expectations* ($\beta = 0.206$, $p < 0.01$), and *green perceived utility* ($\beta = 0.085$, $p < 0.05$) have a positive and significant impact on *purchase intention*. Hence, H2a, H3a, H4a, H5a, and H6a are supported. Alternatively, the impact of *environmental concern* is not significant. Hence, H1a is not supported.

Perceived consumer effectiveness ($\beta = 0.193$, $p < 0.01$) and *social influence* ($\beta = 0.177$, $p < 0.01$) have a positive and significant impact on *willingness to pay a premium price*. Hence, H2b and H3b are supported. Alternatively, the effects of *environmental concern*, *perceived safety*, *functionality expectations*, and *green perceived utility* are not significant. Hence, H1b, H4b, H5b, and H6b are not supported. Regarding the control variables, *household net income* has a positive and significant effect on the *purchase intention* and *gender* has a positive and significant effect on the *willingness to pay a premium price*.

5. Discussion

Results highlight the factors influencing consumers' purchase intention and their willingness to pay a premium price for IS products.

On the one hand, several factors affect *purchase intention*, being *perceived consumer effectiveness* the most relevant, followed by *functionality expectations*, *social influence*, *perceived safety*, and *green perceived utility*. On the other hand, only two factors influence consumers' *willingness to pay a premium price*: *perceived consumer effectiveness*, and *social influence*, being *perceived consumer effectiveness* the strongest predictor. *Environmental concern* does not influence either *purchase intention* or *willingness to pay a premium price*.

In the following, results of this paper are contextualized referring to the existing literature.

Although several studies found people's environmental concern affecting their pro-environmental behaviors (e.g., Alzubaidi et al., 2021; Polonsky et al., 2014) as well as purchase intention and willingness to pay for sustainable products - as in the case of sustainable fashion (see Dangelico et al., 2022), our results do not show a significant effect of this variable either on the consumers' purchase intention or on the willingness to pay a premium price. Nevertheless, this result is consistent with Dangelico et al. (2021), who found that environmental concern does not influence either the willingness to pay a premium price or the purchase frequency of green products (as a general category of products). These contrasting results may be due to the fact that the influence of environmental concern on purchase intention and willingness to pay may be dependent on the specific product type that is considered.

The awareness that individual behavior can make a difference in solving environmental issues is a key driver of the purchase intention of IS products, as well as of the willingness to pay a premium price for

[2] As expected for large samples, we got a significant value for the χ^2 test: $\chi^2 = 604.887$ ($p = 0.000$) df = 247.

[3] As expected for large samples, we got a significant value for the χ^2 test: $\chi^2 = 800.348$ ($p = 0.000$) df = 316.

Table 3
Scales with items' mean, standard deviation, and factor loading, Cronbach's α, AVE, and CR.

	Mean	Std dev	Factor loadings	Cronbach's α	AVE	CR
(1) Green perceived utility				0.832	0.629	0.835
1. These products protect the environment	3.613	1.037	0.750			
2. These products can effectively reduce pollution	3.801	0.966	0.866			
3. These products can reduce problems related to landfill saturation	3.756	1.020	0.758			
(2) Perceived safety				0.855	0.670	0.858
1. I think these products are safe	3.907	0.938	0.733			
2. I think these products are benign	3.639	1.045	0.872			
3. I think these products are harmless	3.830	1.041	0.845			
(3) Functionality expectations				0.927	0.811	0.928
1. I expect these products will perform well	4.416	0.656	0.890			
2. I expect these products are capable of doing their job	4.469	0.615	0.937			
3. I expect these products are functional	4.492	0.588	0.875			
(4) Perceived consumer effectiveness (PCE)				0.801	0.585	0.807
1. It is worth it for the individual consumer to make efforts to preserve and improve the environment	4.690	0.572	0.686			
2. Since each individual can have any effect upon environmental problems, what I do can make a meaningful difference	4.428	0.699	0.744			
3. By purchasing products made in an environmentally friendly way, each consumer's behavior can have a positive effect on the environment and society	4.580	0.611	0.856			
(5) Environmental concern				0.857	0.545	0.857
1. I am concerned about the condition of the environment	4.685	0.552	0.739			
2. Humans are ruining the environment	4.651	0.557	0.760			
3. The condition of the natural environment is getting worse every year	4.607	0.629	0.750			
4. I am concerned about natural resource shortage in the future	4.495	0.713	0.679			
5. We all need to change our behavior to protect the natural environment	4.741	0.516	0.761			
(6) Social influence				0.905	0.762	0.905
1. People who are important to me think that I should use environmentally friendly products	3.553	0.981	0.857			
2. People who influence my behavior think that I should use environmentally friendly products	3.493	0.979	0.907			
3. People whose opinions I value prefer that I use environmentally-friendly products	3.599	0.967	0.854			
(7) Willingness to pay a premium price				0.926	0.861	0.925
1. Compared to traditional products I am likely to pay more for these products	3.187	1.077	0.919			
2. Compared to traditional products I am willing to pay a supplement for these products	3.186	1.086	0.937			
(8) Purchase Intention				0.897	0.743	0.897
1. I intend to buy these products in the future	3.852	0.786	0.886			
2. I will try to buy these products in the future	3.966	0.741	0.863			
3. I plan to buy these products in the future	3.790	0.820	0.837			

Table 4
Correlation matrix (squared construct correlations off-diagonal; AVE on diagonal).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Green perceived utility	**0.629**							
(2) Perceived safety	0.284**	**0.671**						
(3) Functionality Expectations	0.049**	0.111**	**0.812**					
(4) Perceived consumer effectiveness	0.067**	0.0144**	0.100**	**0.585**				
(5) Environmental concern	0.035**	0.008*	0.091**	0.410**	**0.545**			
(6) Social influence	0.019**	0.001	0.003	0.084**	0.072**	**0.762**		
(7) Willingness to pay a premium price	0.004	0.000	0.011*	0.071**	0.044**	0.057**	**0.861**	
(8) Purchase intention	0.095**	0.076**	0.135**	0.209**	0.102**	0.085**	0.102**	**0.743**

* $p < 0.05$.
** $p < 0.01$.

them. Indeed, our analysis shows that the strongest factor influencing both consumers' *purchase intention* and *willingness to pay a premium price* for IS products is the *perceived consumer effectiveness*. This result is consistent with several studies in the literature, which highlighted that consumers thinking that their behavior can preserve and improve the environment are more likely to purchase environmentally-friendly products (Alzubaidi et al., 2021; Choi and Kim, 2005; Gleim et al., 2013), as well as more willing to pay a premium price for green products (Barber et al., 2016; Zhao et al., 2018).

The positive impact of *social influence* on the *purchase intention* and *willingness to pay a premium price* for IS products highlighted by our results is consistent with previous studies (de Leeuw et al., 2015; Eze and Ndubisi, 2013; Gleim et al., 2013).

Thus, only two of the three variables of the classic TPB model appear to be relevant in predicting consumers' behavioral intention towards IS products; these two variables are the same for both the model with *purchase intention* (Model 2) and the one for the *willingness to pay a premium price* (Model 4) as the dependent variable.

The perception of a risk related to the product is recognized by the literature as one of the strongest factors that hamper consumers' purchase intention (Baxter et al., 2017; White et al., 2016). We can note that the intention to purchase IS products is positively influenced by the *perceived safety* and *functionality expectations*, thus by low perceived risks related to safety and functionality. These results are consistent with several studies in the literature, for instance Jan et al. (2019) and Ghazali et al. (2017), concerning the positive effect of the perceived safety, and Hur et al. (2015) and Magnier et al. (2019), concerning the positive effect of functionality expectations.

Finally, the *green perceived utility* positively influences the *purchase intention* of IS products, consistently with the results by Te Liu and Tsaur (2020) and Wang and Hazen (2016).

However, *perceived safety*, *functionality expectations*, and *green*

Table 5
Results of the structural equation model.

Path	Standardized estimate	Conclusion
Antecedents → purchase intention		
Environmental concern → purchase intention	−0.018	H1a not supported
Perceived consumer effectiveness → purchase intention	0.330**	H2a supported
Social influence → purchase intention	0.171**	H3a supported
Perceived safety → purchase intention	0.129**	H4a supported
Functionality expectations → purchase intention	0.206**	H5a supported
Green perceived utility → purchase intention	0.085*	H6a supported
Control variables → purchase intention		
Gender → purchase intention	−0.031	
Age → purchase intention	0.039	
Educational level → purchase intention	−0.034	
Household net income → purchase intention	0.060*	
R^2 (purchase intention)	0.34	
Antecedents → willingness to pay a premium price		
Environmental concern → willingness to pay a premium price	0.009	H1b not supported
Perceived consumer effectiveness → willingness to pay a premium price	0.193**	H2b supported
Social influence → willingness to pay a premium price	0.177**	H3b supported
Perceived safety → willingness to pay a premium price	−0.039	H4b not supported
Functionality expectations → willingness to pay a premium price	0.043	H5b not supported
Green perceived utility → willingness to pay a premium price	−0.003	H6b not supported
Control variables → willingness to pay a premium price		
Gender → willingness to pay a premium price	0.097**	
Age → willingness to pay a premium price	0.017	
Educational level → willingness to pay a premium price	0.027	
Household net income → willingness to pay a premium price	0.031	
R^2 (willingness to pay a premium price)	0.12	

* $p < 0.05$.
** $p < 0.01$.

perceived utility are not found to affect the *willingness to pay a premium price* for IS products. This result is in contrast with previous studies, proving that the willingness to pay a premium price is significantly influenced by the perceived safety (Magnier et al., 2019), as well as the expectations of the functionality of the product (Essoussi and Linton, 2010) and the green utility perceived by the consumer (Ha-Brookshire and Norum, 2011). These results highlight that, while these three factors are important to motivate consumers to purchase IS products, they are not enough to justify the payment of a higher price. This may be due to the fact that, for the purchase of high-tech and expensive products, as in the case of our study, these are requisites that consumers expect to find in products by default, for which they are not willing to spend more.

Thus, all the three factors of the TDMP predict purchase intention of IS products, while no one influences the willingness to pay more for these products.

With regards to socio-demographic variables, *household net income* is the only variable that significantly affects the purchase intention of IS products, being higher-income respondents more willing to purchase IS products. This result is consistent with previous studies, emphasizing how consumers with a higher income level are more likely to purchase sustainable products, such as slow fashion apparel (Chi et al., 2021), sustainable wood products (Panico et al., 2018), and green apparel products (Nguyen et al., 2019).

Gender is the only variable that significantly influences the *willingness to pay a premium price*, being female respondents more willing to pay a supplement for IS products. This result is consistent with previous studies highlighting a higher willingness to pay a premium price of women, for instance, for eco-labeled seafood or chocolate (Vecchio and Annunziata, 2015; Vitale et al., 2020) and for products with ecological appeal (de Medeiros et al., 2016).

6. Conclusion and implications

Through an integration of the TPB and the TDMP, this study investigated the main factors affecting the purchase intention of consumers and their willingness to pay a premium price for IS products. Specifically, through a survey of 1.224 Italian consumers, we analyzed product perceptions, purchase intention, and willingness to pay a premium price for electronic products with components made of wood or plastic deriving from IS.

As a general result, our research shows that consumers may be ready for IS products, at least for the considered product category (high-tech products, such as laptops, tablets, and smartphones). Indeed, >60 % of the respondents declared that they were willing to buy these products, while >40 % of respondents were willing to pay a premium price for them.

A theoretical model of factors affecting consumers' behavioral intentions towards IS products has been developed and tested. The results have several implications for theory and practice.

In terms of theoretical implications, this study has relevant elements of novelty. First, in the context of green consumer behavior, limited efforts have been made so far in integrating the TPB and the TDMP (Magnier et al., 2019; Nguyen et al., 2019; Wang and Hazen, 2016). This study integrates the TPB and the TDMP, by extending the TPB with the inclusion of risks and benefits associated with IS products. Further, this study considers both purchase intention and willingness to pay a premium price as outcomes simultaneously. Thus, a more complete picture of green consumption is provided. Our results highlight that most factors of the TPB and the TDMP are useful to explain consumers' behavioral intention towards IS products. However, while the TPB variables relevant in explaining it (perceived consumer effectiveness and social influence) are the same for both purchase intention and willingness to pay a premium price, all the TDMP variables influence purchase intention, but they do not impact the willingness to pay more. This highlights that the two analyzed dimensions of consumers' behavioral intention (purchase intention and willingness to pay a premium price) have partly different antecedents. This result is consistent with Dangelico et al. (2022) and shows that green purchase behavior is a multifaceted phenomenon. This underlines the importance of considering the multiple dimensions of green consumer behavior, highlighting that, in order to fully understand it, each dimension should be carefully analyzed.

A comparison of our study results with previous studies' ones also suggests that the effect of some factors on purchase intention and willingness to pay a premium price may be influenced by the type of products and the related buying behavior. This issue needs to be deepened and future research could follow this direction.

Further, this is the first study to investigate consumers' behavioral intention towards IS products; as such, it contributes to understanding consumer behavior towards this scantly investigated category of products. This is an element of novelty in the IS literature, which has been more oriented to the company perspective rather than the consumer one (e.g., Mallawaarachchi et al., 2020; Neves et al., 2020).

In terms of managerial implications, results of this study offer managers interesting insights, useful to understand consumers' behavioral intention towards IS products and, thus, to develop appropriate marketing strategies. In the following, key insights and related implications for marketing are reported.

1. Our study highlighted that IS products are perceived by most respondents as highly beneficial for the natural environment, functional, and safe. This suggests that promotional campaigns about these products could be devoted to strengthening these positive perceptions and to better inform those consumers that have doubts about IS products' performance and safety.
2. This study showed that higher-income respondents have higher purchase intention and that women display a higher willingness to pay a premium price for IS products. Accordingly, high-income women could be a privileged target for marketers of IS products and specific products and marketing campaigns should be developed for this target segment. At the same time, in order to foster a widespread diffusion of IS products, suitable marketing campaigns should be developed to reach other segments, for instance, with lower-price product lines. Thus, companies may decide whether to pursue a niche marketing (with high-quality/high-price products mainly targeting high-income women) or a differentiated marketing targeting approach, with different products for different target segments.

7. Limitations and future research directions

This study has some limitations. First, it is based on a survey conducted among Italian consumers, mostly female and young, which is not representative of the whole Italian population. Second, this study is focused on electronic products with components made of wood or plastic derived from IS. Perceptions about functionality or safety could be different for other types of products (e.g., clothes or cookware), characterized by contact with the skin or food, or for other types of materials deriving from IS (e.g. metals). Thus, caution should be done when generalizing this study results to all types of IS products.

Future studies could be devoted to enlarge the survey to other countries, with a sample most representative of the whole population. Further, other categories of products, as well as other types of materials deriving from IS, should be considered.

Finally, following the research trend on the use of Machine Learning (for instance based on the Rough Set Theory) to study consumer behavior (e.g., Tran and Huh, 2022), future research could be devoted to deepening the use of these methodologies and integrating them with more conventional ones (such as surveys) to study sustainable consumer behavior.

We hope that this study encourages awareness about IS products and paves the way for future research on consumer behavior related to these products. This would contribute to the diffusion of IS products in the market, thus fostering the development of a circular economy and the achievement of the UN Sustainable Development Goal n. 12 "Ensure sustainable production and consumption patterns".

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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Appendix A

Table A1
Scales and percentage of responses for each category of answers, for IS plastic products and IS wood products (1 = "strongly disagree", 2 = "disagree", 3= "neither agree nor disagree", 4 = "agree", 5 = "strongly agree").

		Sources	IS plastic products					IS wood products				
			1	2	3	4	5	1	2	3	4	5
Green perceived utility	These products are good for the environment	(Chang, 2011; Magnier et al., 2019)	5.6 %	13.4 %	18.7 %	46.1 %	16.2 %	4.8 %	13.2 %	20.0 %	43.9 %	17.9 %
	These products can effectively reduce pollution		3.5 %	10.2 %	14.4 %	50.1 %	21.8 %	3.2 %	10.7 %	15.5 %	50.7 %	19.9 %
	These products can reduce problems related to landfill saturation	Self-developed	3.8 %	11.2 %	13.9 %	46.6 %	24.5 %	4.2 %	12.6 %	17.1 %	47.3 %	18.7 %
Perceived safety	I think these products are safe	(Magnier et al., 2019)	2.3 %	6.6 %	13.9 %	42.6 %	34.5 %	2.7 %	5.7 %	25.7 %	45.4 %	20.5 %
	I think these products are benign		4.1 %	12.6 %	23.5 %	31.2 %	28.6 %	3.2 %	13.2 %	28.4 %	39.3 %	15.8 %
	I think these products are harmless		3.1 %	10.7 %	14.7 %	35.9 %	35.5 %	4.2 %	11.5 %	19.7 %	43.5 %	21.2 %
Functionality expectations	I expect these products will perform well	(Homburg et al., 2015; Magnier et al., 2019)	0.8 %	1.8 %	3.6 %	37.0 %	56.7 %	0.3 %	2.1 %	8.4 %	48.3 %	40.9 %
	I expect these products are capable of doing their job		0.3 %	1.5 %	2.1 %	35.0 %	61.0 %	0.3 %	1.9 %	6.0 %	48.9 %	42.8 %
	I expect these products are functional		0.5 %	0.8 %	2.1 %	35.7 %	60.8 %	0.0 %	1.5 %	5.3 %	48.9 %	44.3 %
Perceived consumer effectiveness	It is worth it for the individual consumers to make efforts to preserve and improve the environment	(Kang et al., 2013)	0.7 %	1.2 %	2.3 %	20.5 %	75.4 %	1.9 %	1.5 %	1.9 %	26.8 %	67.9 %
	When I buy products, I tend to try to consider how my use of them will affect the environment		2.0 %	6.9 %	19.7 %	39.8 %	31.6 %	1.9 %	7.6 %	19.5 %	40.2 %	30.7 %
	Since every individual can have any effect upon environmental problems, what I do can make a meaningful difference		1.2 %	2.1 %	6.9 %	35.0 %	54.7 %	1.8 %	2.7 %	6.6 %	40.5 %	48.3 %

(continued on next page)

Table A1 (*continued*)

		Sources	IS plastic products					IS wood products				
			1	2	3	4	5	1	2	3	4	5
	By purchasing products made in an environmentally friendly way, each consumer's behavior can have a positive effect on the environment and society		0.7 %	0.8 %	3.3 %	29.9 %	65.3 %	1.3 %	2.3 %	3.7 %	33.3 %	59.5 %
Environmental concern	I am concerned about the condition of the environment	(Polonsky et al., 2014)	0.7 %	0.3 %	3.1 %	21.5 %	74.4 %	0.5 %	1.3 %	4.2 %	25.2 %	68.8 %
	Humans are ruining the environment		0.2 %	0.8 %	3.8 %	26.1 %	69.1 %	0.2 %	1.1 %	4.4 %	27.5 %	66.9 %
	I would give up some economic goods for a cleaner environment		1.2 %	1.3 %	10.2 %	39.2 %	48.1 %	0.8 %	2.9 %	9.2 %	40.7 %	46.4 %
	The condition of the natural environment is getting worse every year		0.3 %	0.8 %	5.1 %	25.5 %	68.3 %	0.3 %	1.6 %	7.8 %	24.7 %	65.6 %
	I am concerned about natural resource shortage in the future		0.7 %	2.3 %	6.9 %	29.9 %	60.2 %	0.3 %	2.9 %	7.9 %	30.9 %	58.0 %
	We all need to change our behavior to protect the natural environment		0.3 %	0.3 %	2.6 %	18.2 %	78.5 %	0.3 %	1.6 %	3.2 %	20.8 %	74.0 %
Social influence	People who are important to me think that I should use environmentally friendly products	(Alzubaidi et al., 2020)	3.8 %	9.3 %	35.0 %	35.0 %	16.9 %	3.1 %	9.7 %	35.7 %	31.0 %	20.5 %
	People who influence my behavior think that I should use environmentally friendly products		3.8 %	9.8 %	36.9 %	35.0 %	14.5 %	4.0 %	10.5 %	38.3 %	29.9 %	17.3 %
	People whose opinions I value prefer that I use products environmentally friendly products		3.0 %	8.6 %	35.4 %	34.2 %	18.8 %	3.6 %	8.1 %	36.2 %	32.1 %	20.0 %
Willingness to pay a premium price	Compared to products made of conventional plastic/wood I am likely to pay more for these product	(Magnier et al., 2019)	9.6 %	20.2 %	31.6 %	32.4 %	6.3 %	9.2 %	18.1 %	23.4 %	39.4 %	9.9 %
	Compared to products made of conventional plastic/wood I am willing to pay a supplement for these product		10.2 %	22.1 %	26.1 %	35.7 %	5.8 %	8.6 %	19.2 %	22.1 %	41.2 %	8.9 %
Purchase intention	I intend to buy these products in the future	(Bamberg, 2003; Gleim et al., 2013)	1.0 %	2.6 %	23.5 %	51.4 %	21.5 %	1.6 %	5.0 %	29.1 %	46.8 %	17.4 %
	I will try to buy these products in the future		1.0 %	2.3 %	17.4 %	55.5 %	23.8 %	1.1 %	4.0 %	23.1 %	52.3 %	19.4 %
	I plan to buy these products in the future		1.2 %	2.6 %	28.8 %	46.0 %	21.5 %	1.8 %	4.7 %	35.4 %	41.4 %	16.8 %

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