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Consumer Decision-Making Framework for Circular Economy Oriented Products

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KEYWORDS
Circular economy; Consumer decision-making; Hierarchy of effects; Perceived value; Automobiles; Emerging economy.

ABSTRACT
Today, Automobile manufacturers are transitioning from a linear economic model to a circular economic model, guided by the principles of reduce, reuse, and recycle, which are more sustainable in considering organizational and customer needs. This study proposes a product-centric decision-making model that explains the process and predictors of consumer behavior for circular economy-oriented automobiles. The model covers awareness of circular economy and such brands for their impact on different perceived values: functional, social, epistemic, and attitude that may lead to willingness to purchase and thus determine the purchase behaviour for such circular automobiles. A survey involving 613 respondents was used to test the model empirically. The paper's major contribution is identifying perceived functional value as a major driver for triggering purchase actions of CE products. The outcome of this study will help automobile companies and marketers to align their marketing communication strategy to highlight the functional benefits of such offerings.

INTRODUCTION

Like most businesses, automobile manufacturing firms operate on the linear economic model, i.e., "Take, Make, Consume and Dispose". Wherein the manufacturer sources the material/components, converts it into the finished products, and sells to the end consumer without much concern about what would happen to the sold product when it reaches the end of the lifecycle, leaving waste behind (Ghisellini et al., 2018; Giampieri, et al., 2020). An automobile, which is an intricately engineered product, uses a lot of material and energy throughout its lifecycle from production to end-of-life disposal and thus, has a high sustainability impact (Agarwal et al., 2017). Besides health and environmental concerns related to greenhouse gas emissions, due to the myriad of materials used for production and the high amount of end-of-life waste, automobiles come under the scrutiny of environmentalists and sustainability advocates (Giampieri, et al., 2020). Tons of waste are generated by dumped or unused automobiles, the majority of which is attributed to small auto components and batteries. Thus, valuable resources leave the life cycle that industries could have reused. Amidst rising concerns about automobiles' sustainability impact, more than 85 million new vehicles are produced globally every year (Patel & Singh, 2022).

Responding to the need of the hour, automobile manufacturers are keen to transition from the linear economic model to the circular economic model, where manufacturers follow the principle that materials and products should be restored as they remain valuable after their use (Maldonado-Guzmán et al., 2021). Circular economy (CE) refers to an industrial system that is regenerative by design and intention. This concept emphasizes a shift to renewable energy and the reuse of materials through superior designs, systems, and models, and thus stresses restoration instead of disposal (Hao et al., 2020). CE provides a holistic perspective of manufacturers and customers as it encompasses both production and consumption activities, from transforming the supply chain, designs, and production processes to eco-friendly use (Patel & Singh, 2022). Recent research suggests that despite offering a huge business opportunity, the transition from linear to circular business models has

1 In this study, the words "app" and "platform" are used interchangeably

not been smooth for businesses mainly due to financial and market challenges, including assessment and prediction of consumer behavior for CE products (Colijn et al., 2022). Unlike other stakeholders in the CE value chain such as; raw material/component suppliers, manufacturers distributors, recyclers and retailers whose behavior can be predicted based on monetary incentives and regulatory requirements (Parajuly et al., 2020), it is difficult to predict the behavior of the principal stakeholder i.e., a consumer whose behavior is driven mainly by perceived values associated with the innovated products like CE-oriented automobiles (Miliute-Plepiene et al., 2016). Consumers' behavior determines the demand for CE products such as recycled, refurbished, and reusable products (Mahmoodi & Heydari, 2021), second-hand products (Terzioğlu, 2021), and remanufactured products (Piscicelli et al., 2018). Thus, within CE, the circular thinking of consumers resulting in favorable consumer behavior is critical for the long-term success of manufacturers' initiatives for CE-based innovations.

Despite agreements on the key role of consumer behavior in enabling CE models to offer significant potential for reducing the sustainability impacts of automobiles throughout their lifecycle, there is limited research on consumer behavior towards CE-oriented automobiles (Agarwal et al., 2017). Although, previous empirical studies on CE products examined consumer behavior from various angles such as; how consumer behavior obstructs CE (De Jesus & Mendonça, 2018), affects the release of waste into CE (Wilkinson & Williams, 2020), influences the purchase of green packaging (Testa et al., 2020), etc., in the broader sense, a product-centric consumers' decision-making model which helps the automobile manufacturers and policy-makers predict consumer behavior towards CE-oriented automobiles is still lacking in the literature. Through an empirical investigation, this study proposes a product-centric decision-making model explaining the process and predictors of consumer behavior for CE-oriented automobiles. The proposed model builds upon two of the most recommended theoretical frameworks for understanding consumers' decision-making process in the context of innovative/new products and services such as CE-oriented automobiles, i.e., the theory of hierarchy of effects (HOE) and theory of consumption values (Köse & Kırcova, 2021).

The remaining sections of the paper are organized as follows. Section two provides a literature review and theoretical background of the study, followed by a conceptual model and hypotheses development in section three. Research methods and analysis are discussed in section four. Section 5 reports the results, and the discussion and implications are given in Section 6. Concluding remarks and limitations are provided in section 7.

LITERATURE REVIEW AND THEORETICAL BACKGROUND

Circular Economy-based Innovations

Circular Economy Based Innovation (CEBI) has gained extensive consideration in the academic literature over the past few years due to its potential to address global sustainability challenges by creating closed-loop systems that minimize waste and maximize resource use (Ferlito & Faraci, 2022). CEBI is defined as "an innovative approach focused on developing products, services, and business models based on the CE principles" (Gonçalves, et al., 2022). Unlike linear systems, CE-based industrial systems are regenerative and restorative by design, aiming to keep products, components, and materials at their highest value and usefulness at all times (Ranta et al., 2020). CEBI aims to create closed-loop systems that reduce waste and extend the use of resources by designing out waste, keeping products and materials in use, and regenerating natural systems (Brown et al., 2019). Some of the key benefits of CEBI highlighted in the literature are reduced resource use, increased resource efficiency, reduced waste, improved environmental sustainability, and the creation of new business opportunities and jobs (Han et al., 2020). Past research also highlights challenges related to CEBI implementations, such as the lack of awareness and knowledge of CE principles, the need for new policies and regulations that support CE practices, the need for new technologies and infrastructure, and the high initial costs of transitioning to CE practices (Bocken et al., 2016). CEBI can be categorized into distinct types, such as product/service innovation, process innovation, business model innovation, and service innovation (Brown et al., 2019; Han et al., 2020). Some of the product innovations grounded on CE principles explored by prior studies are modular products, upcycling, closed-loop packaging, and bio-based materials (Bocken et al., 2016). CE-oriented process innovations imply the development of new methods and technologies that can help reduce waste and resource use in production processes such as resource recovery and digitalization. Further, generating new business models based on CE principles, such as product-as-a-service or sharing economy models, constitutes business model innovations (Ferlito & Faraci, 2022).

Innovations for Enabling a Circular Automotive Economy

The automotive sector is one of the most significant contributors to global greenhouse gas emissions, and as such, has been the focus of many CEBIs aimed at reducing waste and promoting sustainability (Bachteler et al., 2019). A set of prior studies have explored innovations in the automotive sector's product design and development and supply chain for integrating CE principles. Rysanek and Raab (2019) studied the recycling systems for reducing waste and increasing the resource efficiency of production processes in automotive companies, e.g., BMW has implemented a closed-loop recycling system for its aluminum production process, where scrap aluminum is collected, melted down, and used to produce new aluminum components. Studies have explored remanufacturing strategies for restoring used auto-components and engines to their original condition, extending their lifespan, and reducing waste (e.g., Caterpillar's engine remanufacturing program) (Johnston & Wood, 2019). Other widely explored CEBIs in the context of the automotive sector are lightweight, i.e., the use of lightweight materials to reduce the weight of vehicles (e.g., BMW i3 electric vehicle composed of lightweight carbon fiber) (Rysanek & Raab, 2019). Another widely examined CE-based service innovation is the adoption of shared platforms

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by automakers for offering ride-sharing services to reduce the number of vehicles on the road, reduce emissions, and promote resource efficiency (e.g., ride-sharing service Lyft promoted by General Motors) (Kara et al., 2020). Electric and hybrid vehicles are another widely explored CEBI that promotes sustainability and reduces waste in the automotive sector (Bachteler et al., 2019).

Consumer Behaviour for Sustainable/circular Automotive

Despite the significant sustainability impact of automobiles and auto-components due to their high energy consumption, emissions, and resource utilization throughout their lifecycle, from production to end-of-life disposal, there is limited research on consumer attitudes and behavior towards sustainable or CE-based attributes in automobiles such as design for assembly, extended life cycle, and recyclable materials (Agarwal et al., 2017). A few studies have investigated factors influencing consumer decision-making for sustainable or green automobiles (Chen et al., 2018). A study on Chinese automobile owners, Chen et.al.(2018) found consumers' environmental attitudes as a significant predictor of their behavior toward sustainable automotive. The authors found that more environmentally conscious consumers are more likely to adopt sustainable automotive practices such as electric vehicles and ridesharing. Chel and Kannan (2021) found that consumers are more likely to adopt sustainable automotive practices if they perceive social and peer pressure, or social norms, to do so. Perceived cost savings in the long run are identified as another critical factor influencing the adoption of sustainable automotive, e.g., consumers are more likely to purchase an electric vehicle if they perceive that they will save money on fuel and maintenance costs (MacDuffie & Fuchs, 2019). Additionally, perceived convenience and ease of use are other factors that influence consumer behavior for sustainable automotive, e.g., ease of access to car-sharing services (Schamel, 2019). Studies have found that consumers are more likely to adopt sustainable automotive practices if they trust the companies and institutions promoting them (Agarwal, et al., 2017). For example, consumers may be more likely to purchase an electric vehicle if they trust the manufacturer's commitment to sustainability and environmental responsibility. Thus, the review showed a research gap in terms of the nature of CEBIs in the automotive sector and how the customer perceives circular automotive.

Theoretical background

Hierarchy-of-effects (HOE) Model

Usually, transformative and innovative products and services, such as circular automotive, encourage consumers to learn new behavior and practices (Bianchi, 2021). Therefore, learning theories such as the theory of hierarchy of effects (HOE) provide an appropriate theoretical foundation for conceptual models that aim to study and explore how consumers decide to switch from existing products/services to new products/services. The HOE proposed by Lavidge and Steiner (1961) describes the process of consumers' decision to purchase an unfamiliar or less familiar product/service (Wijaya, 2015), such as a circular automotive. The model proposed by HOE has been frequently applied when the product/service under examination is innovative, transformative, and/or complex (Rehman et al., 2014). Considering the transformative nature of circular automotive and consumers' limited knowledge of CEBI and circular automotive, we adopted the HOE model to study consumers' purchase decision-making process of circular automotive. The model suggests a sequential process consisting of three stages: cognition, affect, and conation. Under the cognition stage consumer develops familiarity with the new product/service by processing the available information about the attributes, features, and utility of the product/service. By the end of this stage, the information gets translated into knowledge, and the consumer is reasonably aware of the features and advantages of the new product/service (Tsiotsou, 2013). In the current context, cognition refers to the consumer's mental activity to process information into knowledge on the need for circular economy (CE) and CE innovation initiatives taken by automotives, which is reflected in circular economy awareness (CE awareness) and circular automotive brand awareness (CAB awareness). Initially, growing concerns for the environmental hazards of automobiles attract consumers' attention to sustainable solutions such as circular automotive, which encourages him/her to develop familiarity with circular automotive, and we call this stage CA cognition. The consumer moves to the affection stage, where he/she forms a good impression and gradually develops affection for the new product/service (Wijaya, 2015). In this study, we call this stage CA affection. Affection refers to a consumer's degree of emotions and feelings attributable to circular automotive (Ketelsen et al., 2020). In this stage, the consumer starts liking the product/service, which is reflected in his/her positive attitude and perceived values of circular automotive. Previous studies suggest that perceived consumption values are at the core of consumers' preference for a new product/service over the current one (Kumar & Noble, 2016). In the current context, the perceived value of circular automotive is defined as the consumer's perception of the trade-off between the benefits and sacrifices associated with purchasing circular automotive (Payne & Holt, 2001). High perceived value and positive attitude toward circular automotive lead the consumer to the third stage: conation. In this stage, consumers' willingness to purchase the product/service is stimulated, which results in a purchase decision (Ketelsen et al., 2020). In this study, we refer to this stage as CA Conation, under which a consumer's affection for circular automotive products will promote their purchase intention and ultimately lead to the decision to purchase. Purchase intention is defined as the consumer's willingness to switch from personal or non-circular automotive to circular automotive products (Inman & Zeelenberg, 2002), and a purchase decision refers to the consumer's final decision to buy circular automotive (Sharma & Foropon, 2019).

Theory of Consumption Values

As suggested by numerous previous studies, we referred to the theory of consumption values to develop a holistic understanding of different dimensions of perceived consumption values and their potential role in the CA affection stage of the sequential purchase decision-making process (Köse & Kırcova, 2021) The seminal work of Sheth et al. (1991) suggested five dimensions of consumption values namely; functional value, social value, epistemic value, conditional value, and

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emotional value. Functional value is described as the perceived utility of a product determined by its capacity for functional performance, reflected in the quality of the product. Functional value is reflected in a product's key features and attributes, which are instrumental in building consumers' preference for the product/service (Popescu & Ciurlău, 2019). In the current context, reused and recycled auto components are considered vital product attributes that make circular automotive a sustainable automotive solution with high physical performance, thus enhancing its perceived functional value related to quality (Candan & Yıldırım, 2013). Social value refers to a product/service's perceived association with social, cultural, and demographic groups, which may enhance an individual's reputation and group acceptance (Costa et al., 2014). Perceived social value is considered a key factor influencing an individual's preference for sustainable products/services (de Regt et al., 2020). In this study, perceived social value captures the consumer's perception of self-image (an image of an environmentally responsible person) associated with using circular automotive instead of personal or non-circular automotive solutions (Turel et al., 2010). Epistemic value is the third perceived value we considered in this study, as empirical studies suggest that the epistemic value associated with a transformative product or service significantly influences consumers' preferences for it over others (Du et al., 2021). It refers to the product/service's ability to stimulate a consumer's curiosity to try out the product/service and desire for knowledge (Malodia et al., 2021). In the current context, perceived epistemic value is captured by measuring a consumer's curiosity to experience and know more about circular automotive. Next is perceived emotional value, which is measured by a set of emotions associated with the product/service under examination. Lastly, perceived conditional value focuses on the significance of the conditions or circumstances under which purchase decisions are made (Turel et al., 2010). As reported in previous studies, in the context of trendy, transformative, and sustainable products and services, the above two values are only marginally relevant (Kim & Jan, 2021). Therefore, we did not consider the perceived emotional and conditional value in this study.

HYPOTHESIS DEVELOPMENT AND RESEARCH MODEL

Facets of CE Innovation Cognition on Consumers' Affection

Environmental awareness and consciousness have been established as strong influencing forces on consumer actions related to sustainability (D. De Toni et al., 2018). This is also true for CE-related consumer behavior (Testa et al., 2020). In this section, we posit how CE awareness and CE-oriented brand awareness contribute to perceived value and attitude in consumers.

CE awareness

For this study, CE awareness has been operationalized as the extent to which the customer is sensitive to the impacts of one's actions on the environment and the need to move from a linear economy to a circular economy. It has been established in prior research that customers who are more environmentally conscious and aware display more sustainable consumption behavior (Micheletti, 2010), and this environmental awareness has an impact on their perceived value (including functional, social, and epistemic) in the offering as well (Basselier et al., 2018). Regarding functional value awareness and knowledge about the enhanced quality of CE innovations in the product, it has been established (Chen & Chang, 2012). Similarly, the awareness about CE practices and innovations in products seem to put individuals as smart or esteemed that contribute to saving the planet (Wang & Hazen, 2016) and the novelty associated with CE innovations in automobiles could arouse curiosity and the need to satisfy knowledge about such practices and product. We therefore hypothesize: -

H1a: CE awareness impacts the perceived social value of CE products
H1b: CE awareness impacts the perceived functional value of CE products
H1c: CE awareness impacts the perceived epistemic value of CE products

Consumer attitude is defined as a feeling of favorableness or unfavorableness that an individual has towards an object (Schiffman & Kanuk, 2008). Attitude in the long term has been conceptualized as the sum of an individual's predominant belief towards the attitude object, and the importance given to attributes of the object (Fishbein, 1973). Awareness of a particular phenomenon is the first step towards attitude formation as it provides information that leads to knowledge and belief around the object, which also happens for CE behaviors (Mostaghel & Chirumalla, 2021). Drawing on extant literature on awareness leads to attitude and how scholars have encouraged the need to build awareness for CE-related behaviors we posit the following hypothesis in the context of automotive products (Mostaghel & Chirumalla, 2021)

H2: CE awareness impacts attitude towards CE products.

CE-oriented brand awareness

Brands play a vital role in consumer decision-making by offering assurance and credibility, thereby increasing trust and reducing perceived risk associated with purchasing a branded product (Södergren, 2021). Scholars have established the role of brand awareness in creating perceived value in the context of sustainability (D. De Toni et. al., 2018) and also its importance in the context of CE-oriented brands and perceived values (Ayuso, et al., 2021) such as functional (price and quality), epistemic and social (Mostaghel & Chirumalla, 2021). CE-oriented brand awareness would comprise the reduce, recycle, and reuse practices being used by the CE brand in the automotive context such as hybrid / electric cars, CE technologies such as dry wash technologies, fuel-efficient engines, and repair facilities being used in the same context of CE automotive that may have an impact on the functional, epistemic and social values. We therefore posit;

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H3a: CE-oriented brand awareness impacts perceived social value for a CE product
H3b: CE-oriented brand awareness impacts perceived functional value for a CE product.
H3a: CE-oriented brand awareness impacts perceived epistemic value for a CE product.

Brand awareness reflects a buyer's capacity to recognize a brand in sufficient detail to make a purchase and has been considered a prerequisite for the brand attitude that may lead to purchase action (Rossiter & Percy, 1987). Sustainability scholars have linked brand attitude and product purchase decisions to brand awareness (Wang et al., 2022). Mostaghel & Chirumalla, (2021) conceptualize the role of CE-oriented brand awareness in attitude formation. For our study, the CE-oriented attitude has been operationalized in terms of the individual deriving personal meaning out of the CE-oriented brand that is satisfying to him and has a feeling of creating an impact on the environment and society through his attitude. Thus, we hypothesize;

H4: CE-oriented brand awareness leads to attitude formation for CE products.

Facets of Consumers' Affection on Consumers' Action

Perceived value and willingness to purchase

Customers' perceived value of a product or service has a direct effect on their purchase intentions or willingness to purchase, with high customer value directly increasing the purchase intention (Hakim & Susanti,2017). Customers decide to purchase a product after weighing the perceived benefits that can be obtained from it and the perceived costs of the products that need to be sacrificed. Customers having a positive perceived value of the product show a willingness to purchase. In contrast, customers having a negative perceived value show an unwillingness to purchase the product (Lim et.al., 2014). Today's customers perceive more value in products and services contributing to sustainable solutions (Ketelsen et al., 2020). Considering the positive impact that sustainable solutions have on customers' value perception, customers are likely to be willing to purchase CE products. The perceived quality of CE products and the perceived risks influence customers' perceived value and, ultimately, their willingness to purchase.

Perceived value has also been found to customer loyalty, which in turn influences their actual purchasing behavior. High social value, which is associated with a customer's social status and reputation, increases a customer's satisfaction with a product (Gan & Wang, 2017). Availability of information concerning common functional values of a product, which include the quality of a product, reliability, durability, and price of a product, increases the customer's willingness to purchase (Nguyen et al., 2020). Dangelico et al. (2021) found that the social and functional values of green products had a significant and positive impact on the frequency of purchase of green products. Epistemic value, due to its capacity to provide something new or different, positively impacts a customer's commitment to a product and can lead to repurchase. This study proposes that the customers' willingness to purchase CE products is due to the higher value (social, epistemic, and functional) that they perceive from such products.

H5a: The perceived social value of CE products positively affects willingness to purchase CE products
H5b: The perceived functional value of CE products positively affects willingness to purchase CE products
H5c: The perceived epistemic value of CE products positively affects willingness to purchase CE products

Attitude and willingness to purchase

Attitudes of customers serve as drivers of behavioral outcomes to purchase products, with human attitude framing human behavior (Fishben & Ajzen, 1975). Their decision and willingness to purchase are based on attitudinal beliefs, such as knowledge of the product and its quality, influenced by societal factors including peers, family, and technical experts with whom they consult (Pisitkkhakarn & Vassanadumrongdee, 2020). It has been shown that a positive attitude affects the willingness to purchase (Bian & Forsythe, 2012; Suki, 2016), with scholars having identified a significant relationship between attitude and buying decisions (Ashraf et.al, 2019). Customers' attitude has proved to positively influence their purchase intention for green products (Maichum et.al., 2016). Considering customers' positive attitude towards green and sustainable solutions, we propose that it is demonstrated in their willingness to purchase CE products. We, therefore, propose the following hypothesis;

H6: Attitude toward CE products positively affects willingness to purchase CE products

Mediating role of willingness to purchase

According to Bagozzi et al. (1990), product purchase willingness reflects customers' consciousness to exert a particular degree of effort needed to carry out the purchasing behavior. It significantly influences customers' buying decisions (Brown et al., 2003). Evidence of a strong association between attitude, willingness to pay, and actual buying behavior has been found in the study conducted by Choo et.al. (2004). Customers who understand the ethical dimensions of a product (Dickson, 2001) and who are willing to purchase and pay for green and environmentally friendly products most likely end up purchasing the product (Oliver & Lee, 2012). Chauke and Duh (2019), in their study, found that the perceived value of societal acceptance influenced customers' purchase decisions of organic products. Schill et.al. (2019), in their study on customers' purchase intention for smart home objects, confirm that environmental concerns and perceived usefulness positively affect consumers' willingness to purchase smart objects. The epistemic value of green products was one of the significant drivers

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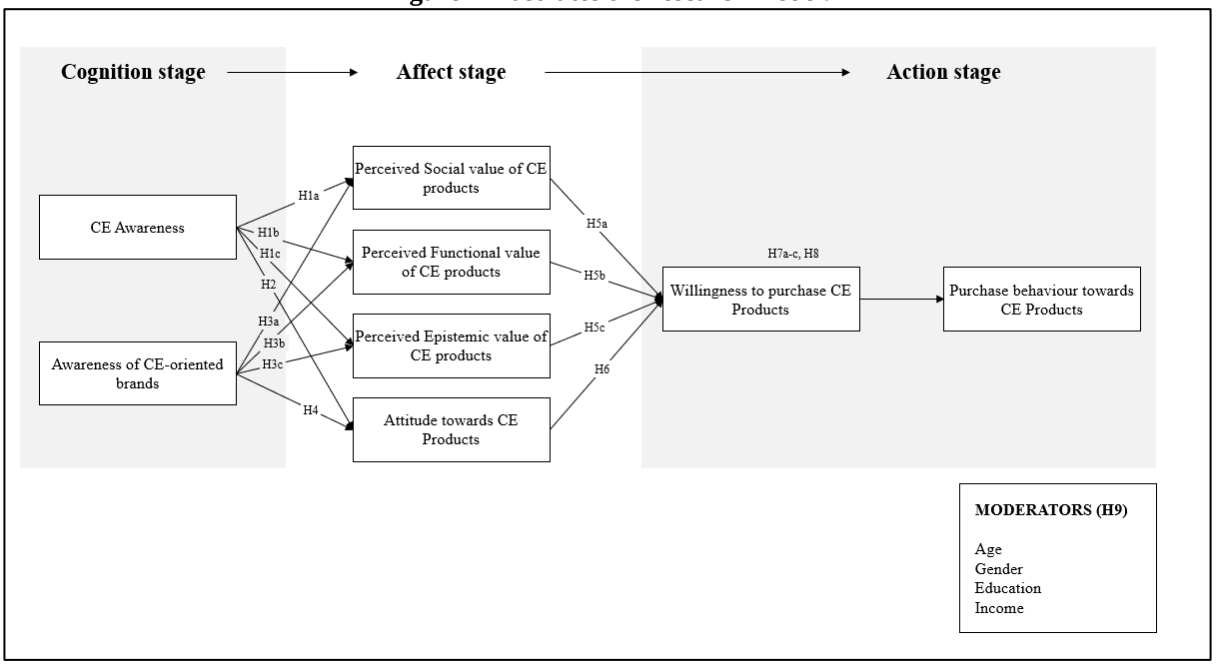
impacting customer attitude, the intention to buy, and purchase behavior (Dilotsothle & Duh, 2021). We, therefore, propose the following hypothesis:

H7a: Willingness to purchase CE products mediates the association of perceived social value and purchase behavior towards CE products
H7b: Willingness to purchase CE products mediates the association of perceived functional value and purchase behavior towards CE products
H7c: Willingness to purchase CE products mediates the association of perceived epistemic value and purchase behavior CE products
H8: Willingness to purchase CE products mediates the association of attitude towards CE products and purchase behavior of CE products

Consumer Demographics and Relationships Between CE Innovation, Cognition, and Consumers' Affection
Socioeconomic status, comprising variables such as age, income, gender, education, etc, has a strong relationship with consumer attitudes and behavior and is often used for market segmentation (Loef, 2002). These variables have also been studied with reference to sustainability for examining relationships between awareness, attitudes, and behavioral consequences in the context of sustainable tourism, renewable energy, green foods, etc. (Ashinze et.al., 2021), which are stages of cognition and affection also as a part of the proposed conceptual model in this study. Studies report both significant and non-significant influences of these on the two stages, including CE contexts (Zhao et al., 2014). Women have been reported to be more environmentally friendly in the awareness and behavior stages (Saifulina & Carballo-Penela, 2017), along with education and income (Zhao et al., 2014). We therefore hypothesize;

H9: Education, income, age, and gender would impact the CE cognition (awareness) and affect stages (perceived values and attitude).

Figure 1 illustrates the research model.



METHODOLOGY

Survey Instrument
The survey instrument was designed using established scales from literature (Mostaghel & Chirumalla, 2021; Wei et al., 2017; Han et al., 2020) and adapted for the CE-oriented innovation context. Insights gained from interviews with senior executives of an automobile company were utilized to refine the awareness scale for CE-oriented brands. The interview transcripts have been provided as Appendix 1. The survey instrument was divided into three sections. The initial section comprised questions to collect information from respondents, i.e., gender, age, educational qualifications, and household income. The second section comprised items to assess respondents' CE awareness (Diddi & Niehm, 2016) and awareness of CE-oriented brands (Huang et al., 2014) to evaluate the cognitive stage. The third section comprised measurement items for respondents' perceived value of CE products (Suki, 2016) and attitude towards CE products (Malik et al., 2017) to assess their affect stage. The last section comprised questions to evaluate the respondents' willingness to purchase CE products (Kazeminia et al., 2016) and their purchase behavior towards CE products (Wei et al., 2017), as part of the action stage. All responses were collected using a 5-point Likert scale, so 1 referred to 'strongly disagree' and 5 indicated 'strongly agree'. A description of the measurement items is presented in Table 2.

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The survey was piloted with two academicians and one practitioner to verify its face and content validity. Specific issues were identified by experts, primarily regarding the terminology used in measures. Additionally, several countermeasures have been developed to mitigate the issue of common method variance (CMV). First, we ensured that the questionnaire items measuring the criterion and predictor variables were divided into sections. Additionally, the use of different scale formats, objective concepts for each item about a construct, and the explanation for each item were ensured to eliminate any ambiguity (Podsakoff et al., 2003). Also, during data collection, we ensured the anonymity of respondents.

Sample Selection and Data Collection

The unit of analysis for the study was the prospective customers of new cars from the urban SEC A tier. A non-random sampling approach was used for sample selection (Hair et al., 2014). Respondents were selected based on a few criteria, first, the respondents should be potential buyers of a new car, second, we excluded those buyers who thought of purchasing used cars, third, only buyers who were considering top car brands (i.e. Maruti, Hyundai India or Tata Motor) in India who were known for their environmentally sustainable products and use of CE practices. Survey data was collected from January to March 2023. Survey data was collected by personal administration of questionnaires at the service stations of chosen companies. A total of 613 completed responses were received out of 1,000 after follow-ups. The respondent profile for the quantitative study is presented in Table 1. The majority of respondents were male (65.4%), over 25 years of age (56.6%), and had an annual income exceeding INR 10,00,000 (54.2%). Out of the total respondents, 61% were graduates or less.

Table 1: Sample Description

Variable	Category	Number	Percentage
Gender	Male	401	65.42%
	Female	209	34.09%
	Other	3	0.49%
Age	25 years or less	266	43.39%
	More than 25 years	347	56.61%
Annual Income	INR 10,00,000 or less	281	45.84%
	More than INR 10,00,000	332	54.16%
Education	Graduation or less	374	61.01%
	Post-graduation	239	38.99%

Data analysis

First, the data were analyzed for potential sampling bias due to non-response, using the Mann-Whitney Test in SPSS (Hair et al., 2014). This test was used to examine the statistically significant differences in respondents' characteristics, e.g., age, income, and education. The results indicated insignificant differences, nullifying the issue of non-response bias. Next, late-response bias was tested by comparing the means of the first 50 and last 50 responses using the paired t-test in SPSS. The results showed no significant difference, thus nullifying the issue of non-response bias in the data. Third, the possibility of common method variance (CMV) was tested with Harman's single-factor test. The results implied that a first factor explained 22.78% (far less than 50%) of the total variance, thus CMV issues were disregarded (Hu & Bentler, 1999). Lastly, the construct reliability and validity were assessed through confirmatory factor analysis (CFA) in AMOS 21. While the construct reliability was evaluated using composite reliability (CR) and Cronbach α, (Hair et al., 2014) (CR>0.7 and α> 0.8 considered acceptable), and item-level reliability was assessed through factor loadings (loading>0.5 acceptable). The convergent validity of constructs was tested using the average variance extracted (AVE), (AVE > 0.5 considered acceptable) (Fornell & Larcker, 1981). Table 2 presents the results of CFA.

Table 2: Construct reliability and validity

Construct	Item description	Mean	Standard Deviation	Factor Loadings (ʎ)	CR	Cronbach α	AVE
CE Awareness	Plants and animals have as much right as humans to exist.	4.520	0.829	0.683	0.835	0.852	0.505
	We are approaching the limit of the number of people that the Earth can support.	4.219	0.997	0.659			
	Humankind is severely abusing the environment.	4.471	0.841	0.794			
	The earth is like a spaceship with only limited room and resources.	4.289	0.982	0.664			
	When humans interfere with nature, it often produces disastrous consequences.	4.364	0.878	0.743			

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Construct	Item description	Mean	Standard Deviation	Factor Loadings (ƛ)	CR	Cronbach α	AVE
Awareness of CE oriented brands	Does the brand that adopts the 3Rs (reduce, reuse, recycle) such as hybrid / electric vehicles, dry wash technology, refurbishing cars, and cars available on rental, play an important role in decision-making?	4.155	0.920	0.725	0.742	0.740	0.591
	Do you consider the brand's environmental impact such as fuel-efficient engines, recyclable packaging material and doorstep service facility to save fuel, while making a decision?	4.189	0.889	0.810			
	Does the brand's reputation on conservation of resources such as repair of minor dents without stripping paint, recycling facility for managing vehicle's end of life, plays an important role while making a decision?	4.12	0.82	0.82			
Perceived Social Value of CE products	Buying the CE product would help me to feel acceptable.	3.489	1.205	0.789	0.888	0.888	0.665
	Buying the CE product would improve the way that I am perceived.	3.450	1.155	0.852			
	Buying the CE product would make a good impression on other people.	3.454	1.173	0.806			
	Buying the CE product would give its owner social approval.	3.385	1.241	0.814			
Perceived Functional Value of CE products	The CE product has consistent quality.	3.670	0.980	0.782	0.897	0.896	0.685
	The CE product is well-made.	3.724	0.970	0.863			
	The CE product has an acceptable standard of quality.	3.871	0.903	0.807			
	The CE product would perform consistently.	3.719	0.982	0.856			
Perceived Epistemic Value of CE products:	Before buying the product, I would obtain substantial information about the different makes and models of products	4.186	0.964	0.797	0.835	0.831	0.561
	I would acquire a great deal of information about the different makes and models before buying the product.	4.165	0.941	0.856			
	I am willing to seek out novel information.	4.046	0.921	0.701			
	I like to search for the new and different products	4.170	0.910	0.621			
Willingness to Purchase CE products	How willing would you be to buy a more expensive CE product?	3.715	0.986	0.712	0.809	0.800	0.587
	How willing would you be to buy a CE product if you knew	3.894	0.895	0.852			

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Construct	Item description	Mean	Standard Deviation	Factor Loadings (ƛ)	CR	Cronbach α	AVE
	the added cost paid for a better environment?						
	How willing would you be to pay more for a CE product as opposed to a 'regular' product?	3.933	0.926	0.727			
Attitude towards CE products	I believe that my use of CE products will benefit society, environment, and the economy.	4.289	0.884	0.784	0.800	0.797	0.572
	I feel good about myself when I use CE products	4.294	0.933	0.723			
	I think CE is a meaningful exercise.	4.439	0.803	0.761			
Purchase behavior towards CE products	I make a special effort to buy CE products in sustainable packages;	3.843	1.072	0.751	0.839	0.839	0.636
	I would switch from my usual brands and buy CE products, even if I had to give up some effectiveness.	3.701	1.076	0.822			
	I have switched to CE products for sustainability related reasons.	3.654	1.124	0.817			

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Further, the divergent validity of the constructs was tested using Fornell and Larcker's (1981) method. This approach involves comparing the square root of the estimated AVE between a pair of constructs with the intercorrelation between the constructs. Table 3 shows the results of discriminant validity. The fitness of the measurement model was judged using model fit indices including the relative chi-square index (CMIN/DF), comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root-mean-square error of approximation index (RMSEA) (Hu & Bentler, 1999). The fit indices of the measurement model i.e., $\chi 2/df = 2.04$, CFI =.96, TLI =.95, RMSEA =.04, and SRMR = .03 were acceptable as per the cut-offs for the fit indices (Hu & Bentler, 1999).

Table 3: Discriminant validity

Construct	Mean	St. Dev	1	2	3	4	5	6	7	8
1. CE awareness	4.132	0.609	0.711							
2. Awareness of CE-oriented brands	3.533	0.586	0.450	0.769						
3. Social value	3.283	0.901	0.217	0.270	0.816					
4. Functional value	3.541	0.734	0.420	0.307	0.564	0.828				
5. Epistemic value	4.131	0.716	0.463	0.440	0.300	0.429	0.749			
6. Attitude toward CE products	4.287	0.638	0.638	0.438	0.405	0.455	0.518	0.756		
7. Willingness to purchase CE products	3.582	0.650	0.459	0.365	0.375	0.536	0.419	0.706	0.766	
8. Purchase behavior towards CE products	3.589	0.751	0.460	0.363	0.531	0.611	0.455	0.575	0.667	0.797

RESULTS

The proposed hypotheses and research model (Figure 1) were empirically examined using SEM procedures (Hair et al., 2014). The fit indices of the structural model (with controls), i.e., CMIN/dF = 2.08, CFI = 0.95, TLI = 0.94, RMSEA = 0.04, SMMR=0.058 showed a good model fit (Shah & Goldstein, 2006). For testing the hypothesis , the path coefficients (β) and corresponding t-values were examined (Hair et al., 2010). Table 4 summarizes the results of direct effect and mediation effect testing. The results showed that CE awareness has a positive and significant impact on perceived social value (β =.18***; t=3.46), functional value (β =.37***; t=7.25), and epistemic value of CE products (β =.34***; t=7.25), with the strongest impact on functional value. Thus H1a, H1b, and H1c were supported. Also, CE awareness positively influences attitude towards CE products (β =.53***; t=9.8), thereby supporting H2. Further, we found a positive direct effect of awareness of CE-oriented brands on social value (β =.25***; t =4.34), functional value (β =.20***; t =3.82), and epistemic value of CE

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product (β =.33***; t =5.67), thereby supporting H3a, H3b, and H3c. Also, the direct effect of awareness of CE-oriented brands on attitude towards CE products was found to be positive and significant (β =.14**; t=2.89) (H4 supported). Further, the results supported the positive impact of perceived social value (β =.07*; t =1.96) and functional value (β =.30***; t =7.19) of CE product (H5a & H5b supported), however, the impact of epistemic value was not supported (H5c not supported). Also, the influence of attitude towards CE products on willingness to purchase CE products (β =.54***; t- =10.04) was found to be significant, hereby supporting
H6.

Table 4: Hypothesis testing

Hyp	**Relationship**			**R^2**	**β**	**S.E**	**t-value**	**Result**
H1a	CE awareness	→	The social value of CE products	14%	0.184***	0.08	3.47	Supported
H1b	CE awareness	→	The functional value of CE products	25%	0.376***	0.07	7.26	Supported
H1c	CE awareness	→	The epistemic value of CE products	33%	0.337***	0.05	6.25	Supported
H2	CE awareness	→	Attitude to CE products	46%	0.529***	0.06	9.85	Supported
H3a	CE brand awareness	→	The social value of CE products	14%	0.251***	0.08	4.35	Supported
H3b	CE brand awareness	→	The functional value of CE products	25%	0.205***	0.06	3.83	Supported
H3c	CE brand awareness	→	The epistemic value of CE products	33%	0.332***	0.05	5.67	Supported
H4	CE brand awareness	→	Attitude to CE products	46%	0.25***	0.05	4.73	Supported
H5a	The social value of CE products	→	Willingness to purchase	56%	0.075*	0.03	1.96	Not supported
H5b	The functional value of CE products	→	Willingness to purchase	56%	0.305***	0.04	7.19	Supported
H5c	The epistemic value of CE products	→	Willingness to purchase	56%	0.051	0.05	1.22	Not supported
H6	Attitude to CE products	→	Willingness to purchase	56%	0.539***	0.05	10.05	Supported
	Age	→	Purchase behavior	54%	-0.031	0.06	-0.88	
	Income	→	Purchase behavior	54%	-0.065*	0.06	-1.86	
	Education	→	Purchase behavior	54%	-0.042	0.06	-1.17	
	Mediation							
	Relationship			**Total Effect**	**Direct Effect**	**Indirect Effect**	**95% Boot CI (Indirect effect)**	
H7a	The social value of CE products	→	Purchase behavior	0.240**	0.229**	0.013	[-.032,.059]	No mediation
H7b	The functional value of CE products	→	Purchase behavior	0.314**	0.196**	0.114***	[.050,.213]	Partial mediation
H7c	The epistemic value of CE products	→	Purchase behavior	0.114	0.101	0.015	[-.027,.059]	No mediation
H8	Attitude to CE products	→	Purchase behavior	0.237**	0.027	0.227**	[.114,.354]	Full mediation

Mediation Analysis

The mediating role of willingness to purchase CE products (H7a-c and H8) was tested through the product of coefficients method based on the bias-corrected bootstrapping approach (Mackinnon et al., 2007) using AMOS 26. The results showed that, with the introduction of 'willingness to purchase' as a mediator, a statistically significant indirect effect (β = 0.114, 95%

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CI: [0.05, 0.21], which does not include zero) exists between the perceived functional value of CE products and purchase behavior. Additionally, the direct effect of the perceived functional value of CE products on the purchase behavior is also statistically significant (0.314**, p-value < 0.05 from bootstrapping, Table 4), thus indicating partial mediation, thereby supporting H7b (H7a and H7c not supported). Instead, the direct effect of attitude toward CE products on the purchase behavior becomes statistically insignificant (0.02, p-value > 0.10 from bootstrapping, Table 4) with the introduction of willingness to purchase as the mediator. Further since, there is a statistically significant indirect effect in this case (0.227**, 95% CI: [.114, .354] does not include zero, Table 4), we find a full mediating role of willingness to purchase on the relationship between attitude to CE products and purchase behavior, thereby supporting H8.

Moderation Analysis

To test the hypotheses on the influence of consumer demographics on CE cognition (awareness) and affect stages (H9), a multigroup moderation analysis (Hair et al., 2014) was conducted (Table 5). For the analysis, groups are created based on three demographic characteristics, i.e., education, income, age, and gender. Table 5 presents the results. The results showed that at the model level, all four characteristics {p-value ($\Delta\chi2$) < 0.10} have a significant moderation effect on the overall model. Furthermore, path-level analyses revealed a strong moderating effect of all four demographic characteristics on the relationships between CE awareness and perceived values and attitudes tard CE products. Also, results showed the strong moderating effect of all four demographic characteristics on relationships between CE-oriented brand awareness and perceived values of CE products. Thus, H9 was supported.

Table 5: Moderation Analyses

		Education			Income			Age			Gender		
Relationship (β)		Graduate or less	Post graduate	Result [p-value ($\Delta\chi2$)]	INR 10,00,000 or less	More than INR 10,00,000	Result [p-value ($\Delta\chi2$)]	25 years or less	More than 25 years	Result [p-value ($\Delta\chi2$)]	Male	Female	Result [p-value ($\Delta\chi2$)]
Model Level		*$\chi2/Df$ = 1.841 CFI = 0.931 TLI = 0.924 RMSEA = 0.037 SRMR = 0.062*		***Education moderates the overall model*** *p < 0.00*	*$\chi2/Df$ = 2.004 CFI = 0.918 TLI = 0.910 RMSEA = 0.041 SRMR = 0.064*		***Income moderates overall model*** *p-value < 0.00*	*$\chi2/Df$ = 1.920 CFI = 0.925 TLI = 0.917 RMSEA = 0.039 SRMR = 0.062*		***Age moderates the overall model*** *p-value < 0.00*	*$\chi2/Df$ = 1.892 CFI = 0.924 TLI = 0.916 RMSEA = 0.038 SRMR = 0.064*		***Gender moderates the overall model*** *p-value < 0.00*
CE awareness	– The social value of CE products	-0.672***	0.184**	*p < 0.01*	0.104	-0.832***	*p < 0.01*	-5	0.217***	*p < 0.01*	0.251***	-0.617**	*p < 0.01*
CE awareness	– The functional value of CE products	-0.37**	0.344***	*p < 0.01*	0.374***	-0.572*	*p < 0.01*	-4.319	0.409***	*p < 0.01*	0.404***	-0.388*	*p < 0.01*
CE awareness	– The epistemic value of CE products	-0.236	0.438***	*p < 0.01*	0.524***	-0.353	*p < 0.01*	-1.361	0.438***	*p < 0.01*	0.336***	0.108	
CE awareness	– Attitude to CE products	-0.009	0.653***	*p < 0.0*	0.679*	-0.3	*p < 0.0*	-1.7	0.614	*p < 0.0*	0.617	0.069	*p < 0.0*

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				1	**	27	*1*	18	***	*1*	***		*1*
CE brand awareness	The social value of CE products	1.11***	0.2**	*p < 0.01*	0.421***	1.203***	*p < 0.01*	5.201	0.334***	*p < 0.01*	0.187**	1.016***	*p < 0.01*
CE brand awareness	The functional value of CE products	1.016***	0.085	*p < 0.01*	0.275***	1.089***	*p < 0.01*	4.747	0.242***	*p < 0.01*	0.157**	0.987***	*p < 0.01*
CE brand awareness	The epistemic value of CE products	0.826***	0.309***	*p < 0.01*	0.275***	0.762**	*p < 0.01*	1.844	0.293***	*p < 0.01*	0.297***	0.541**	*p < 0.01*
CE brand awareness	Attitude to CE products	0.739***	0.224**	*p < 0.01*	0.138**	1.011***	*p < 0.01*	2.325	0.286***	*p < 0.01*	0.175**	0.599***	*p < 0.01*
The social value of CE products	Willingness to purchase	0.084*	0.029		0.157**	-0.034	*p < 0.05*	0.026	0.074		0.071	0.129*	
The functional value of CE products	Willingness to purchase	0.227***	0.397***		0.323***	0.276***		0.257**	0.338***		0.373***	0.138*	*p < 0.05*
The epistemic value of CE products	Willingness to purchase	0.08	-0.006		-0.013	0.085		0.046	0.056		0.003	0.217**	*p < 0.10*
Attitude to CE products	Willingness to purchase	0.577***	0.514***		0.528***	0.611***		0.583***	0.539***		0.548***	0.479***	
Willingness to purchase	Purchase behavior	0.739***	0.727***		0.738***	0.737***		0.689***	0.761***		0.726***	0.711***	

DISCUSSION AND IMPLICATIONS

Our results support the sequential decision-making process suggested by the HOE model. The direct effect of the cognition stage on the affective stage was found to be strong and significant. We found that factors associated with the cognition stage, i.e., CE awareness and CE-oriented brand awareness, had a strong impact on affection stage factors, i.e., perceived values and attitude towards CE products/services (H1a-c, H2, H3a-c & H4 supported). Supporting the findings of numerous previous studies, the results indicate that awareness of the environmental and social benefits of CE products/services positively influences consumers' perception of values associated with the product (Kim et al., 2022). Additionally, our results supported the hypotheses suggesting that CE awareness and CE-oriented brand awareness improve consumers' attitude toward CE products. Corroborating the findings of previous studies on sustainable products, this study reports a strong positive impact of awareness about the environmental benefits of CE products on consumers' attitudes (Hill & Lynchehaun, 2002).

These results offer important implications for companies and marketers. Our study emphasizes the need for creating more awareness about CE-oriented brands as sustainable concepts like CE are perceived as adding value (Ritch, 2020). Environmentally conscious consumers develop affection for CE products as they believe that these products will help them contribute to society and the planet (Wang & Hazen, 2016), serve their utility requirement (Chen & Chang, 2012), and fulfill their quest for knowledge about innovative technologies and products (Basselier et al., 2018). Moreover, companies' efforts to create a sufficient understanding of the distinguishing attributes of CE products associated with environmental benefits can inform consumers' purchase behavior through psychological reactions reflected in their positive attitude. Companies should link the environment-based marketing efforts to beneficial outcomes, not only in terms of environmental benefits but also with regard to how CE products and companies' environmental strategies offer benefits to society at large (social value). Marketers should highlight how consumers who choose CE-oriented automotive brands are contributing to the effort to mitigate the societal and environmental impact of automobile use. When consumers encounter innovative products, they seek knowledge about the product and its technology (Lin et al., 2012). Marketers can use this as an opportunity to create epistemic value for CE-oriented brands. Expert opinion can be utilized as a powerful tool to create awareness and disseminate

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information about how CE products serve environmental interests by utilizing the latest technology, thus fulfilling their need for epistemic value (Aqueveque, 2006).

Further, our investigation into the impact of affection stage factors (perceived values and attitude) on the factors associated with consumers' action stage (willingness to purchase CE products) revealed insightful and valuable findings. Despite considerable support for the impact of perceived values on consumers' purchase intention for sustainable innovative products (Gonçalves et al., 2016; Lin & Huang, 2012), the literature reported mixed findings regarding the individual impact of social, functional, and epistemic values. Some previous studies claimed that social and epistemic values are stronger predictors of consumers' purchase intention (Lin & Huang, 2012). Conversely, a few others have provided empirical evidence showing that functional value has a more positive effect on consumers' willingness to purchase sustainable products (Gonçalves et al., 2016). Our results clarify these doubts in the context of CE products by showing that out of the three, perceived functional value is the best predictor for consumers' behavioral intention (H5b supported, H5a and b rejected). Next, the impact of other affection stage factors, i.e., attitude, on consumers' purchase intention was supported (H6 accepted). In line with numerous previous studies on consumer buying behavior for environmentally friendly products, this study argues that when consumers' evaluation of buying CE products is positive, there is a high probability that consumers will have a strong willingness to purchase them (Dixit & Badgaiyan, 2016). This is an important finding because considerable support exists in the literature for the proposition suggesting that strong purchase intention determines final purchase behavior (Oliver & Lee, 2012; Doanh, et.al., 2021). Thus, attitude is likely to indirectly drive consumers' purchase decisions through a positive attitude, which our analysis validates. We found that functional value and attitude had a direct positive impact on the actual purchase behavior of the consumer, and also an indirect significant impact mediated by willingness to purchase CE-products (H7b and H8 supported). On the other hand, the remaining two affection stage factors (social and epistemic value) failed to affect consumers' purchase behavior (H7a and c rejected) directly or indirectly.

These results imply that consumers' affection for CE-oriented brands is mainly driven by the psychological reactions and functional value perceived to be linked with these products. Consumers are unable to appreciate the social and epistemic values of CE products. Therefore, these values remain ineffective for directly or indirectly triggering purchase actions in the context of CE products. A possible reason for these findings is that, in general, consumers interpret the perceived value of environmentally friendly products in terms of quality, efficiency, and value for money because such products are more expensive than their counterparts (Harahap et al.,2020). Therefore, consumers' action indicators, such as willingness to purchase and purchase behavior, are largely influenced by the functional value of CE products.

From a managerial point of view, overall, these findings suggest the importance of functional value and attitude as triggers for consumers to switch from traditional automotive to CE automotive. Marketers should emphasize the functional value of CE-oriented brands and products in their marketing communications, especially since CE automotives are costlier than fossil-fuel-based automotives. Research on sustainable products has consistently shown that consumers are unwilling to pay premium prices for sustainable products (D'Souza et al., 2007). Therefore, companies must embark on consumer awareness campaigns that inform consumers about the attributes of CE automotive that are linked with other functional aspects such as the quality and utility of the product. Our study indicates that consumers' purchase decisions are likely to be influenced by a trade-off between higher prices and the quality and utility offered by CE products. Consumers must be aware of the potential for favorable environmental outcomes associated with the extra money spent on purchasing CE-oriented automotive brands. Overall, the findings suggest that it is necessary to embark on a consumer awareness campaign that informs consumers about CE-oriented brand attributes, which are linked to perceived values in general, and functional value in particular.

CONCLUSION AND LIMITATIONS

This study highlights the impact of customer awareness of CE and CE-oriented brands on the social, functional, and epistemic values and attitudes toward products and services supporting CE-based innovations. The positive impact of customer awareness of the environmental benefits of CE products on their perceived value is demonstrated. This study addresses an important gap in the literature. To the researchers' knowledge, no study has attempted to investigate the impact of customer awareness of brands initiating CE-based innovations on their perceived value. The paper makes a significant contribution by identifying perceived functional value as a major driver for triggering purchase actions of CE products. The outcome of this study will help automobile companies and marketers align their marketing communication strategies to highlight the functional benefits of products and services that support CE-based innovations.

It is essential to acknowledge the study's limitations. First, the survey instrument was designed using established literature and modified to fit the context of CE-oriented innovations. This modification process can introduce measurement errors and reduce the measurement validity of the adapted constructs. To mitigate this limitation, researchers carefully considered the process of construct adaptation, conducted pilot studies, and validated the adapted constructs in the new context. Furthermore, the limitations inherent to survey-based research also apply to this study. For example, the respondents' opinions are assumed to evolve as the awareness of CE-oriented brands increases. Being a recent concept, the grasp of CE and CE-oriented brands is still immature. Thus, future studies could incorporate longitudinal designs to compare the effects of changes in CE awareness on consumers' purchase behavior towards CE-oriented brands over time, providing additional insights for our study.

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[1] In this study, the words "app" and "platform" are used interchangeably.

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