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A study on factors affecting green tech products adoption; Integrating TAM and TPB

Un estudio sobre los factores que afectan la adopción de productos de tecnología verde; integrando TAM y TPB

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Abstract

The goal of the study is to analyze the influence of the different aspects on users' usage behavior of Green-tech products. A survey-based questionnaire was created and analyzed by using SmartPLS. The Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) are integrated into this study. The shift from technology to green technology has been a "jump" in the right direction. This study analyses the effect of several elements on the usage of intended behavior among users. The study found perceived behavioral control as the most significant factor in the adoption of green tech products. This research will help consumers to better understand their behavior and make decisions accordingly. It would be also helpful for businesses to understand the users' intended behavior and makeshift towards green-tech products to increase their output.

JEL Code: M00, O3, Y1, Y8
Keywords: attitude; green-tech; green technology; TAM; TPB

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Resumen

El objetivo del estudio es analizar la influencia de diferentes aspectos en el comportamiento de uso de los usuarios respecto a los productos de tecnología verde. Se creó un cuestionario basado en encuestas y se analizó utilizando SmartPLS. En este estudio se integran el Modelo de Aceptación Tecnológica (TAM) y la Teoría del Comportamiento Planificado (TPB). El cambio de la tecnología convencional a la tecnología verde ha sido un paso en la dirección correcta. Este estudio analiza el efecto de varios elementos sobre el comportamiento de uso previsto entre los usuarios. El estudio encontró que el control conductual percibido es el factor más significativo en la adopción de productos de tecnología verde. Esta investigación ayudará a los consumidores a comprender mejor su comportamiento y tomar decisiones en consecuencia. También será útil para que las empresas comprendan el comportamiento previsto de los usuarios y realicen una transición hacia productos de tecnología verde para aumentar su productividad.

Código JEL: M00, O3, Y1, Y8
Palabras clave: actitud; tecnología verde; tecnología ecológica; TAM; TPB

Introduction

Green tech products, also known as environmentally friendly or sustainable technology products, have been gaining increasing adoption in recent years (Gawshinde & AL Aflak, 2023). The growing awareness about environmental issues, coupled with advancements in technology, has contributed to the widespread adoption of these products. Globally, sustainable development is a popular issue, and there is a growing push to embrace more eco-friendly methods (Dezdar, 2017). Green tech is presently playing an imperative role in changing the country's economic growth trajectory toward sustainable development and offering an appropriate socioeconomic model that would permit coming generations to live in a safe and healthy environment while staying in balance with nature (Sithan & Lai, 2011).

Green tech is used in recycling as well as compost incineration practices. Recycled materials can be used to make plastics, fertilizers, and fuel (Mejia, 2019). Green tech, such as ways for recycling trash or water in the manufacturing process, may be comprised of the practice (Yacob et al., 2019). The environmental sustainability of manufacturing SMEs is unaffected by the moderation analysis of green technology adoption (Hasan et al., 2023). Green investments by manufacturers always help retailers in terms of lower costs, however, because of the market-expanding influence of green tech, having additional manufacturers capitalize on green tech does not automatically lower total carbon releases (Zhang et al., 2020).

Green buildings consume less energy, water, and trash, and are thus healthier places to live, work, or attend school. Cities can become greener, safer, and more efficient thanks to technology (Mejia, 2019). Governments and their partners can save energy, keep people moving efficiently, and improve safety and quality of life by linking gadgets, cars, and infrastructure across a city (Anser et al., 2020).

Smart Green Cities is a collaborative center that brings together businesses, government, scholars, and the community to develop livable urban environments via evidence-based problem resolution (Dezdar, 2017).

There are various studies that have been done by employing different technological models. But, there are very few researches that combine the different technological models and too in green-tech industries (Bollinger, 2015; Mejia, 2019). Consequently, the goal of the study is to observe how behavioral elements affect the use of green-tech products. To understand the user's perceptions about the components that affect their perspective, a questionnaire was planned and developed.

The remaining part of the document is formatted as follows. The study questions and hypotheses are outlined in section two along with the conceptual framework and research model that were developed based on the literature. The study technique and approach are discussed in section three. Section five contains the data analysis and empirical outcomes. Section six summarises the key findings as well as the hypothesis testing results. The research implications are then explored, as well as how they relate to the literature. The study's inference and potential directions for further studies are provided in the last part.

Research framework and hypotheses

The “Theory of Reasoned Action (TRA) was given in 1980.” But due to some of the limitations of TRA in addressing behaviors on which individuals have partial volitional control, another theory was developed as an extension of the TRA (which was linked to voluntary behavior) called the “Theory of Planned Behavior” (TPB) (Fishbein & Ajzen, 1980). In accordance with TPB Individual behaviour is governed by behavioural intentions, which are the outcome of a person's attitude towards the action (Ajzen, 1991).

The “Technology Acceptance Model” (TAM) is an “information systems theory” given in 1989 that defines how technology acknowledged and used by consumers. One of the most well-known extensions of the TRA is the TAM (Davis, 1989). TAM contends that “perceived usefulness (PU)” and “perceived ease of use” (PEU) affect a person's intention to a system usage, further, real system utilization and actual system use mediated by intention (Davis, 1989).

The integrated model combining the TAM and the TPB is more effective than a single theory as it offers a broader perspective. TAM highlights perceived usefulness and ease of use, while TPB includes social influence and behavioral control, delivering a more complete understanding of adoption behavior (Handarujati, 2024; Rehman et al., 2019).

In this study, we have used the combination of TAM-TPB (Safeena et al., 2013) to better understand user behavior for green-tech adoption. All the TPB variables have an important role in technology adoption. But the most important variables of TPB – “Attitude, Subjective Norm, and Perceived Behavioral Control” are used in the study (Ejigu & Yeshitela, 2024; Wang et al., 2024). From

TAM, two key variables i.e. PU and PEU lead to Attitude with one additional Variable called Environmental Conscientiousness.

Green technology

Green technology, also known as sustainable technology, involves products, systems, and processes designed to reduce or reverse the harmful effects of human activities on the environment (L. Chen et al., 2021; Fiedler, 2018). It encompasses various technologies aimed at conserving natural resources, lowering pollution, and boosting sustainability. Built on the idea of creating long-term environmental solutions, green technology focuses on cutting carbon emissions, enhancing energy efficiency, and minimizing waste. It plays a vital role in addressing climate change and supporting a cleaner, more sustainable future (Alrasheedi et al., 2022; Clark & Doll, 2024; Shishakly et al., 2024).

There are several types of green technology, each addressing specific environmental challenges. Solar panels and wind turbines are well-known renewable energy technologies that produce clean electricity by harnessing natural resources like sunlight and wind without releasing harmful emissions (Ali et al., 2023; Almrafee & Akaileh, 2024). Energy efficiency technologies aim to reduce the energy needed for various tasks, with examples including LED lighting and smart grids that optimize energy distribution (Z. Chen et al., 2022). Additionally, green building technologies focus on constructing eco-friendly buildings using sustainable materials and reducing energy consumption through design features such as improved insulation and natural lighting (Al Mamun et al., 2023; Bharwani & Mathews, 2023).

Environmental conscientiousness

Environmental conscientiousness plays a key role in the green tech products adoption (Duong, 2022; Milford et al., 2021). When individuals and organizations prioritize sustainability and environmental impact, they are more likely to embrace and support greentech solutions (Milford et al., 2021). This conscientiousness drives the demand for environmentally friendly technologies and encourages innovation in the green tech sector. By being environmentally conscientious, individuals and organizations actively seek out green tech products that align with their values and goals (Bergeman et al., 1993; Roberts & Bogg, 2004). They are more inclined to invest in renewable energy systems, energy-efficient appliances, electric vehicles, and other sustainable technologies. Their choices reflect a commitment to reducing carbon emissions, conserving resources, and minimizing ecological harm (Liu et al., 2021). Furthermore, environmental conscientiousness drives advocacy and education efforts, spreading consciousness about the advantages of green tech adoption (Hasan et al., 2023). It encourages collaboration with policymakers, businesses, and communities to create an environment that helps the

development and implementation of green technologies (Milford et al., 2021). The following hypothesis is developed based on the preceding considerations:

H1: Environment conscientiousness has a significant relationship with Attitude towards Green-tech products.

Perceived usefulness

Perceived Usefulness (PU) refers to individuals' beliefs about how adopting Greentech can enhance their lives, address environmental challenges, and bring about positive outcomes (Davis, 1989). The PU of Greentech is a key determinant of individuals' intentions to adopt and use these technologies (Sivo et al., 2018). When individuals perceive Greentech as useful, they are more likely to embrace it. They believe that Greentech can offer tangible benefits like decreased energy consumption, cost savings, improved environmental quality, and increased sustainability (Agyei et al., 2020). Moreover, the perceived usefulness of Greentech extends beyond personal advantages, as individuals recognize the broader societal and environmental benefits associated with its adoption (Svendsen et al., 2013). Factors influencing the perceived usefulness of Greentech include the availability of reliable information, demonstration of successful implementations, ease of use, compatibility with existing infrastructure, and the perceived effectiveness of Greentech in mitigating environmental issues (Chatterjee & Kumar Kar, 2020). Thus, the subsequent hypothesis is framed:

H2: PU has a significant relationship with Attitude towards Green-tech products.

Perceived ease of use

PEU is individuals' beliefs about how easy it is to understand and utilize green technologies. The easier greentech is observed to be, the more likely individuals are to adopt and incorporate it into their lives. According to (Davis, 1989), users are more likely to adopt one program over another that is thought to be user-friendly. When greentech solutions are easy to understand and implement, they lower the barriers to adoption (Meyer & Greve, 2019). Users are more likely to embrace technologies that require minimal effort to learn, operate, and maintain. Intuitive user interfaces, clear instructions, and streamlined processes add to a progressive user experience, facilitating the uptake of Greentech (Chatterjee & Bhattacharjee, 2020). Moreover, the PEU enhances the confidence and self-efficacy of potential adopters. When individuals believe that they possess the necessary skills to utilize Greentech effectively, they are more inclined to embrace it (Wong et al., 2020). Conversely, if a solution appears complex or requires specialized knowledge, it can deter adoption and limit its potential impact (Dilotsotlhe, 2021). Consequently, the assumption proposed is:

H3: PEU has a significant relationship with Attitude towards Green-tech products.

Attitude

The person's "positive or negative" sentiments about completing an activity are characterized by their attitude to the behaviour (Fishbein & Ajzen, 1980). In the context of Greentech adoption, attitudes can influence the willingness of individuals and organizations to embrace and assimilate environmentally friendly technologies and apply them to their daily lives or operations (Gawshinde & AL Aflak, 2023). Positive attitudes towards Greentech are often associated with beliefs in the importance of environmental sustainability, a desire to reduce carbon footprint, and a commitment to responsible resource management (Dilotsotlhe, 2021). When individuals hold positive attitudes, they are more likely to view Greentech as beneficial, valuable, and aligned with their personal values and goals. Conversely, negative attitudes or skepticism can hinder Greentech's adoption (Akinwale & Kyari, 2020). Concerns such as perceived inconvenience, high costs, or doubts about the effectiveness of Greentech solutions may discourage individuals from engaging with or investing in these technologies (Zhang et al., 2020).

Assessing one's thoughts on the consequences of conduct as well as the acceptability of such outcomes helps decide attitude (Ajzen, 1991). It evaluates an individual's level of awareness and interest in green tech in the context of Green-tech products (Anser et al., 2020). Green-tech products and practices are more likely to be adopted by those who have a favorable attitude toward them (Sadaf et al., 2012). The following hypothesis is developed based on the preceding considerations:

H4: Attitude has a significant relationship with behavior intention towards Green-tech products.

Subjective norm

SN is one of the key factor influencing Greentech adoption, referring to one's perceptive of societal stress and expectations regarding the use of environmentally friendly technologies and practices (Nag & Shah, 2022). It reflects the stimulus of social norms, opinions, and the behavior of others on one's decision to adopt greentech solutions. When individuals perceive that important others, such as friends, family, or influential figures, endorse and support Greentech adoption, they are more likely to adopt these technologies themselves (Chen & Chen, 2017). Positive subjective norms create a sense of social approval and conformity, reinforcing the belief that embracing greentech is the right thing to do (Nam et al., 2017). Conversely, if individuals perceive that the people around them are indifferent or skeptical towards greentech, it can create social pressure against adoption. The fear of being judged or ostracized may deter individuals from embracing greentech solutions, even if they believe in their benefits (Saxena & Vij, 2024).

The incentive that a person has to comply with a referent's demands determines the significance of that referent's view (Ajzen, 1991). Previous studies using the TRA and TPB models validated the impact of perceived norms on behavioral intention (Ajzen, 1991; Z. Chen & Chen, 2017). According to (Z. Chen & Chen, 2017) SN considered to be a substantial factor in explaining Green IT adoption. Individuals who believe they are under more societal pressure to practice green tech are more likely to do so. So, the subsequent assumption is framed:

H5: SN has a significant relationship with behavior intention towards Green-tech products.

Perceived behavioral control

"Perceived behavioral control (PBC)" is a vital factor in the adoption of Greentech solutions, referring to a one's opinion of their capability to efficaciously engross in the desired behavior of adopting and using environmentally friendly technologies and practices (Ajjan & Hartshorne, 2008). It encompasses factors such as self-efficacy, perceived resources, and perceived barriers that influence an individual's confidence and control over adopting Greentech. When individuals perceive a high level of control over adopting Greentech, they are more likely to engross in the behavior (Trehan & Sinha, 2020). This includes having confidence in their ability to understand and operate greentech solutions, having access to necessary resources (financial, technical, or infrastructural), and perceiving minimal barriers or obstacles in the adoption process (Nag & Shah, 2022). Conversely, if individuals perceive low control or face significant barriers, such as high costs, lack of knowledge or skills, or limited availability of Greentech options, it can hinder adoption. PBC plays a significant role in overcoming these barriers and empowering individuals to take action (Saxena & Vij, 2024).

The impression of the difficulty of executing an action is referred to as behavioral control. According to TPB, people may control their behavior on a scale ranging from easy actions to those requiring a lot of effort, resources, etc (Ajzen, 1991). Customers' intentions to utilize Green-tech products are influenced by perceived individual control over occurrences. The perception of personal control over events has an impact on customers' intentions to utilize green IT. The subsequent hypothesis is framed based on the preceding considerations:

H6: PBC has a significant relationship with behavior intention towards Green-tech products.

Behavioral intention

Behavioral intention (BI) is a substantial predictor of Greentech adoption and refers to one's readiness to involve in the behavior of adopting and using environmentally friendly technologies and practices (Chao, 2019). It represents the individual's motivation and commitment to take action toward Greentech adoption.

When individuals have a positive behavioral intention toward Greentech adoption, they are more likely to follow through and adopt these technologies (Saari et al., 2021). A favorable intention replicates one's personal beliefs, attitudes, perceived behavioral control, and subjective norms related to Greentech (Han, 2020). Positive attitudes towards Greentech, belief in its effectiveness and benefits, confidence in one's ability to use Greentech solutions, and social influence from important others who support environmentally friendly practices all contribute to a stronger behavioral intention (Tusyanah et al., 2021).

The direct antecedent of behavior is intention (Ajzen, 1991). BI have a positive effect on actual behavior, as per previous studies (Anser et al., 2020; Z. Chen & Chen, 2017). Hence, the hypothesis proposed is:

H7: BI has a significant relationship with use behavior towards Green-tech products.

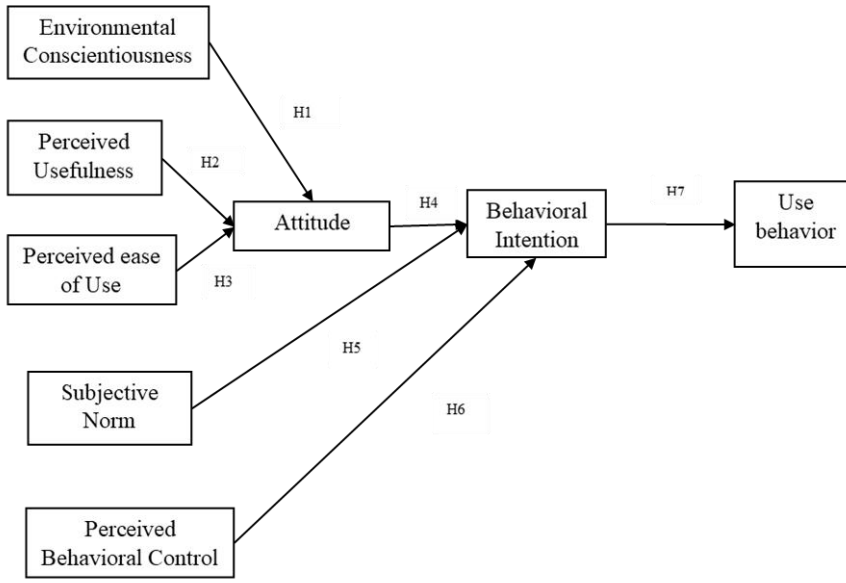

Figure 1. Research Path Model

Research methodology

This study aims to determine the influence of numerous factors on green-tech product usage behavior. To accomplish this objective, the current study uses a quantitative method in the form of a survey. The survey approach is considered the superior choice for assessing and validating the quantitative depiction of participants' perspectives. For this investigation, first the purposive sampling technique is used to target the greentech users then from those random sampling is used (Aregawi et al., 2021). The term "purposeful

sample" refers to a sample that appropriately reflects specific segments of the choosen population (Merriam, 2009). With a total sample of (n=334) persons form Indian region, the participants in this study were chosen from among those who use green-tech products. Integration of TAM & TPB has been done in this study. The questionnaire's items evaluated by "7-point Likert scale (Strongly Disagree = 1 to Strongly Agree = 7)". SmartPLS software was used to analysis the data.

Results

Demographic profiles

The demographics have well defined in Table 1. Demographic profiles included gender, age, educational level, as well as income. This research included those who use green-tech products. The demographic results show that the majority of males (64.97 percent) are involved in green tech adoption. Individuals between the age of 30-40 (48.2 percent) are more included in green tech adoption. Individuals with high education levels are more influenced to adopt green tech with (45.21 percent) of post-graduation individuals. The mainstream green tech users have incomes ranging from rupee 250,000 to 500,000 (32.34 percent).

Table 1
Demographics (n=334)

Demographics	Category	Frequency	%
Gender	Male	217	64.97
	Female	117	35.03
Age	Below 30 years	106	31.73
	30-40	161	48.2
	40-50	59	17.66
	50 and above	8	2.41
Education Level	Below graduation	52	15.57
	Graduation	119	35.63
	Post-graduation	151	45.21
	Professionals	12	3.59
Income (Annual)	Less than 2,50,000	57	17.07

2,50,000-5,00,000	108	32.34
5,00,000-10,00,000	89	26.65
More than 10,00,000	80	23.94

Measurement model assessment

The study applied internal reliability and convergent validity evaluations of the framework to examine reflective model specifications. Table 2 shows all values of factor loading, "Average Variance Extracted (AVE)", "Composite Reliability (CR)" are between the threshold limits (Hair et al., 2019). "Factor loadings (FL)" values are above the range of 0.708 and below the mentioned range of 0.95. All the AVE values mentioned in Table 2 are above the threshold limit of 5. The CR has three ranges of acceptance and rejection of the items, this study ranges between the middle range of CR which shows that all the items in Table 2 are between the acceptable limits. Table 2 data used in the analysis. The second item of EC and the last item of PBC were erased because they surpass the verge bound of 5 on the AVE (Gautam, Kumar, Dahiya, et al., 2024). Hence, reliability is not a concern in the present study.

Table 2
Measurement Model

Dimensions	Items	FL	Cronbach's Alpha	Rho_A	CR	AVE
Attitude (ATT)	"ATT1"	0.823	0.766	0.768	0.865	0.681
	2	0.794				
	3	0.859				
Behavioural Intention (BI)	"BI1"	0.844	0.726	0.725	0.846	0.647
	2	0.803				
	3	0.764				
Environment Consciousness (EC)	EC1	0.746	0.866	0.876	0.909	0.716
	2	0.9				
	3	0.85				
	4	0.88				
"Perceived Behavioral Control" (PBC)	PBC1	0.899	0.826	0.826	0.898	0.747

	2	0.765				
	3	0.92				
"Perceived Ease of Use" (PEU)	"PEU1"	0.815	0.786	0.786	0.875	0.7
	2	0.843				
	3	0.851				
"Perceived Usefulness" (PU)	PU1	0.928	0.874	0.888	0.923	0.799
	2	0.859				
	3	0.893				
Subjective Norm (SN)	"SN1"	0.875	0.825	0.836	0.895	0.739
	2	0.824				
	3	0.88				
Use Behaviour (UB)	"UB1"	0.847	0.726	0.742	0.845	0.647
	2	0.728				
	3	0.832				

Discriminant validity can use two approaches i.e. "Fornell-Lacker criteria" and "Heterotrait-Monotrait ratio criteria" (HTMT) (Gautam & Kumar, 2023). HTMT method were used to check the "discriminant validity". The standards in bold in Table 3 show that the variance of other dormant constructs is smaller than the variance of latent concepts for their measure. The most recent standard states that all HTMT values must be less than 1, as recommended by the HTMT inference technique, but to be even stricter, the HTMT Ratio of Correlations has an acceptable value range of 0.85 to 0.9 (Henseler et al., 2015). The present study exceeds the limit of 0.85 in a few constructs but all the values are below the permissible value of 0.9 (Gautam, Kumar, & Dahiya, 2024).

Table 3
Discriminant Validity (HTMT)

	ATT	BI	EC	PBC	PEU	PU	SN	UB
ATT	0.826							
BI	0.661	0.804						
EC	0.412	0.394	0.846					

PBC	0.748	0.708	0.552	0.864				
PEU	0.471	0.38	0.321	0.595	0.837			
PU	0.444	0.347	0.25	0.519	0.758	0.894		
SN	0.334	0.345	0.212	0.319	0.15	0.172	0.86	
UB	0.694	0.738	0.534	0.912	0.538	0.469	0.312	0.804

Assessed relationship

SmartPLS 3.0 employs the SmartPLS Algorithm function approach known as bootstrapping to determine the standardized beta (b) of route coefficients (Hair et al., 2019). A minimum of 0.01 and a maximum of 0.05 is required for the P-Value. All of the standardized beta and P-values in the current study are between the fixed limits. The values of the relations are H1 (b: 0.289, p.00), H2 (b: 0.201, p.006), and H3 (b: 0.226, p.004), all of these show a substantial influence on attitude towards green tech adoption. The values of the relations are H4 (b: 0.277, p.00), H5 (b: 0.103, p.008), and H6 (b: 0.468, p.00), all of which show a substantial influence on behavioral intention towards green tech adoption. The values of the relation H7 (b: 0.738, p.00) also show a substantial influence on user behavior towards green tech adoption. All of the hypotheses from the study are supported, including "H1 (Environment Consciousness -> Attitude), H2 (Perceived Usefulness -> Attitude), H3 (Perceived Ease of Use -> Attitude), H4 (Attitude -> Behavioural Intention of Greentech products and Services), H5 (Subjective Norm -> Behavioural Intention of Greentech products and Services), H6 (Perceived Behavioral Control -> Behavioural Intention of Greentech products and Services), and H7 (Behavioural Intention of Greentech products and Services -> Use Behaviour)". Figure 2 shows the item's path coefficients, outer loadings, and R^2 values.

Table 4
Path Coefficients Results

Hypothesis (H)	Paths	Standardized Beta	Standard Deviation	T Statistics	P Values	Results
H1	Environment Consciousness -> ATT	0.289	0.051	5.639	0	Yes
H2	PU -> ATT	0.201	0.073	2.749	0.006	Yes
H3	PEU -> ATT	0.226	0.079	2.868	0.004	Yes

H4	ATT -> BI of Greentech products	0.277	0.067	4.106	0	Yes
H5	SN -> BI of Greentech products	0.103	0.039	2.667	0.008	Yes
H6	PBC -> BI of Greentech products	0.468	0.067	6.938	0	Yes
H7	BI of Greentech products -> Use Behaviour	0.738	0.027	27.503	0	Yes

Table 5
Questionnaire Items

Constructs	About		Items	Source
Environment Consciousness	Conscientiousness is characterized by a high level of self-discipline, responsibility, eagerness to accomplish, and adherence to rules and standards.	EC 1	Try my best	(Sun et al., 2018)
		2	Carry out my promise	
		3	Sometimes I can't be reliable	
		4	Always prepared to use	
Perceived Usefulness	"The degree to which a person feels that utilizing a certain system will improve his or her job performance is described as perceived usefulness."	PU1	Save money	(Albayati et al., 2020; Belanche et al., 2019)
		2	Help in sustainable development	
		3	Useful for environment	
"Perceived Ease of Use"	"Perceived ease of use refers to the degree to which a person feels that utilizing a specific technology would be painless."	1	Easy to use	(Belanche et al., 2019; Venkatesh et al., 2003)
		2	"Easy to learn"	
		3	"Easy to get new tools"	
"Attitude"	The "individual's positive or negative sentiments" about completing work are	AT1	"Like the idea"	(Grabner-Kräuter & Faullant, 2008; Pwc, 2019)
		2	"Pleasant experience"	

	characterized as attitude toward the behavior.	3	Prefer to work by using green tech products	
"Subjective Norm"	"A subjective norm is described as an individual's assessment of whether or not key individuals in their lives believe the conduct should be carried out."	SN1	People important to me	(Albayati et al., 2020; Mazambani & Mutambara, 2019)
		2	Persons influence my behavior	
		3	Higher status in society	
"Perceived Behavioral Control"	The impression of the difficulty of executing an action is referred to as behavioral control.	PBC1	Confident in my ability	(Kandil, 2018; Gupta et al., 2020)
		2	If I wanted to, I could buy	
		3	It is mostly up to me whether or not to buy	
Behavioral Intention	"The motivational factors that influence a specific action."	BI1	Intend to use	(Albayati et al., 2020; Pwc, 2019)
		2	Always try to use	
		3	I forecast that I will use	
Use Behavior	Use behavior is the actual behavior of the person.	UB1	Confirm to use	(Gholami et al., 2013; Kandil, 2018)
		UB2	Commit to adopt	
		UB3	Firmly believe frequently in use	

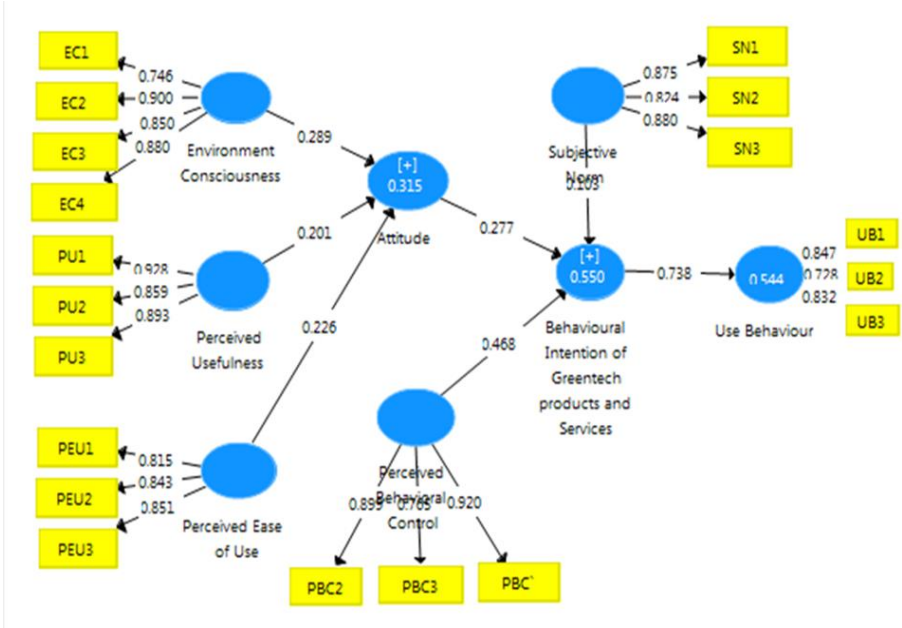

Figure 2. Structural Model Assessment

Discussion and implications

This study examined the elements that affect users' behaviour in adopting green-tech products by combining the TAM with the TPB. The results, derived from a survey and data analysis utilising SmartPLS, offer significant insights into the factors influencing user adoption of green technology. The study specifically identified perceived behavioural control as the most significant factor influencing the intention to use green-tech products, demonstrating the importance of individuals' perceived capability to engage in environmentally conscious actions (Dilotsotlhe, 2021).

The results of this study align with the existing research, reinforcing the substantial of main factors influencing the adoption of Greentech. The main factors of TAM perceived ease of use, perceived usefulness and environmental consciousness have significance effect on attitude which in turn has substantial impact on BI which align with the results past research emphasising on the significance affect or PU, PEU, Environmental consciousness on attitude and importance of attitude in shaping the behavioural intentions (Haryanti & Subriadi, 2022; Li et al., 2023; Rehman et al., 2019) hence H1, H2, H3, and H4 are supported.

Subjective norms' impact on behavioural intention (H5) is in line with earlier research that incorporated the Theory of Planned Behaviour (TPB), which emphasises how societal pressures and

expectations influence people's adoption of green technologies (Gawshinde & AL Aflak, 2023; Leong et al., 2024). Similarly, the large effect of perceived behavioural control (H6) supports previous findings that people's intention to embrace sustainable technologies is significantly predicted by their confidence in their capacity to act in an environmentally beneficial manner (Mukherjee et al., 2023; Sharma et al., 2024). Furthermore, this study extends the literature by identifying the transition from intention to actual behaviour (H7) as a critical link underscoring the gap between intention and action in green-tech adoption (Arli et al., 2018; Bhutto et al., 2019; Vij & AL Aflak, 2023).

These results not only align with but also enhance existing frameworks by providing a comprehensive view of behavioural features influencing sustainable technology adoption. This study offers a thorough framework by analysing different factors, including perceived usefulness, perceived ease of use, subjective norms, and attitudes, to understand the motivations and obstacles associated with the adoption of green technologies. The findings can assist companies in formulating strategies to promote the uptake of sustainable products, ensuring their initiatives resonate with consumers' environmental priorities.

Limitations and future area of study

While this study provides useful insights, there are several limitations that should be addressed. Firstly, the research is quantitative in nature, so future studies could incorporate qualitative methods to gain deeper insights into the subject. The study also focuses on a limited geographic region, which means the findings may not be applicable to larger populations with diverse ethnic and economic backgrounds. Future research could explore cross-cultural comparisons to understand how different social norms and values influence green technology adoption. Additionally, although perceived behavioral control was identified as the most significant factor, future studies should consider other factors, such as financial incentives, government policies, and environmental awareness efforts. Including these external factors could offer a more comprehensive understanding of the complexities involved in adopting green technologies. Moreover, longitudinal research could provide insights into how people's attitudes and behaviors evolve over time, especially as green technologies continue to improve and become more accessible.

Conclusions

This study provides an integrated insight into the factors that affect user behavior in adopting green-tech products by incorporating the Technology Acceptance Model and the Theory of Planned Behavior. The results emphasize the central role of perceived behavioral control as the strongest predictor of intention to

use green technology, which emphasizes the importance of one's perceived ability to engage in environmentally considerate actions.

These findings have important implications for businesses and policymakers in pursuit of fostering the diffusion of green technologies. In this sense, organizations could develop suitable plans to foster green-tech adoption by targeting the above motivational factors and perceived barriers. Transitioning from conventional technology to green technology is now the need of the hour in order to achieve sustainability, and this research brings forward a solid framework guiding the efforts of realignment with consumer behavior in environmental priorities.

Furthermore, the results can assist consumers in contemplating their actions, enabling them to make knowledgeable choices when selecting environmentally friendly technologies. Businesses can utilise this insight to refine their product offerings and marketing approaches, thus promoting a more sustainable marketplace. This study enhances both scholarly discourse and real-world practices by providing practical insights into fostering the adoption of green technology, benefiting both consumers and businesses in their pursuit of sustainability.

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