

Recycled products and environmental sustainability: Effects of psychological risk and the role of social media marketing on consumer purchase behaviour

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Abstract

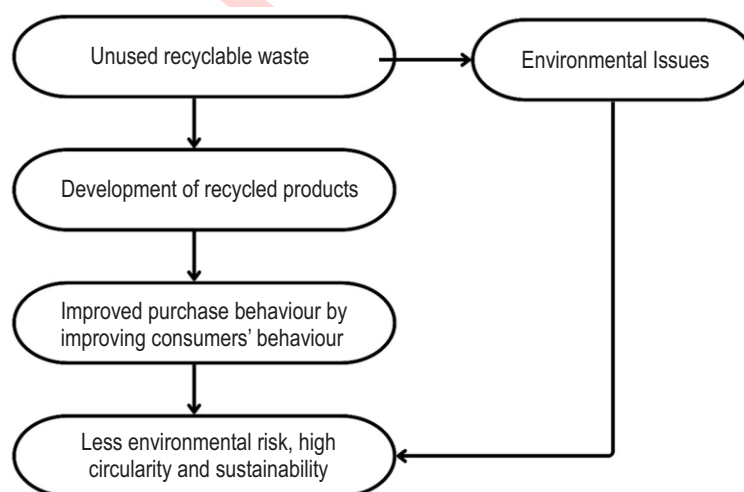
Aim: This study investigates the role of social media marketing (SMM) in reducing psychological risk (PR) and fostering purchase behaviour (PB) towards recycled products, thereby contributing to waste reduction, environmental protection, and the realization of United Nations Sustainable Development Goal 12 on responsible consumption and production.

Methodology: An empirical study was carried out with 369 respondents. An online survey was conducted using social media marketing as an independent variable, psychological risk as a mediating variable, and purchase behaviour of recycled products as a dependent variable.

Results: The effect of mediation of PR on the relationship between SMM and PB of recycled products was tested. The total impact of SMM on PB for recycled products was found to be significant. The specific indirect effect was also significant with the inclusion of PR as a mediator ($\beta = 0.284$, $t = 8.132$, $p = 0.000$).

Interpretation: The findings of the study indicate that psychological risk fully mediates the relationship between social media marketing and purchase behaviour.

Key words: Environmental sustainability, Psychological risk, Purchase behaviour, Recycled products, SDG, Social media marketing



Introduction

The environmental degradation caused by the greenhouse effect has become a critical global issue affecting the polar region and mountain terrains (Elshout *et al.*, 2023), this degradation is further aggravated by black carbon deposition (Zainab, 2024), unsustainable agricultural practices (Jocein and Frederick, 2023) mining activities and deforestation (Bataya, 2024). Globally, more than 60% of greenhouse emission and 50-80% of usage of land, material and water is accounted by households (Ivanova *et al.*, 2016). The environmental crisis is further exacerbated due to overutilization of natural resources, leading to severe resource constraints coupled with environmental pollution (Amer, 2024). These challenges result from rising global population but are significantly influenced by unsustainable consumption patterns adopted by the consumers (Chalkley, 1997). The United Nations introduced 17 sustainable development goals (SDGs) in 2015, with SDG 12 explicitly emphasized on sustainable consumption, production, and resource utilization (Forcadell and Aracil, 2019) by reducing waste, efficient use of natural resources, adopting sustainable business practices, and cutting food waste.

The change to a circular economy, grounded in the principles of 10R Framework, which includes recycling, refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose and recover, offers a viable solution for mitigating resource constraints (Tapia., 2021; Mostaghel and Chirumalla, 2021) and prevent further environmental degradation. This approach seeks to decouple economic growth from resource depletion. Producing goods from virgin materials elevates the carbon footprints, but using recycled materials reduces it significantly (Gabisa, 2023). For example, aluminium products manufactured from recycled material use only 5-6% of the energy, compared to conventional manufacturing process (Al-Alimi *et al.*, 2024). Studies indicate that manufacturing sector using recycled materials is still in nascent state, hindered by uncertain supply of recyclable materials, technological limitations and inconsistent quality standards (Nappi and Souza, 2015). While manufacturers create products from recycled materials, their success depends on consumer behaviour, which determines both loop closure and market viability (Polyporis *et al.*, 2022). Therefore, it is imperative to assess the factors influencing the PB, decision-making processes, and underlying drivers that shape their purchasing decisions regarding recycled products (Jin and Su, 2024), which latently contribute to saving our environment.

Several studies have reiterated that awareness about the environment is high. (Carvalhais *et al.*, 2025; Chumachenko *et al.*, 2024). Enhanced environmental awareness among consumers has led us to believe that they can reduce ecological issues by changing their consumption habits and supporting green purchase (Penz and Hofmann, 2021). Many reasons, such as attention, mindfulness, awareness, moral norms, ethics, ideologies, and self-esteem, can influence consumers to exhibit eco-friendly behaviour (Wiernik *et al.*, 2018; Hosta and Zabkar,

2021). Despite these, the significant barriers for purchase of recycled products exist such as pre-purchase consumer scepticism (Corsini., 2024) absence of government policies promoting circular economy, unwillingness to pay a higher price for recycled products (Singh *et al.*, 2023). Many times, consumers perceive products made from recycled materials to be inferior than virgin products (Essoussi and Linton, 2014) due to performance risk, financial risk (Akkucuk, 2011), health risks, sanitary risks, aesthetic risks (Testa *et al.*, 2021), perceived contamination risks (Meng and Leary, 2021), psychological and social risks (Jacoby and Kaplan, 1972), the emotion of disgust and consumer's self-image (Kim *et al.*, 2021).

Role of Social Media Marketing in Environmental Awareness

SMM usage has gained momentum, and about 4.41 billion people are predicted to use social media by 2025 (Tankovska, 2022). Studies have proved that SMM enhances consumers' environmental knowledge (Rahman, 2017), positively influences and stimulates green consumption among consumers (Xie *et al.*, 2023). Social norms and social media efficiently influence the purchasing of green products (Sun *et al.*, 2020). The difference between the purchase intentions and the actual PB of recycled products, as elucidated in studies by Zhang *et al.* (2021) points to a complex interaction of many factors. Perceived risks include concerns about product quality (Sun *et al.*, 2018), value for money, aesthetic appeal, and PR, including social stigma and fear of negative evaluation by others (Testa *et al.*, 2021) and the concern about self-image. Addressing this PR is essential for bridging the gap between consumers' purchase intentions and PB. This will ensure greater acceptance of products created from recycled materials and drive people to buy them.

The existing literature review identifies PR and social acceptance as a critical barrier for purchasing recycled products. However, more research must be conducted on mitigating these PRs to reduce the gap between consumers' purchase intentions and PB. Trustworthy influencers and peers sharing authentic information can guide individuals to make better decisions. (Kaplan and Miller, 1987). There is an opportunity to explore the potential of SMM, specifically through Instagram, to mitigate the PR and convert the green intentions of consumers into real-time purchases. This study investigates the factors that can help convert consumers' intentions into real-time purchases through effective marketing strategies (Laroche *et al.*, 2001), leveraging the power of SMM, particularly Instagram.

This study uses the Hierarchy of Effects theory (Fig. 1) (Lavidge and Steiner, 1961). The theory suggests that the consumer moves through stages before purchase like exposure, awareness, evaluation associated with cognitive and emotional shifts, forming positive attitude towards ecofriendly recycled products, leading to purchase intention and action. In this study, the Author proposes to find the effect of SMM initiatives like Influencer engagement (IE), Ad-campaign (AC), user generated

content (UGC), Social proof (SP), and Interactive engagement(IENG) and their impact on PR, thereby positively mediating the PB of the recycled products (Fig. 2).

Influencers in social media (Table 1) are characterized by many followers, which can be leveraged to influence certain brands and products (Bastrygina et al., 2024). Ad campaigns conducted through digital platforms have become vital in company's marketing due to its ability to reach consumers more effectively (Kim and Eunju, 2012). Social media, help consumers to share their experiences through videos, pictures, stories, and product reviews. WOM helps buyers to obtain information (Mayzlin and Chevalier 2003), thus reducing the PR. It also acts as a platform to express their thoughts freely (Kim and Ko, 2010). According to social proof theory, people draw references from others' actions (Cialdini, 1984). In this digital era, e-WOM, which spreads through reviews and ratings, acts as a SP (Amlee and Bui, 2012). IE in social media influences all the stages of purchase decisions, Interactive content such as polls, quizzes, and UGC help consumers evaluate the options; customer testimonials, reviews, and ratings reassure potential buyers and help organizations provide personalized messages to potential customers. (Kumar and Mirchandani, 2012).

Jacoby and Kaplan (1972) defined PR as the 'potential for a product or service to have a negative impact on the consumer's peace of mind or self-perception, resulting in anxiety, discomfort or emotional distress. The reason behind that may be ineffective 4Ps, perceived value of green products, and PR. Consumers may experience PR due to negative emotions attached to recycled material in terms of contamination risk and a feeling of disgust (Meng and Leary, 2021), causing worry and regret in purchasing and using that product. Recycled products also indicate lower status; hence, some may worry about judgment by others, indicating social risk (Testa et al., 2021; Kim et al., 2021).

Materials and Methods

A quantitative survey was conducted through a cross-sectional research design using a structured questionnaire, circulated online. The study was descriptive, non-probability purposive sampling method was adopted since only Instagram users were taken for the study. The study was conducted by sending an online survey amongst the Instagram users. Out of 600 Instagram users, 412 responded and 369 were usable. Smart PLS was used for analysis. A structured questionnaire was used to find the impact of SMM on consumers' PB and how SMM helps to reduce PR and affect the PB of recycled products. The questionnaire had four sections. Section I was designed to collect the basic demographic details of the respondents, and section II, was designed to find the impact of SMM methods on consumer PB, the independent variable. Five constructs were taken as independent variables, and five items were brought under each construct. Section III contained five items under PR, the mediating variable, and section IV contained four items about PB of recycled products, the dependent variable. The scales were

adopted from previous research to ensure the steadiness of the questionnaire. Partial Least Square Model and Structural Equation Modelling (PLS-SEM) were used to carry out the test

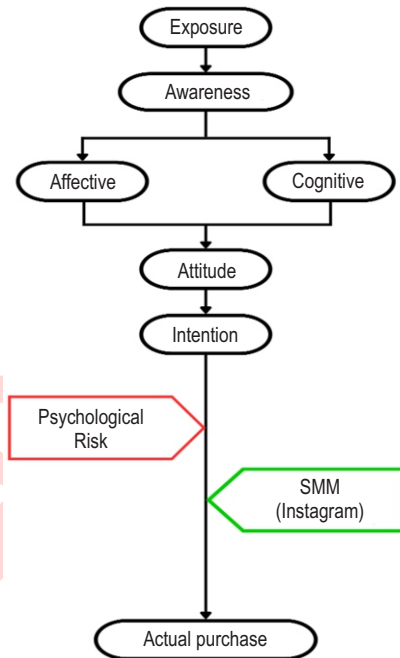


Fig.1: Theory of Hierarchy of Effects (Lavidge and Steiner, 1961), with psychological risk mitigated by Social Media Marketing: This figure illustrates how psychological risk in consumer decision-making is mitigated by SMM (Instagram). It traces the consumer journey from exposure and awareness through cognitive and affective stages, attitude formation, and intention, leading to actual purchase.

Table 1: List of hypotheses tested in the study

Hypothesis
(H1 a): IE on Instagram significantly improves the PB of recycled products.
(H1 b): IE on Instagram significantly reduces the PR.
(H2 a): Instagram AC significantly improves the PB of recycled products.
(H2 b): Instagram AC significantly reduces the PR.
(H3 a): UGC on Instagram significantly improves the PB of recycled products.
(H3 b): UGC on Instagram significantly reduces the PR.
(H4 a): SP on Instagram significantly improves the PB of recycled products.
(H4 b): SP on Instagram significantly reduces the PR.
(H5 a): IENG on Instagram significantly improves the PB of recycled products.
(H5 b): IENG on Instagram significantly reduces the PR.
(H6): Reduced PR leads to improved PB of recycled products.

Note: IE = Influencer engagement, AC = Ad-campaign, UGC = user generated content, SP= Social proof, IENG = Interactive engagement, PR = Psychological risk, and PB = Purchase Behaviour

Table 2: Demographic profile of Instagram users

Demographic Profile	Category / Characteristics	Percentage (%)
Age	18Yrs-30Yrs	63.15
	30.1Yrs-45Yrs	22.49
	45.1Yrs-60Yrs	11.93
	Above 60 Yrs	2.43
Gender	Female	34.69
	Male	65.31
Education	Schooling	0.27
	Diploma	0.81
	Undergraduate	16.53
	Postgraduate	77.52
Occupation	Doctorate	4.87
	Student	58.53
	Self-Employed	4.87
	Employed	35.32
Family Income (Per Month)	Retired	1.28
	Below Rs. 10000	5.42
	Rs.10001-Rs.29999	8.13
	Rs.30000- Rs.49999	14.91
	Rs.50000- Rs.69999	19.24
User of Social Media Platform	Rs. 70000 and above	52.30
	Facebook	54.30
	Instagram	75.78
	WhatsApp	99.55
	Snapchat	23.31
	Telegram	32.28
	YouTube	73.54
Others	10.31	

Table 3: Measurement model assessment

Constructs	Loadings	Cronbach's Alpha	CR (rho-a)	AVE
Influencer engagement (IE)	749-850	0.81	0.82	0.52
Ad-campaign (AC)	717-750	0.71	0.71	0.48
user generated content (UGC)	759-823	0.68	0.69	0.42
Social proof (SP)	708-883	0.82	0.84	0.54
Interactive engagement (IENG)	746-821	0.81	0.81	0.52
Psychological risk (PR)	761-807	0.79	0.79	0.48
Purchase Behaviour (PB)	822-871	0.87	0.86	0.61

using Smart PLS 4.0. The indicator variables with low loading <0.70 (Geffen and Straub, 2005) were removed from the measurement model. Table 2 indicates the demographic characteristics of respondents in various categories, viz. age, gender, education, occupation, family income (per month), and users of social media platforms. Among 369 responses, 63.15% of the respondents were in the age group of 18 to 30 years. Male participants account for 65.31%, and 34.69 % were female participants. 77.52% of the respondents were postgraduates; WhatsApp and Instagram were the most preferred SMM platforms.

Measurement Model: The Measurement model indicates the relationship between the construct and the indicator variables. Internal consistency, reliability, convergent, and discriminant

validity were performed to evaluate the constructs and hypothesis (Brown, 2015). Cronbach alpha varies from 0.75-0.84, and Composite reliability varied from 0.76-0.89, indicating acceptable internal consistency and robust reliability, respectively. According to Nannault and Bernstein (1994), the loadings of the observed variables within the constructs must be greater than 0.7. The loadings of the observed variable, as indicated in Fig. 3, for the constructs IE, AC, UGC, SP, IENG, PR, and PB, were greater than 0.7, suggesting good convergent validity. As indicated in Table 3, the average variance index also revealed that the observed variable explained at least 50 % of the variance in latent constructs, measuring the convergent validity. Fornell-Larcker Criterion was used to evaluate discriminant validity using the average variance extracted (AVE). The square root of AVE for

Table 4: Measurement of discriminant validity established on Fornell-Larker Criterion

Constructs	AC	IE	IENG	PB	PR	SP	UGC
Ad-campaign(AC)	0.61*						
Influencer engagement(IE)	0.57	0.72*					
Interactive engagement(IENG)	0.58	0.62	0.72*				
Purchase Behaviour (PB)	0.55	0.65	0.59	0.78*			
Psychological risk (PR)	0.48	0.66	0.66	0.78	0.69*		
Social proof (SP)	0.58	0.61	0.79	0.53	0.61	0.73*	
User generated content (UGC)	0.47	0.56	0.66	0.38	0.52	0.58	0.65*

Note: * AVE is shown in asterisk at the diagonal

Table 5: Measurement of discriminant validity established on Hetero trait- Mono trait (HTMT) ratio

Constructs	AC	IE	IENG	PB	PR	SP	UGC
Ad-campaign (AC)							
Influencer engagement (IE)	0.57						
Interactive engagement (IENG)	0.58	0.62					
Purchase Behaviour (PB)	0.55	0.65	0.59				
Psychological risk (PR)	0.47	0.66	0.66	0.77			
Social proof (SP)	0.58	0.62	0.80	0.53	0.60		
user generated content(UGC)	0.47	0.56	0.66	0.38	0.51	0.61	0.61

Table 6: Structural Equation Model Results-Total Effect

Hypothesis	Path	Coefficient	t- statistics	P values	R ²	Conclusion
H1 a	IE → PB	0.35	6.52	0.00*	0.52	Accepted
H2 a	AC → PB	0.16	3.55	0.00*		Accepted
H3 a	UGC → PB	-0.05	1.03	0.30		Rejected
H4 a	SP → PB	0.08	1.25	0.21		Rejected
H5 a	IENG → PB	0.21	3.30	0.00*		Accepted
H1 b	IE → PR	0.29	5.67	0.00*	0.40	Accepted
H2 b	AC → PR	0.04	0.91	0.36		Rejected
H3 b	UGC → PR	0.06	1.31	0.19		Rejected
H4 b	SP → PR	0.15	2.22	0.02*		Accepted
H5 b	IENG → PR	0.23	3.48	0.00*		Accepted
H6	PR → PB	0.44	9.29	0.00*		Accepted

*P < 0.05, Results are significant. Note: IE = Influencer engagement, AC = Ad-campaign, UGC = user generated content, SP= Social proof, IENG = Interactive engagement, PR = Psychological risk, and PB = Purchase Behaviour

each construct was greater than the correlation with other constructs, as evident in the analysis (Table 4). Henseler and Sarsted (2009) suggested a threshold of HTMT ratio of 0.90 to ensure the discriminant validity, as shown in Table 5.

Purchase Behaviour (PB): The results of the structural model are presented in Table 6. The study proposed the conceptual framework to test the relationship between SMM variables, Influencer endorsement (IE), Advertising campaign (AC), User-generated content (UGC), Social proof (SP), Interactive engagement (IENG), and PB of recycled products which could positively contribute to the environment. IE and AC significantly

impact Purchase Behaviour with beta coefficients 0.13, 0.11, respectively. The results indicate that the impact of UGC and SP on purchase behaviour was insignificant, as p-values were greater than 0.05. The hypotheses H1 a, H2 a, and H5 a were accepted, while H3 a, H4 a, were rejected.

Psychological Risk (PR): The study also attempted to test the relationship between IE, AC, UGC, SP, IENG, and PR. IE, SP, and IENG had a significant impact on PR with beta coefficients and p-values ($\beta=0.29, p=0.00$), ($\beta=0.15, p=0.02$), and ($\beta=0.23, p=0.00$), respectively. The results indicated that the impact of AC ($\beta=0.04, p=0.36$) and UGC ($\beta=0.06, p=0.19$) on PR was insignificant, as

Table 7: Specific Indirect Effect–Mediation Effect after bootstrapping

Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ((O/STDEV))	P values	Conclusion
IE -> PR -> PB	0.13	0.13	0.02	4.95	0.00*	Accepted
AC -> PR -> PB	0.02	0.02	0.02	0.91	0.36	Rejected
UGC -> PR -> PB	0.02	0.02	0.02	1.29	0.19	Rejected
SP -> PR -> PB	0.06	0.06	0.03	2.11	0.03*	Accepted
IENG -> PR -> PB	0.10	0.10	0.03	3.37	0.00*	Accepted
SMM -> PR -> PB	0.28	0.28	0.03	8.13	0.00*	Accepted

*P < 0.05, Results are significant. Note: IE = Influencer engagement, AC = Ad-campaign, UGC = user generated content, SP= Social proof, IENG = Interactive engagement, PR = Psychological risk, and PB = Purchase Behaviour

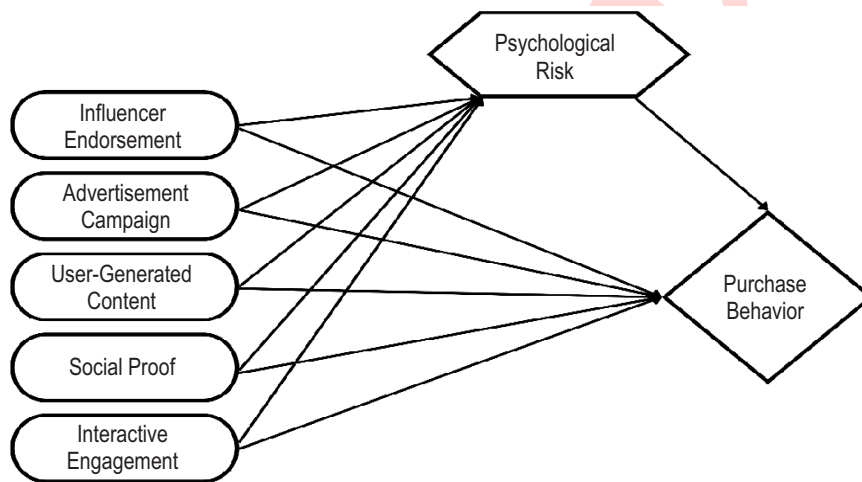


Fig. 2: Social Media Marketing: (Instagram) The proposed conceptual model highlights how Instagram based SMM- influencer endorsement, advertisement campaigns, user-generated content, social proof, and interactive engagement -reduces the psychological risk and drives consumer purchase behaviour of recycled products.

indicated by greater p-values than 0.05. It shows that AC and UGC are not reducing the PR of consumers. Hypothesis H1 b, H4 b, and H5 b are accepted. Hence, IE, SP and IENG help in reducing the PR faced by consumers, however, H2- b and H3- b were rejected.

Mediation Analysis: The mediation analysis was also carried out to understand the mediation role of psychological risk in its relationship with IE, AC, UGC, SP, IENG, and purchase behaviour independently. The results in Table 6 indicate that the total effect between IE and PB was positive and significant. Whereas, after bootstrapping, the specific indirect effect with the inclusion of mediator as PR in the model was substantial ($\beta=0.13$, $t=4.95$, $p=0.00$) (Table 7). Hence, PR fully mediates the relationship between IE and PB. Secondly, Table 6 indicates that the total effect of SP and PB was insignificant. Whereas, after bootstrapping, the specific indirect effect with the inclusion of mediator as PR in the model was moderate ($\beta=0.06$, $t=2.11$, $p=0.03$) (Table 7). Hence, the relationship between SP and PB

was fully mediated. Lastly, Table 6 shows that the total effect between IENG and PB was significant. Whereas, after bootstrapping, the specific indirect effect with the inclusion of mediator as PR in the model was significant ($\beta=0.10$, $t=3.37$, $p=0.00$) as shown in Table 7. Hence, PR completely mediates the relationship between IENG and PB. The constructs IE, AC, UGC, SP, and IENG represent SMM. The mediation effect of PR on the relationship between SMM and PB was tested. The total impact between SMM and PB was found to be significant. The specific indirect effect was also significant with the inclusion of PR as a mediator ($\beta = 0.28$, $t = 8.13$, $p = 0.00$). Therefore, it can be concluded that PR fully mediates the relationship between SMM and PB of recycled products.

Social media influencers play a considerable role in shaping the behaviour of consumers. Our study also substantiates with the findings of Ferberg *et al.* (2011). IE, IENG, and SP significantly impact the purchase of recycled products. Influencers engage with the consumers in interaction (IENG),

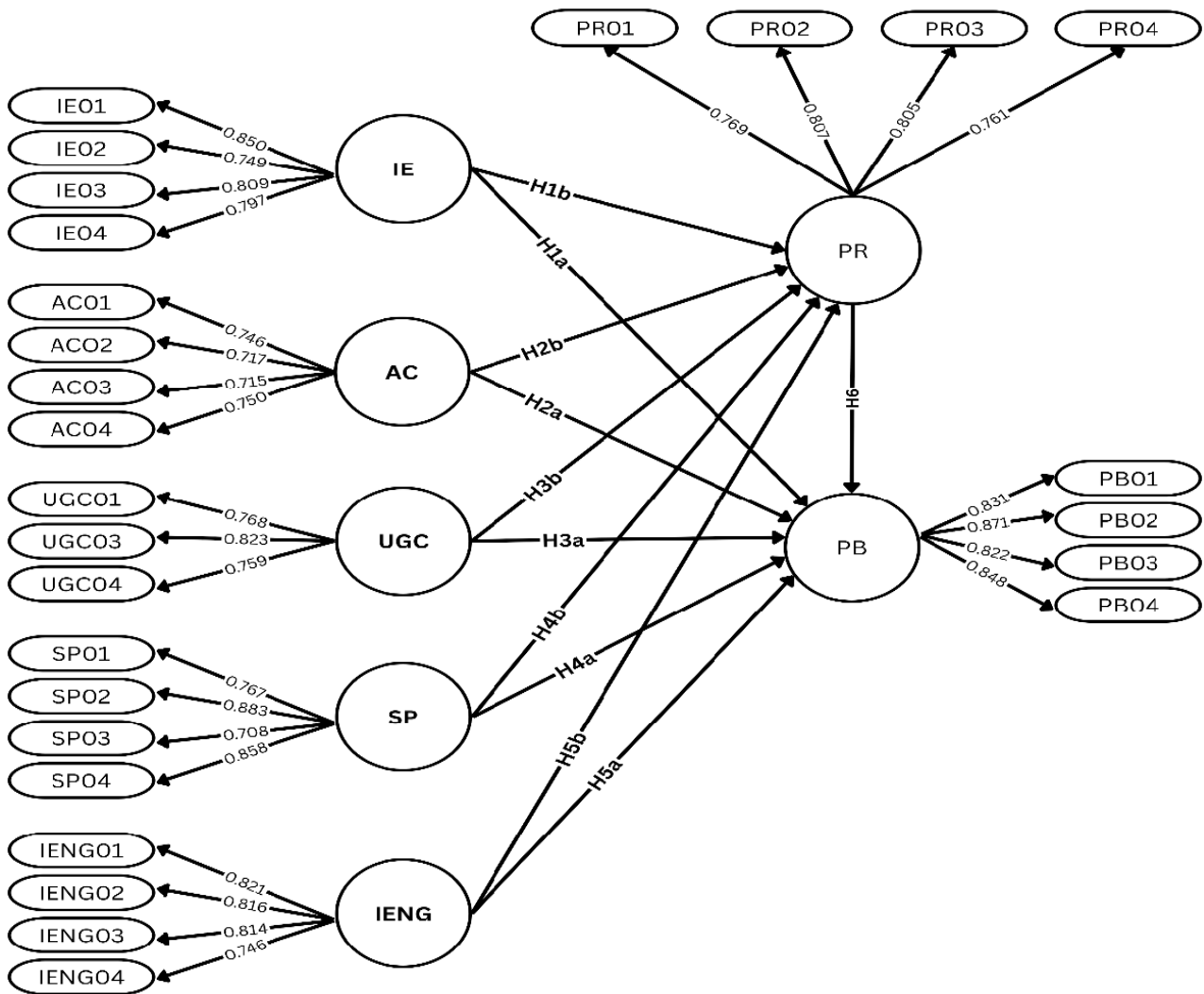


Fig. 3: Structural Equation Model (SEM). SEM validated structural model showing hypothesized relationships between PR, SMM activities and consumer PB.

creating a positive environment, and the brand is better promoted (Lou *et al.*, 2019). The UGC increases the interest in a product (Lilja, 2019). This study also finds that UGC significantly impacts PB, though it does not contribute to reducing the PR of consumers. AC has no significant impact on reducing PR and PB of recycled products. Recycled product companies should leverage trustworthy IE and foster IENG to mitigate PR and enhance PB (Kavitha and Kumar, 2023). Influencers should share genuine experiences and endorse the reliability of recycled products, conveying that using these products is wise and responsible. In addition to this, companies should create platforms for real-time engagement, like live Q & A sessions and product demonstrations, to address concerns and build trust.

The study reveals that PR does not mediate the relationship between AC, UGC, and PB. However, it fully mediates the relationship between IE, IENG, SP, SMM, and PB.

While PR does not mediate AC and UGC, these elements remain essential. The weaker role of advertising content (AC) and user-generated content (UGC) suggests the need for more impactful creative strategies that directly address consumer anxieties related to recycled goods which helps to increase customer satisfaction and prevent environmental degradation, further helps to attain SDG12 of the United Nations sustainable goals. An important finding emerging from this study is that the social media marketing, alleviates the psychological risk leading to enhanced purchase behaviour of the recycled products. This also reinforces that this study has paved the way that SMM can help organisation and society achieve SDG 12 of responsible consumption and production of environmentally friendly recycled products.

From a managerial perspective, this study provides clear orientation: SMM initiatives, if designed thoughtfully, can reduce hesitation, normalize recycled product usage, positioning

recycled products as mainstream choices rather than niche alternatives and foster greater acceptance among consumers. From a societal perspective, the study reinforces how digital penetration in both urban and rural areas can accelerate the adoption of recycled products, directly aligning with Sustainable Development Goal 12 (Responsible Consumption and Production). By encouraging environmentally conscious purchasing and reducing carbon footprints, the research underscores the dual benefit: marketers achieve stronger consumer acceptance, while society benefits from sustainable growth and ecological preservation. In a nutshell, this study demonstrates that Social Media Marketing (SMM) can play a transformative role in reducing consumers' psychological risk (PR), thereby improving their purchase behaviour (PB) toward recycled products. By highlighting the impact of interactive engagement (IE), influencer engagement (IENG), and social proof (SP), the findings emphasize how marketers can strategically employ micro-influencers and consumer advocates to build trust and confidence in recycled products.

While the study specifically focused on the psychological risk dimension, future research should extend to other perceived risks—functional, social, financial, physical, and time-related, along with exploring multiple social media platforms such as Facebook, Twitter, WhatsApp, and e-WOM. Broadening the scope in this manner can create a holistic understanding of how SMM can systematically mitigate barriers and improve the overall adoption of recycled products.

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