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The AI-Human Synergy: Understanding Webrooming Behavior in the Digital Age

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Abstract

This study investigates how webrooming intention (the practice of customers searching for things online before making an in-store purchase) is affected by AI-driven technologies. The study examines how consumers' intention to webroom is affected by AI-driven personalisation, AI-driven virtual try-on technologies, customer satisfaction, Involvement, and engagement; purchase Anxiety affects webrooming behaviour. AI-driven personalisation and Involvement Were insignificant, while other variables were positively associated with webrooming intention. Retailers may build interactive experiences that connect online and offline purchasing by utilising virtual try-on technologies. Results point to the need for personalised suggestions and different channel options, as current customers want a smooth transition from online research to actual purchase. By using offline channel reassurance mechanisms, consumer confidence can be increased by reducing consumers' purchase anxiety. A conceptual structured model was designed and evaluated in this study using structural equation modelling with AMOS software. The study's results provide an analytical understanding of the roles of advanced technology and customers' emotional factors in shaping consumer behaviour, offering actionable insights for retail strategies in the digital era. Moderating and mediating variables can be used in future studies.

Keywords: Webrooming, Omnichannel, AI-driven Personalisation, Virtual Try-On Technology, Purchase Anxiety, Customer Involvement, Engagement, and Satisfaction.

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Introduction

Traditional consumers purchase products through both online and offline channels, indicating a simple channel purchase pattern. Still, with technological advances and the internet, consumers can make purchases through both channels. Modern consumers can have connections with rivals, producers, and other clients during their purchase journey (Zarinkamar et al., 2024; Ackermann & Richter, 2024). Consumers nowadays use multiple channels, and these behaviours are known as showrooming and webrooming (Goraya et al., 2022). Webrooming behavior, online product search, and offline passes have been highly used behaviors among consumers (Flavián et al., 2020; Boon et al., 2018). Webroom behavior allows consumers to explore product assortments. Comparison of product information across both channels helps reduce prices and build confidence in their product choice. A survey of 2000 shoppers reveals that 74% of consumers in the UK and the US participate in webrooming, mainly for electronics, apparel, and home appliances. Since over two-thirds of consumers research products online before making an offline purchase, webrooming has grown in popularity in European nations and is far more prevalent than other forms of consumer behaviour (Villacis et al., 2024). Asian consumers are also exhibiting webrooming behaviour, other than Americans and Europeans (Sethuraman et al., 2023). A study conducted across nine major Asian cities reports that 80% of shoppers exhibit webrooming behaviour while shopping (Kleinlercher et al., 2020). Multi-channel utilisation includes using the physical store for actual transactions while relying on the online platform to gather information and discover products. These are the main approaches for comparing prices. (Yu et al., 2011).

The retail and wholesale industries generate vast amounts of data that can be analysed with this technology, leading to rapid transformations in the sector through AI-driven solutions that enhance the overall process (Victoria & Rindasu, 2021; Rakhmanovich et al., 2025). Artificial intelligence has shown rapid growth in a short period (Bogue, 2016). It has been used across every sphere of life, especially in the retail industry, where it provides personalised services to each customer across a wide range of products, helping consumers make the right decisions about their purchases (Prakash & Saxena, 2025).

Artificial Intelligence is revolutionizing the field of omnichannel customer service by providing companies with creative methods to enhance productivity, personalization, and customer experience. Through AI-driven virtual assistants, businesses can communicate with customers in real time across various platforms, contributing to the growing popularity of chatbots (Ghosh et al., 2024). The benefits of integrating AI into omnichannel customer support are substantial, regardless of certain challenges. This integration helps companies stand out in a competitive environment, improving operational effectiveness and fostering a stronger, more enduring association with customers. This study examines how AI-powered technologies and human-centred factors influence consumers' motivations to engage in webrooming (Arora & Sahney, 2019). It provides important insights for retailers aiming to create strategies that cater to multi-channel shoppers, especially webroomers.

Review of Literature

Understanding Webrooming Behaviour in the Consumer Journey

The term "webrooming" refers to the practice of consumers researching things online before making a real purchase. The phrase frequently contrasts with showrooming, another consumer strategy where shoppers examine products in-store before making an online purchase. In contrast, webrooming involves consumers first seeing items online before making a purchase in- store (Khoshtaria et al., 2021). Marketers look at these changes in part to see how they affect physical stores. Research shows that webrooming is becoming increasingly crucial, as online webrooming has become an integral part of consumer behaviour across all channels globally.

Webrooming and Retailers

Distributors strive to recognise, comprehend, and offer services to consumers who exhibit webrooming habits, as the multitude of touchpoints and options available to consumers has added complexity to their journey (Shankar et al., 2021). By exploring products through one retail channel and completing the purchase through another, these clients get a sort of free ride that is, they get the information they need from one retail platform without making a transaction. As a result, retailers must offer their services at no cost during the research phase but ultimately lose potential revenue when customers finalise their purchase elsewhere. To avoid losing consumers during the purchase phase, shops must recognise, understand, and improve customer service in light of webrooming habits (Herrero-Crespo et al., 2022).

Conceptual Framework and Hypothesis Development

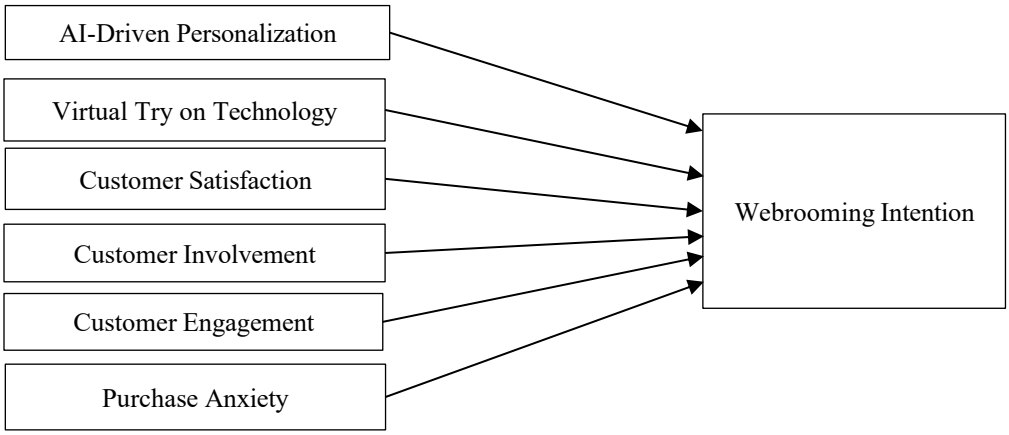

Fig.1: Conceptual Framework

(Fig.1) The study divides the factors influencing webrooming intention into AI-powered factors and human-centric factors. AI-powered elements use technologies to enhance customer experience, engagement, and decision-making throughout the shopping journey, including AI-driven personalisation and virtual try-on. The factors of human-centricity are psychological and emotional elements that influence how consumers perceive, are involved with, and behave in webrooming shopping behaviour (Flavián et al., 2019).

The conceptual framework of the study explains how AI-powered and Human-centric factors influence customers' intention to purchase products (Arora & Sahney, 2017; Brodie et al., 2011). For testing the hypothesis, the study has one dependent and six independent variables. The study explains that AI personalisation (AI), Virtual try technology (VR), Customer engagement (CE), customer involvement (CI), customer satisfaction (CS), and purchase anxiety influence the webrooming intention (WI). There were six hypotheses developed for studying the influence on webrooming intention.

AI-Driven Personalisation

The present business world has improved significantly through the use of artificial intelligence to personalise information and advice on product selection and to provide tailored offers. It also enhances customer engagement and satisfaction, and generates revenue by giving good involvement. (Personalization-driven behavior, webrooming, and providing personalized recommendations according to customers' needs. Therefore, it is hypothesized that:

H1. *AI-driven personalisation significantly affects the webrooming intention*

Virtual Try-On Technology

The superimposition of computer-generated graphics onto a view of the actual world created by an augmented device is augmented reality, or AR. Previously achieved using smartphones and tablets, technology like Google's Tango platform and Microsoft's HoloLens is advancing this technique. Bardi (2024 Augmented reality is utilised in virtual try-on technology, enabling customers to interact with products online, offering a real-time experience and giving consumers more immersive interactions (Björkbom, 2023). Virtual try-on technology helps consumers refer online, but consumers may prefer to purchase offline, leading to webrooming behaviour nowadays. Therefore, it is hypothesized that.

H2. *Virtual try-on technology significantly affects the webrooming intention*

Customer Satisfaction

As stated by Oliver (1997), customer satisfaction is defined by consumers' perceptions of achievement. Evaluating the aspects that influence user happiness, including enhanced or diminished accomplishment, in a product or service. According to Hom Willard (2000), there are two theories of consumer satisfaction: Macro and Micro. The macro model describes the effects of several causes, whereas the micro model describes the AI-driven components. Consumers will receive the AI-driven recommendations. It benefits them by offering individualized advice and real-time experience. Jaiwant (2022). Since happy consumers are more comfortable making wise offline purchases, it is anticipated that customer satisfaction increases webrooming intentions by promoting trust in online research and lowering perceived risks. According to studies, consumers' sense of control and happiness increase when they

have an enjoyable online experience, thereby promoting hybrid buying behaviours such as webrooming. Therefore, it is hypothesized that:

H3. *Customer satisfaction significantly affects the webrooming intention*

Customer Engagement

Awareness, motivation, and social networks often influence decision-making and may be utilised to influence different behavioural outcomes (Rather, 2019; Mohammad et al., 2020; Ornelas Sanchez, Vera Martínez, 2021). Loureiro et al. (2017) suggest that highly engaged consumers are willing to invest their time, money, and effort in value co-creation behaviours to express their brand loyalty within their social networks. Customers with greater brand familiarity tend to engage in hybrid buying behaviours, such as webrooming, which allows them to leverage the confidence provided by physical stores and the information gathered online. Therefore, it is hypothesized that:

H4. *Customer engagement significantly affects the webrooming intention*

Customer Involvement

Webroomers' customer journeys enable them to conduct in-depth searches on both the internet and brick & mortar stores before buying a product, it is anticipated that consumers' degree of product engagement will be positively correlated with their tendency to engage in web rooming (Kleinlercher et al., 2020) According to (Gibson et al., 2022), consumers who value in-person interactions are more likely to switch from online to in-person channels throughout the purchasing process, and risk can be reduced by the experiencing the product directly, proving web rooming in the favor (Akram & Lavuri, 2024). The AI tools give consumers greater involvement in the purchasing process. Therefore, it is hypothesized that:

H5. *Customer involvement significantly affects the webrooming intention*

Purchase Anxiety

The theory of social cognition states that anxiety is an emotional reaction that weakens a person's resolve to carry out a particular action by reducing expectations of the intended performance outcome and limiting one's judgments and abilities to generate performance through emotional stimulation. According to research by Kim and Forsythe, the intangibility of online shopping raises perceived risk and uncertainty, which in turn fuels anxiety related to online shopping. Unpleasant thoughts about related or unrelated topics that might have negative consequences are the precursors of anxiety. Consumers globally are not adequately protected from the hazards posed by virtual suppliers under the current rules and regulations governing electronic commerce. Their excitement about using this strategy is tempered by significant apprehension about the environment surrounding online purchasing. Consumers are less likely to purchase online and visit electronic stores when they are nervous (Khoa & Huynh, 2023). Therefore, it is hypothesized that:

H6. *Purchase anxiety significantly affects the webrooming intention*

Research Method

Sampling and Data Collection

Data were obtained from consumers who searched online for details and then made purchases in physical shops. Both primary and secondary data were used in the research. First-hand information was taken from 210 consumers using a structured questionnaire. The questionnaire was designed with the following four sections: demographics, AI-driven technologies, human-centric values, and webrooming intention. The design is provided in the following table 1.

Table 1: Questionnaire Design

Particulars	**No. of statements**	Cronbach's Alpha
Section I Consumer demographics	-	-
Section II		
1. AI-driven personalisation	3	0.848
2. Virtual try-on technology	3	0.709
Section III Human-centric variables		
1. Customer satisfaction	3	0.763
2. Customer involvement	4	0.789

3. Customer engagement	3	0.705
4. Purchase Anxiety	4	0.795
Section IV Webrooming intention	4	0.850

Measures and Instrument Development

To assess the reliability of the collected data, Cronbach's alpha was used to conduct a Reliability analysis. It measures the consistency of the questions, which means the closeness of the variables related to the construct. Different methods of statistics were used in this study, including confirmatory factor analysis and AMOS structural equation modelling to understand AI personalisation (AI), Virtual try technology (VR), Customer engagement (CE), customer involvement (CI), customer satisfaction (CS), and purchase anxiety towards webrooming intention (WI)

Results

The data analysis was conducted in a structured two-step procedure. In the first stage, a measurement framework was examined to ensure that the variables represented the intended constructs and to assess internal consistency. This included determining the strength and suitability of the relationships between observed indicators and underlying factors (Hooper & Coughlan, 2008). In the second stage, an extensive modelling method was used to investigate relationships between constructs and to assess the proposed assumptions. This approach allowed us to identify direct effects between variables and to gain a good understanding of the underlying structural relationships. The analysis was conducted using specialised statistical software to ensure the model was estimated and validated precisely.

Measurement Model

In this modelling, a structural modelling approach was used to discuss relationships among variables and conduct an adequacy check of the proposed framework. The quality of the measurement model was examined by examining the strength of associations between observed indicators and the different constructs. Acceptable performance of the indicators was ensured by maintaining a sufficient loading value. Model suitability was further assessed using multiple fit measures to evaluate whether the proposed structure adequately represents the observed data. Values reflecting a good match between the model and the data were considered desirable, and deviations indicated the need to improve the model. Additionally, measures of error approximation were used to assess the degree of unexplained variance in the model. The consistency of the measurement scale was confirmed through an internal reliability analysis, in which all constructs showed satisfactory levels of reliability, indicating that the items used were stable and reliable for analysis.

Table 2: Confirmatory Factor Analysis

Factors	Measures	Standardised Regression Weights**	Average Variance Extracted	Composite Reliability Coefficient	The Goodness of Fit Indices	
AI	AI1	0.850	0.654	0.850	GFI =	0.964
	AI2	0.737			AGFI =	0.916
	AI3	0.835			NFI =	0.946
					CFI =	0.966
					RMSEA =	0.060
VR	VR1	0.563	0.542	0.774	GFI =	0.961
	VR2	0.706			AGFI =	0.908
	VR3	0.901			NFI =	0.944
					CFI =	0.963
					RMSEA =	0.073
CS	CS1	0.799	0.536	0.772	GFI =	0.979
	CS2	0.556			AGFI =	0.922
	CS3	0.813			NFI =	0.970
					CFI =	0.980
					RMSEA =	0.065
	CI1	0.832	0.535	0.821	GFI =	0.964
CI						
	CI2	0.692			AGFI =	0.918
	CI3	0.654			NFI =	0.930

	CI4	0.737			CFI =	0.936
					RMSEA =	0.068
CE	CE1	0.725	0.536	0.773	GFI =	0.978
	CE2	0.616			AGFI =	0.988
	CE3	0.838			NFI =	0.946
					CFI =	0.990
					RMSEA =	0.026
AX	AX1	0.727	0.526	0.811	GFI =	0.979
	AX2	0.879			AGFI =	0.903
	AX3	0.727			NFI =	0.968
	AX4	0.523			CFI =	0.975
					RMSEA =	0.070
WI	WI1	0.713	0.589	0.851	GFI =	0.983
	WI2	0.753			AGFI =	0.916
	WI3	0.788			NFI =	0.979
	WI4	0.812			CFI =	0.984
					RMSEA =	0.065

As can be seen from table 2, all the studied constructs, personalisation-based personalisation, virtual try-on systems, satisfaction, involvement, engagement, behavioural anxiety, and behavioural intention, exhibit acceptable measurement performance. The strength of the relationships between the indicators and their respective constructs is adequate, indicating that the items effectively capture the intended concepts. Additionally, the obtained variance and composite reliability values indicate adequate convergence and internal consistency across all constructs. The reliability of the measurement instrument is also supported by an internal consistency analysis, in which all variables yield stable, reliable scores. This suggests that the measurement items are consistent in their representation of the underlying dimensions, with some constructs showing greater reliability. Furthermore, the model's overall goodness-of-fit was evaluated using several fit measures. The obtained values suggest a strong relationship between the proposed structure and the data (Hair et al., 1994; Hair et al., 1998; Hair et al., 2006). Therefore, the model is a satisfactory representation of the relationships between the variables.

Factors Affecting Webrooming Intention

SEM utilizes this research, which utilizes Covariance-Based Modelling and Equation Modelling (CB-SEM) to examine the elements influencing webrooming intention among consumers (Hu & Bentler, 1999). It examines the relationships between AI-powered and human-centric factors that influence consumers' decisions to research products online but purchase them in physical stores. CB-SEM helps validate the proposed analytical model by analysing how well the theoretical framework fits the observed hypothesized statistically significant relationships between variables. The Structural Equation Model depicting the Influencing Factors on Webrooming Intention is shown in fig. 2.

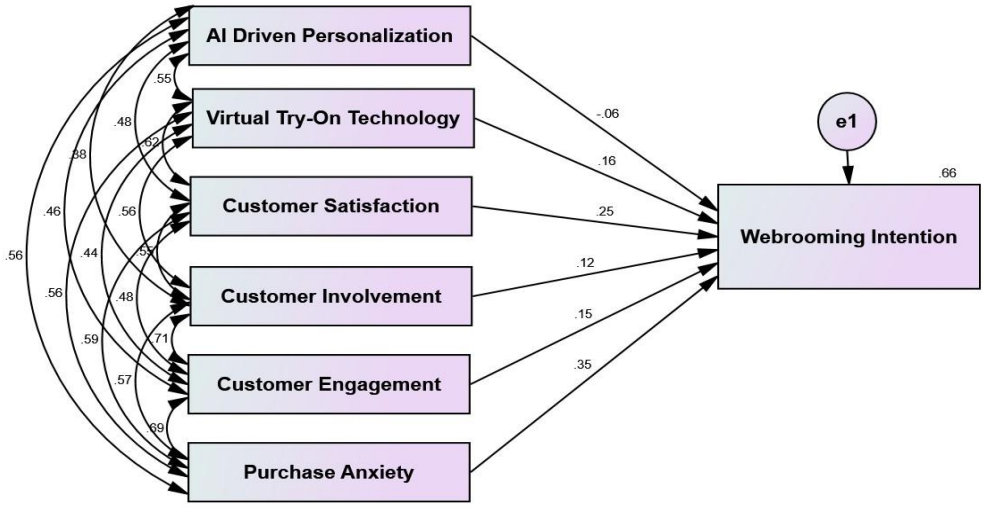

Fig. 2: Structural Equation Model on the Factors Affecting Webrooming Intention

Table 2 presents the correlations from structural identification modelling, identifying the Factors that significantly impact Webrooming Intention.

Table 3: Factors Affecting Webrooming Intention - Coefficients

Factors			Unstandardized Coefficient	Standardized Coefficient	S.E	C.R	P	Decision
AI-driven Personalisation	→	Webrooming Intention	-0.063	-0.059	0.055	-1.133	0.257	H1 Not Supported
Virtual Try-On Technology	→	Webrooming Intention	0.161	0.157	0.060	2.667	<0.001**	**H2 Supported**
Customer Satisfaction	→	Webrooming Intention	0.271	0.250	0.062	4.401	<0.001**	**H3 Supported**
Customer Involvement	→	Webrooming Intention	0.118	0.117	0.064	1.848	0.065	H4 Not Supported
Customer Engagement	→	Webrooming Intention	0.163	0.151	0.072	2.267	0.023*	**H5 Supported**
Purchase Anxiety	→	Webrooming Intention	0.397	0.355	0.072	5.532	<0.001**	**H6 Supported**

**** Significant at 5% level***

***** Significant at 1% level***

From table 3, it is evident that several factors significantly influence consumers' intentions toward webrooming, including Virtual Try-On Technology, Customer Satisfaction, Customer Engagement, and Purchase Anxiety. Personalisation and Customer Involvement do not have any impact on webrooming, as the p-values are insignificant at both 5% and 1%. In structural equation modelling, statistical significance is assessed using the critical ratio (C.R.). A C.R. value between -1.96 and 1,96 indicates that the effect is statistically insignificant at a 5 % level of significance. From the table, it is evident that C.R = -1.133 falls within this range, which is significant in consumers' decision to engage in webrooming behaviour.

Among the affected factors, Purchase Anxiety exerts the greatest Standardized impact (Standardized Coefficient of 0.397), followed by Customer Satisfaction (Standardized Coefficient of 0.271), Customer Engagement (Standardized Coefficient of 0.163), and Virtual Try-On Technology (Standardized Coefficient of 0.161).

Table 4: Factors Affecting Webrooming Intention - Model Fit Indices

Index	CMIN/df	GFI	AGFI	NFI	CFI	RMR	RMSEA
Value	3.782	.959	.981	.951	.952	.036	.076
Criteria	>5	<0.900	<0.900	<0.900	<0.900	>0.080	>0.080

In addition, the model has undergone evaluation to assess how well it represents the construct. To evaluate model fit, several indices were applied. Table 4 showed that all these indices have met the threshold, and hence proved that the model is fit and capable of representing what it was intended to represent.

Discussion

The findings of this research illuminate the main factors that influence behavior, emphasizing how different elements affect consumers' intentions to participate in webrooming, particularly in light of advanced technological and psychological influences. First, it was found that AI-driven personalisation had no significant impact on webrooming intention (H1 not supported). Several reasons for this result are: Primarily, AI-driven personal recommendations may not be appropriate or trustworthy for consumers, so they would prefer personal search to AI-generated suggestions. Secondly, webrooming behaviour is influenced by factors such as the tactile experience of shopping in-store, immediate possession, and the ability to touch and examine the item, which AI cannot fully address. These recommendations suggest that personalisation remains a valuable tool for increasing the consumer experience. It has a limited impact on webrooming intention, except that it involves more personalisation strategies and trust-building mechanisms.

Virtual try-on technology has shown a significant positive impact on webrooming intentions. Hypothesis 2 is supported. It helps reduce the disparity between online and offline channels by enhancing consumers' confidence and

satisfaction during online product evaluation and motivating them to finalise purchases in-store. Webrooming intention is strongly influenced, which cannot help but boost client value by earning their trust. It is observed that webrooming intention is very positively impacted by consumer involvement. Participation in promotional activities and interactions with brand material fosters a relationship with the brand, which in turn encourages consumers to engage in webrooming. Hypothesis 6 supports that purchase anxiety influences the webrooming intention among consumers. The customer's risk associated with online purchases is reduced when consumers can examine the product in person, thereby increasing consumer satisfaction.

Contribution and Suggestions

To improve webrooming behaviour, this study offers practical recommendations for retailers. Focus areas include the use of AI technologies and increased customer engagement, and, by reducing purchase anxiety, the customer's webrooming experience can be enhanced. From the findings, it is personalisation that is insignificant for webrooming intention, suggesting that retailers refine strategies to provide promotional opportunities, focusing on in-store-specific stock updates in real-time and incentives by location. Additionally, virtual try-on technology has been shown to positively impact webrooming intention, underscoring the importance of AR-based shopping experiences and suggesting integrating mobile apps to connect digital and physical retail spaces**.**

Webrooming behaviour is driven by customer satisfaction and engagement. It further highlights the importance of accurate product information, an enhanced user experience on the website, customer loyalty programs, and live demos and collaborations on social media. The findings reveal that purchase anxiety is the strongest factor driving webrooming, as customers prefer to verify product quality in-store. Retailers can utilise this finding by offering flexible product return plans, dedicated in-store zones for validating product quality, and AI-powered tools for product quality checks or review submissions.

Customer involvement was found to be insignificant, yet simplifying online research tools, product comparison tools, and reservation-based purchasing options greatly supported consumer purchase decisions. Thus, we can conclude retailers can maximise webrooming conversions by expanding Virtual Try-On Technology, reducing purchase anxiety, and strengthening engagement strategies, ensuring a smooth transition from online research to in-store purchase, ultimately driving sales growth and brand loyalty.

Limitations and Future Directions

This study offers important perspectives and factors affecting webrooming intentions in the context of AI-driven technologies, yet it has specific limitations that suggest opportunities for future studies. Firstly, this study examines the direct correlations among personalisation, virtual try-on technology, customer satisfaction, engagement, involvement, and purchase anxiety. webrooming intention. However, it overlooks potential mediating or moderating factors. Subsequent research could examine how factors such as trust in AI, perceived risk, or technology readiness may influence the relationship between AI-driven features and webrooming behaviour.

Additionally, this research does not explore variations in webrooming intention across different industries. Consumer behaviour may differ across retail sectors (e.g., fashion, home appliances, electronics) due to the influence of AI-based technologies. Further studies can consider sector-specific AI applications to produce more goal-oriented results. Eventually, anxiety about the purchase has the greatest impact on webrooming intention, suggesting that consumers prefer to examine products in person before purchasing. Future studies can examine how elastic-return policies, AI-driven quality assessment, or blockchain-based product authentication influence purchase anxiety and confidence in online channels. By highlighting these gaps, future studies can deepen understanding of how artificial intelligence shapes omnichannel consumer behaviour and webrooming dynamics.

Conclusion

This study enhances understanding of webrooming behaviour in the AI-enhanced retail landscape, emphasizing the impact of virtual try-on technology, customer satisfaction, engagement, and purchase anxiety on consumer choices (Bhuiyan, 2024). Purchase anxiety was the most significant factor, underscoring the need for trust-building strategies, such as flexible return policies and AI-driven quality assurance measures. Interestingly, AI-powered personalisation and customer involvement did not have a meaningful effect on webrooming, suggesting that AI-based recommendations alone may not be sufficient to drive in-store purchases**.**

Retailers can maximise webrooming behaviour by investing in AR-based virtual try-on technology, reducing purchase anxiety, and improving customer engagement through customised in-store promotions and real-time updates on product availability. Integrating AI advancements with sustainable retail methods can improve both efficiency and consumer confidence. By facilitating a smooth shift from online exploration to in-store transactions, companies can boost sales growth, strengthen brand loyalty, and enhance customer satisfaction in a retail landscape increasingly driven by AI.

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