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Immersive Assurance in Digital Retail: A Conceptual Framework on How Augmented Reality Virtual Try-Ons Reduce Purchase Uncertainty and Return Intentions

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ABSTRACT

The rapid expansion of e-commerce has significantly transformed consumer purchasing behaviour, yet the inability to physically evaluate products continues to create uncertainty during online decision-making. Consumers frequently struggle to assess important product attributes such as fit, appearance, and suitability through static images or textual descriptions, which often leads to hesitation during purchase and higher product return intentions. Although online retailers increasingly adopt immersive technologies, limited conceptual research has examined how such tools influence consumer confidence and decision certainty in digital retail environments.

This paper develops a conceptual framework explaining how augmented reality (AR)-based virtual try-on technologies can reduce purchase uncertainty and minimise return intentions in online retail. Drawing on the Technology Acceptance Model, Perceived Risk Theory, and the Stimulus-Organism-Response (SOR) model, the framework proposes that AR-enabled visualisation allows consumers to virtually experience products before purchasing, thereby improving product evaluation and compatibility assessment. The model highlights key psychological mechanisms-perceived risk reduction, enhanced product visualisation, and increased decision confidence-that collectively contribute to stronger purchase assurance and a lower likelihood of product returns. The framework introduces AR quality and individual consumer characteristics as moderators of the proposed pathway, and identifies a three-dimensional decomposition of purchase uncertainty-functional, evaluative, and fit-as a conceptual refinement with implications for scale development. The proposed framework provides theoretical guidance for future empirical research and offers practical implications for e-commerce platforms seeking to design technology-enabled retail environments that reduce both consumer uncertainty and the operational and environmental costs of product returns.

Keywords: augmented reality; virtual try-on technology; purchase uncertainty; perceived risk reduction; consumer confidence; return intentions; online retail

1. INTRODUCTION

Consumers' interaction with the retail marketplace has dramatically altered due to the rapid growth of e-commerce. Online platforms offer consumers convenience and a much larger selection of merchandise at competitive prices; however, they also present challenges related to product evaluation. Unlike physical store environments, where shoppers can touch, feel, and try products before purchasing, online environments provide little or no sensory interaction. Consumers often face uncertainty about how a given product will fit, what quality it will have, and how it will look visually-uncertainty that creates hesitation during the purchase process and leads to higher rates of product returns (Hilken et al., 2017; Poushneh & Vasquez-Parraga, 2017).

Augmented reality (AR) is a digital technology that addresses these shortcomings by blending virtual elements into real-world environments through mobile devices and cameras, thereby allowing consumers to visualise products in an active and immersive manner. In retailing, AR-based virtual try-on (VTO) systems provide consumers with the ability to simulate wearing or using products-shoes, make-up, eyeglasses, clothing-in an interactive manner. By enabling realistic visualisation of products, consumers are able to evaluate these products with greater accuracy before making a purchase decision (Smink et al., 2019; Qin et al., 2021).

As more e-commerce platforms implement AR technology, understanding how immersive experiences affect consumer decision-making becomes increasingly relevant. This paper develops a framework explaining how AR virtual try-on tools reduce consumers' perceived level of uncertainty in purchasing decisions and, consequently, affect their willingness to return items in the digital retail environment.

2. REVIEW OF LITERATURE

2.1 AR and Enhanced Product Visualisation

Hilken et al. (2017) demonstrated that AR activities enhance the service experience in an online context by offering improved product visualisation and increasing consumer interaction with products. Their findings indicate that integration of AR technology allows for the merging of physical products into a digital medium, creating an ongoing sense of existence within the consumer's environment. This interactive immersion enhances how consumers perceive the physical structure and functionality of products prior to purchase, thereby reducing uncertainty and enhancing the perceived value of digital retail experiences.

Poushneh and Vasquez-Parraga (2017) found that consumers are positively influenced by AR implementation in retail environments. AR enhances both the functional and experiential aspects of online shopping, resulting in increased product understanding, greater enjoyment of AR-enabled experiences, and stronger emotional attachments to digital shopping platforms. Consumers utilising AR technology are consequently more likely to have a favourable attitude towards the retailer and to complete a purchase.

2.2 AR and Consumer Engagement in Purchase Decisions

Rauschnabel, Felix and Hinsch (2019) investigated how AR marketing influences consumer behaviour and brand loyalty. Their results reveal that AR allows for more enjoyable and involved shopping through interactive product experiences, building emotional attachment to brands and increasing motivation to investigate products further, ultimately leading to a higher probability of purchase. Smink et al. (2019) found that virtual try-on features provide consumers with the ability to experience a product before purchasing, enabling better evaluation of product characteristics-design, size, and appearance-than

conventional online display methods. AR use was also found to increase consumer confidence in online retailers by providing more realistic and detailed product representations.

Saprikis, Avlogiaris, and Katarachia (2020) developed a framework for understanding consumers' intentions to adopt mobile AR shopping applications, concluding that adoption would be enhanced by users' perceptions of usefulness, enjoyment, and technological innovativeness. Qin, Peak, and Prybutok (2021) found that AR technologies allow consumers to see products in ways that are more realistic than traditional online displays, thereby improving product visualisation, providing interactive product information, and reducing the uncertainty associated with online purchases.

2.3 AR, Information Asymmetry, and Post-Purchase Behaviour

Rejeb, Rejeb and Treiblmaier (2023) documented that AR reduces the information asymmetry found in online retail by providing consumers with interactive and immersive product representations, enabling more confident purchasing decisions. Buhkari et al. (2025) examined how AR system characteristics-specifically realism, interactivity, and aesthetics-influence consumer behaviour in virtual shopping. Their findings identified all three attributes as increasing user engagement and purchase intention, concluding that high-quality AR integration improves customer experience and confidence in online purchasing.

Flavián, Ibáñez-Sánchez and Orús (2019) investigated how immersive technologies affect consumer experiences in the retail sector, finding that AR and VR increase interactivity between consumers and products, making shopping more realistic and creating a greater sense of personal involvement. Both technologies were found to enhance consumer positivity toward digital retail platforms and confidence in purchase decisions.

Table 1: Literature Synthesis - AR Virtual Try-On Technology and Consumer Behaviour Outcomes

Study	AR Feature Examined	Primary Finding	Contribution to This Framework
Hilken et al. (2017)	AR product visualisation in service contexts	AR enhances product evaluation and reduces uncertainty in online contexts	Grounds AR-uncertainty reduction linkage
Poushneh & Vasquez-Parraga (2017)	AR in retail environments	AR improves product understanding, enjoyment, and emotional attachment to retailers	Supports AR as consumer confidence driver
Rauschnabel et al. (2019)	AR marketing and brand engagement	AR creates immersive experiences, emotional brand attachment, and increased purchase motivation	Links AR interactivity to purchase intention
Smink et al. (2019)	Virtual try-on AR shopping apps	AR enables more accurate product evaluation and	Directly grounds H1 and H2

Study	AR Feature Examined	Primary Finding	Contribution to This Framework
		increases consumer confidence in online retailers	
Saprikis et al. (2020)	Mobile AR adoption in retail	Usefulness, enjoyment, and innovativeness drive AR adoption; user-friendly interface critical	Supports TAM application to AR VTO
Qin et al. (2021)	Mobile AR in online retail	AR reduces purchase uncertainty by enabling realistic product visualisation	Central support for mediating variable
Rejeb et al. (2023)	AR and retail innovation	AR reduces information asymmetry and improves decision confidence	Supports information asymmetry argument
Buhkari et al. (2025)	AR system quality (realism, interactivity, aesthetics)	All three attributes increase engagement and purchase confidence	Grounds AR quality dimensions in framework
Russ (2019)	Experiential AR in retail	AR increases product understanding and brand trust; builds consumer control perceptions	Supports SOR model application
Flavián et al. (2019)	AR and VR in consumer experience	Immersive technologies enhance realism, involvement, and decision confidence in digital retail	Grounds immersion as mechanism in framework

3. RESEARCH GAP

The role of AR in digital retail experiences has been recognised in existing literature. Both Hilken et al. (2017) and Poushneh and Vasquez-Parraga (2017) explicate how AR enhances product visualisation at the point of sale. However, several gaps persist. Most previous research studies focus almost exclusively on consumer engagement, technology acceptance, and purchase intention rather than on how AR specifically helps reduce purchase uncertainty and, in turn, alleviates product return behaviour.

Research by Rejeb et al. (2023) and Buhkari et al. (2025), while documenting AR's positive influence on retail innovation and user engagement, focuses little on post-purchase outcomes such as return intention. Russ (2019) and Flavián et al. (2019) highlighted the potential of AR for immersive retail experiences but

neither study explored the relationship between AR virtual try-on technologies' uncertainty-reduction capacity and consumers' return intentions. This gap motivates the present study's focus on the full pathway from AR VTO → purchase uncertainty reduction → reduced return intention.

Table 2: Research Gaps and This Study's Response

Identified Gap	Evidence	This Study's Response
Focus on engagement/adoption over uncertainty reduction	Hilken et al. (2017); Rauschnabel et al. (2019)	Explicitly models purchase uncertainty reduction as the mediating variable
Neglect of post-purchase outcomes (return intention)	Rejeb et al. (2023); Buhkari et al. (2025)	Positions reduced return intention as the primary dependent variable
No integrated model linking AR → uncertainty → returns	Smink et al. (2019); Qin et al. (2021)	Proposes a full IV → M → DV conceptual model with three theoretically grounded hypotheses
Limited application of SOR model to AR-return behaviour	Flavián et al. (2019); Russ (2019)	Applies the SOR model to explain the AR-stimulus → psychological organism → return response pathway

4. OBJECTIVES OF THE STUDY

1. To understand how augmented reality virtual try-on technology may help customers feel more confident when shopping for items online.
2. To establish how AR application usage can decrease consumers' purchase uncertainty when purchasing from online retailers.
3. To examine the relationship between AR virtual try-on experiences and intention to return items purchased through e-commerce.

5. STATEMENT OF THE PROBLEM

Since the rise of online shopping, significant changes have emerged in consumers' product choice processes. While digital shopping offers many conveniences, the inability to physically inspect or try products prior to purchase creates persistent uncertainty about size, appearance, quality, and suitability. This uncertainty frequently translates into post-purchase disappointment and contributes to the high rates of product returns that characterise e-commerce, particularly in categories such as footwear and apparel. Although retailers increasingly adopt AR-based virtual try-on systems to address these visualisation challenges, there has been limited research examining the direct effect of AR on purchase-related uncertainty and subsequent return intention. The present study seeks to establish how AR-based virtual try-on technologies reduce the uncertainty of potential customers purchasing products through online retailers and how this reduction influences customers' intent to return those products.

6. THEORETICAL FRAMEWORK

6.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (Davis, 1989) describes the methods through which individuals adopt and implement new technologies. TAM identifies two core constructs: perceived usefulness-the extent to which an individual perceives using a specific technology to positively influence their performance-and perceived ease of use-the degree to which that technology can be utilised without difficulty. In digital retail, AR virtual try-on applications help consumers visualise products in a more interactive manner. When shoppers consider AR technology useful for evaluating product characteristics such as visual appearance, size, and fit, they are more likely to accept and adopt this technology. TAM therefore serves as a framework for explaining how consumers adopt AR technologies and how those technologies affect their purchase decisions.

6.2 Perceived Risk Theory

Perceived Risk Theory (Bauer, 1960; Cox & Rich, 1964) holds that purchasing decisions are always accompanied by consumer uncertainty about whether a product will meet expectations. This risk is elevated in online retail environments because consumers cannot physically interact with products prior to purchase, particularly when fit or visual assessment is critical. AR applications provide the potential to reduce these risks by allowing consumers to interact with a digital representation of the product before committing to a purchase. By providing realistic images of how a product will look and enabling interactive evaluation, AR reduces the functional and performance risks associated with online purchasing, thereby making Perceived Risk Theory a central theoretical anchor for the mediating variable in the framework.

6.3 Stimulus-Organism-Response (SOR) Model

The Stimulus-Organism-Response model (Mehrabian & Russell, 1974) illustrates how an individual's psychological state is shaped by environmental stimuli and how that psychological state drives behavioural response. In an online retailing context, AR virtual try-on technology serves as the External Stimulus, providing the consumer with immersion and interaction with a product. This stimulus shapes the Organism-the consumer's mental and emotional state-by enhancing product perception, decreasing uncertainty, and increasing confidence in product evaluation. The resulting Response is the consumer's behavioural outcome: a high level of purchase satisfaction and a correspondingly lower likelihood of returning the product. The SOR model thereby provides the explanatory pathway connecting immersive technology stimulus to post-purchase return behaviour.

Table 3: Theoretical Frameworks Mapped to Framework Constructs

Theory	Core Proposition	Construct Explained	Predicted Relationship	Supporting Scholars
Technology Acceptance Model	Perceived usefulness and ease of use drive technology adoption	AR VTO adoption and continued use	Perceived usefulness of AR → increased product evaluation ability → purchase confidence	Davis (1989); Saprikis et al. (2020)

Theory	Core Proposition	Construct Explained	Predicted Relationship	Supporting Scholars
Perceived Risk Theory	Consumers assess performance, functional, and social risks in purchase decisions	Purchase Uncertainty (Mediator)	AR reduces perceived risk of wrong fit/appearance → lower uncertainty → lower return intention	Bauer (1960); Smink et al. (2019)
SOR Model	Environmental stimuli shape psychological organism state → behavioural response	AR as stimulus → uncertainty as organism state → return intention as response	AR VTO (stimulus) → reduced uncertainty (organism) → lower return intention (response)	Mehrabian & Russell (1974); Qin et al. (2021)

7. STATEMENT OF SIGNIFICANCE

This research has significant implications for how AR-based virtual try-on technologies could improve the online shopping experience. Consumers tend to feel uncertainty about online products because they cannot physically inspect, test, or try items before purchase. AR allows consumers to view and interact with products in a virtual environment, providing additional information that facilitates more accurate product evaluation. This helps consumers make more confident purchasing decisions and, in turn, reduces the likelihood of post-purchase dissatisfaction and returns.

From a practical standpoint, the findings may assist retailers in developing more interactive and informative online shopping sites that increase customer satisfaction and lower operating costs associated with product returns. The research also has environmental significance: reduced returns translate directly into lower reverse-logistics operations, reducing unnecessary transportation emissions and contributing to more sustainable e-commerce practices.

8. CONCEPTUAL FRAMEWORK

The proposed conceptual framework analyses the impact of AR virtual try-on technology on consumer behaviour during online purchases. AR virtual try-on technology serves as the independent variable, providing consumers with the ability to digitally visualise products before buying. This technology alleviates uncertainty about fit, size accuracy, and appearance-the mediating variable. Alleviated uncertainty creates greater confidence in consumers' purchase decisions and decreases the likelihood of dissatisfaction. Product return intention-the dependent variable-consequently decreases. Figure 1 presents the complete framework.

The framework is grounded in a three-stage causal chain that maps directly onto the Stimulus–Organism–Response (SOR) architecture (Mehrabian & Russell, 1974): AR virtual try-on technology acts as the technological stimulus; purchase uncertainty reduction functions as the psychological mediating organism state; and reduced return intention represents the downstream behavioural response. This tripartite structure enables the framework to account for the full explanatory pathway from technological input to post-purchase outcome, rather than positing a direct effect of AR use on return intention that would leave the underlying psychological mechanism unspecified. Without the uncertainty-reduction mechanism as an

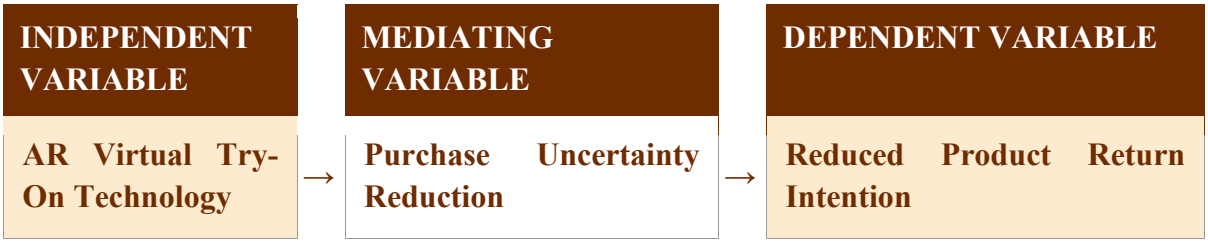
explicit intermediate step, the framework would be unable to explain why AR technology reduces returns in some product categories or for some consumer segments more effectively than others. The mediating variable provides the precise psychological account of how the technology achieves its effect, making the model both theoretically richer and empirically more tractable than a simple direct-effects formulation.

The framework further recognises that purchase uncertainty is not a unidimensional construct. Drawing on Perceived Risk Theory (Bauer, 1960), it is useful to disaggregate uncertainty into three constituent dimensions: functional uncertainty (whether the product will perform as intended), evaluative uncertainty (whether the product matches the consumer's aesthetic preferences and personal style), and fit uncertainty (whether physical dimensions such as size and proportionality will be correct). AR virtual try-on technology does not reduce all three dimensions with equal effectiveness. Its core capability-rendering a realistic visual simulation of the product on or near the consumer's body or environment-most directly addresses evaluative and fit uncertainty. Its impact on functional uncertainty is comparatively indirect, operating through the inference that a high-quality AR experience signals a more diligent and trustworthy retailer. Future empirical studies should employ a multi-dimensional uncertainty scale capable of distinguishing among these three forms, rather than a single composite measure that would obscure the differential impact of AR across uncertainty types.

The framework introduces AR quality as a moderating variable governing the strength of the AR-to-uncertainty-reduction pathway. A low-fidelity AR experience characterised by poor body-tracking accuracy, unrealistic texture rendering, or restricted lighting simulation may fail to produce the evaluative and fit confidence the framework predicts, and may in certain cases increase uncertainty by drawing attention to the discrepancy between digital simulation and the real-world product. This quality-contingency implies that the AR effect is moderated by perceived AR quality-encompassing realism, interactivity, and aesthetic fidelity (Buhkari et al., 2025). Empirical studies testing the framework should include AR quality as a moderator, testing the conditional indirect effect of AR use on return intention via uncertainty reduction, and identifying quality thresholds at which AR technology transitions from uncertainty-reducing to potentially uncertainty-amplifying.

Individual consumer characteristics represent a further set of boundary conditions. Technology readiness and prior AR experience are likely to strengthen the uncertainty-reduction effect, as consumers comfortable with digital interfaces can more accurately translate a two-dimensional simulation into a mental model of three-dimensional physical reality. Among consumers with limited digital literacy, the AR interface may introduce cognitive load that partially offsets its uncertainty-reduction potential. The framework therefore anticipates heterogeneous AR effects across consumer segments. Empirical studies should incorporate individual-level moderators such as technology readiness, prior AR experience, and product category involvement alongside the core structural path model.

Figure 1: Conceptual Framework - AR Virtual Try-On Technology, Purchase Uncertainty, and Return Intention



◆ Immersive 3D product visualisation ◆ Real-time fit simulation ◆ Interactive product information ◆ Personalised size compatibility ◆ Aesthetic and colour realism Theoretical Anchors: *TAM (Davis, 1989)* *Perceived Risk Theory (Bauer, 1960)* *SOR Model (Mehrabian & Russell, 1974)*	◆ Reduced perceived risk ◆ Improved product-attribute evaluation ◆ Enhanced size and fit confidence ◆ Reduced information asymmetry ◆ Increased decision confidence	◆ Lower post-purchase dissonance ◆ Expectation-reality alignment ◆ Reduced fit/size dissatisfaction ◆ Higher post-purchase satisfaction ◆ Sustainable e-commerce behaviour

H1: AR VTO → Product Evaluation Ability (direct +) | H2: AR VTO → Purchase Uncertainty (mediated –) | H3: AR VTO → Return Intention (indirect –, via uncertainty reduction)

Source: Authors' own conceptualisation (2025). Theoretical anchors: TAM (Davis, 1989); Perceived Risk Theory (Bauer, 1960); SOR Model (Mehrabian & Russell, 1974).

9. PROPOSED HYPOTHESES

Table 4: Proposed Research Hypotheses

Hyp.	Type	Alternative Hypothesis Statement
H1	*Direct (+)*	Augmented reality virtual try-on technology has a significant and positive impact on consumers' ability to evaluate products when shopping online, improving assessments of fit, size, appearance, and quality relative to traditional display methods (Hilken et al., 2017; Smink et al., 2019).
H2	*Direct (–)*	The use of augmented reality virtual try-on applications significantly decreases the level of purchase uncertainty for consumers when shopping online, by reducing information asymmetry and enabling realistic product evaluation prior to purchase (Qin et al., 2021; Rejeb et al., 2023).

Hyp.	Type	Alternative Hypothesis Statement
H3	*Indirect (–)*	Augmented reality virtual try-on experiences and consumers' product return intentions in a digital retail environment are significantly and negatively related, mediated by reduced purchase uncertainty: greater AR-enabled confidence leads to lower post-purchase dissonance and lower return likelihood (Smink et al., 2019; Buhkari et al., 2025).

10. RESEARCH DESIGN

10.1 Type of Research

This research adopts a descriptive research design, which is appropriate for systematically examining how consumers using AR-based visualisation tools experience purchase uncertainty and form product return intentions when shopping online. The descriptive approach allows for structured examination of consumer attitudes and behaviour without requiring experimental manipulation.

10.2 Method and Sources of Data Collection

Primary *data will be collected* through a structured questionnaire administered to consumers with past experience purchasing products online from retailers that have AR virtual try-on features. Close-ended items will measure consumers' perceptions of AR technology benefits, their purchase uncertainty, and their likelihood of returning purchased items. Secondary data will be drawn from academic publications, industry reports, and online publications pertaining to AR technology and online consumer behaviour.

10.3 Sampling Technique and Sample Size

A convenience non-probability sampling technique will be used to select respondents, targeting individuals who have purchased products online using AR-based virtual try-on technology. Approximately 200 responses will be obtained to provide a reasonably accurate representation of consumer experiences.

10.4 Data Analysis Tools

The data obtained will be processed and analysed using SPSS software. Analytical techniques will include descriptive analysis, field reliability analysis using Cronbach's alpha, correlation analysis, and regression analysis to investigate the relationships between AR virtual try-on technology, purchase uncertainty, and product return intention. Structural equation modelling using SmartPLS or AMOS is recommended for future studies testing the full path model.

Table 5: Methodological Profile of the Study

Parameter	Details
Research Design	Descriptive, cross-sectional
Data Type	Primary (structured questionnaire) and secondary (academic and industry sources)
Target Population	Consumers who have purchased products online using AR-based virtual try-on technology
Sampling Technique	Convenience non-probability sampling

Parameter	Details
Recommended Sample Size	200 respondents (minimum for regression and reliability analysis)
Measurement Scale	Close-ended items on Likert-type scales; validated scales from existing literature
Primary Analysis Tools	SPSS: descriptive analysis, Cronbach's alpha, correlation, regression
Advanced Analysis	SmartPLS / AMOS for structural equation modelling in future empirical studies

11. DISCUSSION

The conceptual analysis presented in this paper develops several insights into the role of AR virtual try-on technologies in shaping consumer decision-making and post-purchase behaviour in digital retail. The framework's central argument-that AR VTO reduces purchase uncertainty as the primary mechanism through which it influences return intention-is supported across multiple theoretical perspectives and consistent with the empirical literature reviewed.

From a TAM perspective, the AR virtual try-on interface functions as a usefulness-enhancing technology that enables consumers to evaluate product characteristics-fit, size, aesthetic-with a level of confidence that static imagery cannot provide. From a Perceived Risk Theory perspective, AR systematically reduces the functional and performance risks that dominate consumers' hesitations in online footwear and apparel purchases. The SOR model provides the overarching explanatory architecture: AR stimuli alter consumers' organism state by reducing uncertainty and building confidence, ultimately driving a response of lower return intention.

The practical significance of this pathway is considerable. Research consistently indicates that product returns in e-commerce represent a major operational and sustainability challenge for retailers. The present framework demonstrates that AR VTO technologies address this challenge not merely by improving purchase experience but by structurally reducing the expectation-reality gap that generates most returns.

A critical distinction emerges between two mechanisms through which AR VTO technology reduces the expectation-reality gap. The informational mechanism: AR provides richer, more accurate pre-purchase information, enabling better-calibrated expectations and reducing the discrepancy between what consumers anticipate and what they receive. The experiential mechanism: AR creates a form of pre-purchase ownership experience that generates psychological commitment to the product, making post-purchase reassessment less likely. These mechanisms are conceptually distinct and may be differentially effective across consumer segments. The informational mechanism is likely to dominate for consumers whose returns are driven by unmet expectations regarding fit, size, or appearance. The experiential mechanism is likely to dominate for consumers whose returns stem from post-purchase regret or impulse purchasing. A complete account of how AR VTO reduces return intention requires distinguishing between these two mechanisms and measuring their relative contributions in future empirical work.

A further insight surfaces what might be termed an AR overconfidence effect. Very high levels of AR realism may paradoxically increase consumer confidence to the point where they purchase products that turn out, upon physical receipt, to fall short in dimensions the AR simulation cannot fully replicate-such

as fabric weight, tactile texture, or subtle colour variation under natural lighting. Excessively realistic simulations may thus set expectations that physical products cannot meet, potentially increasing returns among consumers for whom the informational mechanism was operating most strongly. Retailers investing in high-fidelity AR should therefore complement the AR experience with transparent expectation-management communication that explicitly acknowledges the residual limitations of digital product simulation.

The discussion also draws attention to the broader sustainability dimension of the framework. Every product return initiates a reverse-logistics chain involving transportation, repackaging, inspection, and in many cases disposal-each step associated with material and energy costs. With apparel return rates in e-commerce estimated to exceed twenty percent, the aggregate environmental impact of unnecessary returns is substantial. The present framework demonstrates that AR VTO technology does not merely serve the commercial interests of individual retailers; it has the potential to contribute to systemic reductions in the environmental footprint of digital commerce, positioning AR adoption as a dimension of corporate sustainability strategy and warranting consideration in policy frameworks for sustainable retail.

12. IMPLICATIONS

12.1 Theoretical Implications

This research adds to current knowledge of consumer behaviour and digital retail technology by analysing how AR virtual try-on systems reduce purchase uncertainty and return intention. The study builds on existing technology acceptance and perceived risk reduction theory by demonstrating how immersive technologies impact consumer decision-making in internet environments. It establishes the theoretical linkage between AR-based product visualisation and purchase uncertainty/return intention, providing a foundation for further investigation into the impact of emerging technologies on online consumer behaviour.

From a Technology Acceptance Model perspective, the framework extends TAM's application beyond standard adoption into the domain of post-adoption, post-purchase behavioural outcomes. Standard TAM applications use behavioural intention to use a technology as the primary dependent variable; the present framework uses return intention as the ultimate outcome, establishing a downstream extension of the TAM causal chain that has received limited theoretical attention in the existing literature. This requires a reconceptualisation of perceived usefulness: in the return-intention context, usefulness is not merely the belief that AR will help make a purchase, but the belief that AR will help make a purchase one will not subsequently regret. This regret-prevention dimension of perceived usefulness is theoretically distinct from standard performance-enhancement conceptualisations and opens a productive avenue for TAM refinement in post-purchase consumer behaviour research.

From a Perceived Risk Theory perspective, the framework's three-dimensional decomposition of purchase uncertainty into functional, evaluative, and fit components has theoretical implications beyond the AR context: it suggests that any uncertainty-reduction intervention should be evaluated not against a composite uncertainty score but against its effectiveness across each risk dimension separately. From an SOR perspective, the framework operationalises the 'organism' construct as a precisely specified mediating variable-purchase uncertainty reduction-rather than the broader and less tractable formulations such as 'psychological state' or 'arousal' that characterise earlier SOR applications in retail contexts. This precision makes the framework's predictions empirically testable and contributes to the effort to ground the SOR model in clearly specified, measurable psychological mediators.

12.2 Practical Implications

The utilisation of AR technology through a virtual try-on feature will greatly improve the overall online retail experience by allowing customers to visually assess what a product will look like and how it will fit prior to purchase. Reduced uncertainty addresses the three major sources of consumer concern regarding online product purchases-fit, size, and appearance-potentially leading to lower return rates and higher customer satisfaction. Introducing AR capabilities also allows businesses to build competitive differentiation in the highly competitive online retail marketplace while enhancing consumer trust and engagement.

12.3 Policy Implications

One implication of this research is relevant for industry practitioners and policymakers in digital commerce development. Policies that encourage technological innovation, digital infrastructure enhancement, and consumer protection in online purchase settings can foster the adoption of AR and similar emerging technologies. Such policies have the potential to enable businesses to provide advanced tools that enhance transparency, reduce product uncertainty, and promote more sustainable retailing through the reduction of unnecessary reverse logistics operations.

13. CONCLUSION

This paper has developed a conceptual framework explaining how AR-based virtual try-on technology can enhance consumer confidence and reduce purchase uncertainty and product return intention in digital retail environments. Online shopping presents persistent challenges related to physical product evaluation that AR technology is uniquely positioned to address. By enabling realistic and interactive product visualisation-grounded in the Technology Acceptance Model, Perceived Risk Theory, and the SOR model-AR virtual try-on systems reduce the information asymmetry and evaluation uncertainty that generate post-purchase dissatisfaction and returns.

The three formally stated hypotheses provide a structured agenda for future empirical investigation. Confirming the proposed pathways empirically would strengthen both the theoretical understanding of immersive technology in consumer behaviour research and the practical case for retailers to invest in AR-enabled shopping experiences. Future research should examine the larger implications of immersive technologies across various retail product categories and consumer segments.

14. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

14.1 Limitations

This study carries limitations inherent to its conceptual nature. The proposed relationships are theoretically grounded but remain unverified through primary data collection. The focus on AR-enabled online retail may not extend without modification to product categories where fit and visualisation are less central concerns. The methodological design proposed-cross-sectional-captures consumer perceptions at a single point and cannot trace how attitudes toward AR evolve over time. Self-report data carry risks of response bias and personal interpretation.

14.2 Future Research Directions

Future research should expand samples to include greater demographic and geographic diversity to improve generalisability. Comparative research designs examining AR virtual try-on technology across retail product categories-clothing, cosmetics, eyewear, accessories-would provide additional insights into how AR impacts consumer purchasing behaviour across different product types. Longitudinal studies are

particularly needed to evaluate how continued exposure to AR shapes long-term consumer confidence and reduces return rates over time. Finally, moderation analyses examining the role of consumer age, technological familiarity, and platform trust as boundary conditions of the proposed framework would strengthen the model's explanatory scope.

Several more targeted research agendas follow from the conceptual contributions of this paper. First, the multi-dimensional uncertainty decomposition-distinguishing functional, evaluative, and fit uncertainty-calls for development of a validated multi-dimensional purchase uncertainty scale tailored to the AR VTO context, tested for discriminant validity across sub-dimensions and differential responsiveness to AR quality manipulations. Second, the AR quality moderation hypothesis requires empirical examination through experimental designs in which AR fidelity is systematically varied and its effect on each uncertainty dimension measured independently, enabling precise identification of quality levels at which uncertainty-reduction effects are maximised. Third, the informational versus experiential mechanism distinction could be tested through a two-group design comparing information-oriented AR users against more experiential users, assessing whether the mediated return-intention reduction pathway operates differently across groups.

Finally, the AR overconfidence effect-the possibility that very high-fidelity simulations generate expectations that physical products cannot satisfy in residual sensory dimensions such as tactile texture and fabric weight-is a theoretically important but currently untested boundary condition of the framework. An experimental study systematically varying AR realism levels and measuring return intention alongside post-purchase satisfaction and expectation-confirmation scores would provide direct evidence on whether this non-linearity exists and at what fidelity level it manifests. Such research would have immediate practical value for retailers making AR platform investment decisions, identifying the optimal fidelity range that maximises uncertainty reduction without triggering overconfidence. The sustainability implications of these findings would further strengthen the policy relevance of this agenda within the broader discourse on sustainable digital commerce.

REFERENCES

1. Ardiansyah Wahyudin, M., & Aksari, N. M. A. (2024). The effect of augmented reality virtual try-on on purchase intention mediated by perceived enjoyment. Asian Journal of Management Analytics, 3(4), 1003–1020. https://doi.org/10.55927/ajma.v3i4.10935
2. Buhkari, Sindhu, Haider, & Ul Haq. (2025). Characteristics of AR systems and their influence on consumer virtual shopping behaviour: Realism, interactivity, and aesthetics. Journal of Advertising Research. https://doi.org/10.1080/10496491.2025.2508886
3. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008
4. Dwivedi, Y. K., Hughes, D. L., Ismagilova, E., et al. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research. International Journal of Information Management, 57, 101994.
5. Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019). The impact of virtual, augmented and mixed reality technologies on the customer experience. Journal of Business Research, 100, 547–560. https://doi.org/10.1016/j.jbusres.2018.10.050
6. Hassan Ebadi, J., & Hussain, S. (2025). Evaluating the impact of augmented reality in consumer purchasing behavior. Center for Management Science Research, 3(7), 772–786.

7. Hilken, T., de Ruyter, K., Chylinski, M., Mahr, D., & Keeling, D. (2017). Augmenting the eye of the beholder: Exploring the strategic potential of augmented reality to enhance online service experiences. Journal of the Academy of Marketing Science, 45(6), 884–905. https://doi.org/10.1007/s11747-017-0541-x
8. Huang, T. L., & Liao, S. (2015). A model of acceptance of augmented reality interactive technology: The moderating role of cognitive innovativeness. Electronic Commerce Research, 15(2), 269–295.
9. Javornik, A. (2016). Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behaviour. Journal of Retailing and Consumer Services, 30, 252–261.
10. Javornik, A., Rogers, Y., Moutinho, A. M., & Freeman, R. (2021). Revealing the shopper experience of using augmented reality. Journal of Retailing and Consumer Services.
11. Liu, R., Balakrishnan, B., & Saari, E. M. (2023). The impact of augmented reality technology on consumers' purchasing decision processes. Frontiers in Business, Economics and Management. https://doi.org/10.54097/1r7f1x56
12. Liu, R., Balakrishnan, B., & Saari, E. M. (2024). How AR technology is changing consumer shopping habits: From traditional retail to virtual fitting. Academic Journal of Science and Technology. https://doi.org/10.54097/n5fk7m44
13. Mehrabian, A., & Russell, J. A. (1974). An approach to environmental psychology. The MIT Press.
14. Poushneh, A., & Vasquez-Parraga, A. Z. (2017). Discernible impact of augmented reality on retail customer experience, satisfaction and willingness to buy. Journal of Retailing and Consumer Services, 34, 229–234. https://doi.org/10.1016/j.jretconser.2016.10.005
15. Qin, H., Peak, D. A., & Prybutok, V. (2021). A virtual market in your pocket: How does mobile augmented reality (MAR) influence consumer decision making? Journal of Retailing and Consumer Services, 58, 102337. https://doi.org/10.1016/j.jretconser.2020.102337
16. Rauschnabel, P. A., Felix, R., & Hinsch, C. (2019). Augmented reality marketing: How mobile AR apps influence consumer purchase intentions and engagement. Journal of Retailing and Consumer Services, 49, 57–69. https://doi.org/10.1016/j.jretconser.2019.03.004
17. Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022). What is XR? Towards a framework for augmented and virtual reality marketing research. Journal of Business Research, 148, 687–696.
18. Rejeb, A., Rejeb, K., & Treiblmaier, H. (2023). Augmented reality in retailing: A systematic review of research foci and future agenda. Journal of Strategic Marketing, 31(3), 579–614. https://doi.org/10.1080/0965254X.2021.1972439
19. Russ, M. (2019). Building consumer trust through AR product experiences: An experimental study. Journal of the Academy of Marketing Science, 47(6). https://doi.org/10.1007/s11747-016-0507-9
20. Saprikis, V., Avlogiaris, G., & Katarachia, A. (2020). Determinants of the intention to adopt mobile augmented reality apps in shopping. Journal of Theoretical and Applied Electronic Commerce Research, 16(3), 491–512. https://doi.org/10.3390/jtaer16030030
21. Smink, A. R., Frowijn, S., Van Riemersma, J. V. B., Van Noort, G., & Neijens, P. C. (2019). Try online before you buy: How does augmented reality affect attitudes and purchase intentions? Electronic Commerce Research and Applications, 35, 100854. https://doi.org/10.1016/j.elerap.2019.100864

22. Walia, S., & Tomar, J. (2024). Consumer attitude towards virtual try-on experiences: Examining the impact of augmented reality on consumer purchasing behavior. International Journal of Innovation in Engineering Research and Management, 11(2), 238–245.
23. Yim, M. Y. C., Chu, S. C., & Sauer, P. L. (2017). Is augmented reality technology an effective tool for e-commerce? An interactivity and vividness perspective. Journal of Interactive Marketing, 39, 89–103.