The Perceived Risk in Augmented Reality on Students' Online Purchase Decisions

Thamrin
Institut Bisnis Informasi Teknologi dan Bisnis; Medan, Indonesia
E-Mail: thamrin@itnb.ac.id

Ika Puspa Satrianny
Institut Bisnis Informasi Teknologi dan Bisnis; Medan, Indonesia
E-Mail: ikapuspa@itnb.ac.id

Nasib
Institut Bisnis Informasi Teknologi dan Bisnis; Medan, Indonesia
E-Mail: nasib@itnb.ac.id

Ratih Amelia
Politeknik Unggul LP3M; Medan, Indonesia
E-Mail: rameliahaque1217@yahoo.com

Wily Julitawaty
Sekolah Tinggi Ilmu Ekonomi Professional Manajemen College Indonesia; Medan, Indonesia
E-Mail: wilyjulitawaty@yahoo.com

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ABSTRACT

This study aims to analyze the direct and indirect effects of Augmented Reality (AR) and online trust on online purchasing decisions, with perceived risk as a mediating variable. The study used a quantitative approach with the Structural Equation Modeling method based on Partial Least Squares (PLS-SEM). Data were collected from 150 students who had shopped online using AR technology, using a purposive sampling technique. The results of the analysis showed that AR and online trust had a positive and significant effect on online purchasing decisions, and were able to reduce perceived risk. However, perceived risk did not have a significant effect on purchasing decisions, and did not act as a mediator between AR and online trust on online purchasing decisions. These findings indicate that the digital generation is more influenced by interactive experiences and platform credibility than by perceived risk. The managerial implications of this study emphasize the importance of increasing interactive technology and building consumer trust in e-commerce strategies. The research instrument was developed from previously validated indicators, including visual aspects, interactivity, security, and trust in the platform, as well as perceptions of risk and purchasing decisions.

Keywords*: Augmented Reality, Digital Consumer Behavior, Online Trust, Perceived Risk, Purchase Decision, University Students.*

ABSTRAK

Penelitian ini bertujuan untuk menganalisis pengaruh langsung dan tidak langsung dari Augmented Reality (AR) dan kepercayaan daring terhadap keputusan pembelian daring, dengan persepsi risiko sebagai variabel mediasi. Penelitian ini menggunakan pendekatan kuantitatif dengan metode Structural Equation Modeling berbasis Partial Least Squares (PLS-SEM). Data

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dikumpulkan dari 150 mahasiswa yang pernah berbelanja daring menggunakan teknologi AR, dengan menggunakan teknik purposive sampling. Hasil analisis menunjukkan bahwa AR dan kepercayaan daring berpengaruh positif dan signifikan terhadap keputusan pembelian daring, serta mampu menurunkan persepsi risiko. Namun, persepsi risiko tidak berpengaruh signifikan terhadap keputusan pembelian, serta tidak berperan sebagai mediator antara AR dan kepercayaan daring terhadap keputusan pembelian daring. Temuan ini menunjukkan bahwa generasi digital lebih dipengaruhi oleh pengalaman interaktif dan kredibilitas platform daripada oleh persepsi risiko. Implikasi manajerial dari penelitian ini menekankan pentingnya peningkatan teknologi interaktif dan membangun kepercayaan konsumen terhadap strategi e-commerce. Instrumen penelitian dikembangkan dari indikator-indikator yang telah divalidasi sebelumnya, meliputi aspek visual, interaktivitas, keamanan, dan kepercayaan terhadap platform, serta persepsi risiko dan keputusan pembelian.

***Kata kunci**: Augmented Reality, Perilaku Konsumen Digital, Kepercayaan Daring, Risiko yang Dirasakan, Keputusan Pembelian, Mahasiswa.*

INTRODUCTION

The rapid advancement of information and communication technology has led to major changes in consumer behavior, especially in the area of bold purchases. This technological development has changed the way consumers gather information, rotate alternatives, and complete transactions through digital platforms (Gonçalves et al., 2024). The widespread availability of internet access, coupled with the user-friendly nature of e-commerce interfaces, has significantly increased the convenience and speed of the shopping experience (Varga & Albuquerque, 2024; Eklund et al., 2024). Consumer decisions to make bold purchases present strategic opportunities for businesses to increase product sales volume (Rusniati et al., 2024). The integration of digital technologies such as social media and bold marketing campaigns enables companies to engage directly with consumers, gain insights into their preferences, and customize product offerings in real-time (Roy et al., 2024; Dong et al., 2024; Sembiring & Nisa, 2024; Rasum & Abadi, 2024).

Although online shopping offers various benefits, businesses must remain vigilant against various risks that can threaten the sustainability of their operations (Handoyo, 2024; Prastito & Wardi, 2024; Li et al., 2024). Failure to manage these risks effectively can lead to loss of consumer trust and decreased revenue (Xu & Liu, 2024; Chen, 2024). Although the trend of online shopping continues to grow and offers various conveniences, it also raises new concerns, especially regarding consumer risk perception (Cao et al., 2024). Herlina et al. (2025) explain dimensions, including financial risk, data privacy, product quality, and transaction security, all of which can significantly influence purchasing decisions. Consumers often experience anxiety about potential fraud, unauthorized access to personal information, or receiving products that fail to meet expectations (Hipólito et al., 2025). These concerns pose significant challenges for e-commerce providers in building consumer trust (Assin et al., 2024).

Previous research by Anggraeni (2024) showed that high levels of perceived risk can inhibit consumers' intention to engage in online shopping. Negative experiences in the past such as fraud or receiving products that do not meet expectations can increase perceived risk and reduce consumer trust in e-commerce platforms (Handoyo, 2024; Susipta et al., 2025). These steps are important to rebuild consumer trust, foster customer loyalty, and support long-term sales growth in the digital market. Businesses must adopt effective strategies to manage and reduce consumer perceived risk (Mazur-Włodarczyk et al., 2024; Hossain & Xue, 2025). Rota et al. (2024) consumers tend to feel confident and loyal to their purchasing decisions. In the long run, this not only strengthens the relationship between consumers and brands, but also contributes to sustainable sales growth and builds competitive advantages for businesses in the digital market (Li et al., 2024).

Augmented Reality (AR) features such as virtual try-on tools, allow users to interact with products virtually before purchasing, thereby increasing the personalization and interactivity of the shopping process (Sarkis et al., 2025). Taneja's (2025) study showed that Augmented Reality (AR) technology has a significant impact on online shopping decisions, especially through the mediating role of perceived risk. Another important factor influencing online purchasing decisions is consumer trust in the platform (Chakraborty et al., 2024). Marin and Copeland (2022) Sustained trust not only increases consumer convenience during online shopping but also contributes to long-term customer loyalty and business growth. Previous research Arguedas et al. (2025) showed that online trust has a direct and significant influence on consumers' online purchasing decisions. Trust in an e-commerce platform includes the belief that the information provided is accurate, transactions are secure, and personal data is well protected (Jethava & Rao, 2024). Consumers with high levels of trust tend to feel more confident and comfortable when making purchases (Wang et al., 2022; Qin et al., 2024; Garrouch et al., 2024). This study aims to examine the influence of Augmented Reality (AR) and online trust on online purchasing decisions, highlighting the mediating role of perceived risk, especially among Generation Z students as active users of digital technology.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Risk Perception and Online Shopping Decisions

Wendy (2024) refers perceived risk as to the level of uncertainty and potential loss that consumers associate with online transactions. According to Singh et al. (2025), perceived risk includes several dimensions, including financial risk, product performance risk, privacy risk, social risk, time risk, and psychological risk. When consumers fear losing money, receiving an unsatisfactory product, experiencing a data breach, or experiencing a delay in delivery, their intention to complete an online purchase tends to decrease (Bhutto et al., 2025). Perceived risk plays an important role in shaping consumer trust in online vendors (Nasrudin et al., 2024). The greater the perceived risk, the lower the level of trust consumers place in the digital platform, which ultimately affects their purchasing decisions (Zhang et al., 2024). Consumers who perceive high risk tend to avoid online transactions due to feelings of insecurity and uncertainty about the outcome (Pham et al., 2024). Ghaazi et al. (2024) financial and privacy risks are significant barriers to online shopping. Consumers are often hesitant to share personal and financial information unless the platform provides clear and reliable data security guarantees (Ablan et al., 2025). Previous studies have shown that perceived risk negatively influences online purchasing decisions (Phamthi et al., 2024; Fernandez-Lores et al., 2024; Peng et al., 2024; Michałowska et al., 2024).

H1: Risk perception has a positive effect on online shopping decisions.

Augmented Reality, Risk Perception, and Online Shopping Decisions

Augmented Reality (AR) is an innovative technology that allows consumers to interact visually and in real-time with a digital representation of a product before making a purchase (Erdmann et al., 2023). AR overcomes the limitations of shopping audacity, where consumers cannot touch or try the product physically (Al Hilal, 2023). This technology functions not only as a visual aid but also as a tool to create interactive experiences that increase emotional engagement and perceived product value (Amiera et al., 2023; Kang et al., 2023). The use of Augmented Reality (AR) in the retail world increases consumer emotional engagement, product value perception, and trust in the quality of the goods presented (Zimmermann et al., 2023). This study shows that the higher the quality of the AR experience, the more likely consumers are to continue purchasing (Pini et al., 2023; Pfaff & Spann, 2023). By enriching sensory experiences and providing emotional satisfaction, AR directly influences purchase intentions and decision-making, positioning it as a strategic tool in shaping consumer behavior in digital commerce (Nugroho & Wang, 2023). Alimamy and Gnoth (2022) confirm that

Augmented Reality (AR) has a positive and significant influence on bold shopping decisions. The unique advantage of AR lies in its ability to reduce consumer comfort by providing realistic visualizations that closely resemble the actual use of the product (Dogra et al., 2023; Sarkis et al., 2025). As a result, AR fosters greater confidence and trust before consumers commit to a purchase decision (Kang et al., 2023).

H2: Augmented Reality has a positive effect on risk perception.
H3: Augmented Reality has a positive effect on online shopping decisions.
H4: Augmented Reality has a positive effect on online shopping decisions through risk perception.

Online Trust, Risk Perception, and Online Shopping Decisions

Online trust refers to consumers' belief in the reliability, honesty, and integrity of an e-commerce platform in providing safe and satisfactory services (Li, 2024). This form of trust includes important elements such as personal data protection, financial transaction security, seller reputation, customer reviews, and consistent service quality (Handoyo, 2024). Given that consumers cannot physically inspect the product before purchasing, trust becomes a fundamental factor in determining the success of online transactions. As a result, online trust plays a vital role in shaping purchasing decisions in today's digital commerce landscape. One of the essential components in building online trust is a professionally designed and informative website (Cham et al., 2024). Hao et al. (2025) a clear return policy significantly increases consumer trust in the platform. User-generated reviews and testimonials also play an important role in shaping perceptions of trust (Arizal et al., 2024). Consumers tend to rely on the experiences of others who have previously interacted with the platform. Previous research by Peña-García et al. (2024) showed that high levels of trust in online platforms directly contribute to increased purchase intentions and consumer decision making. When a platform successfully builds a credible and trustworthy image, consumers tend to be more involved in transactions (Ashiq & Hussain, 2024). Thus, trust serves as a key factor in reducing perceived risk and fostering a greater sense of security and confidence during the online purchasing process (Arizal et al., 2024).

H5: Online trust has a positive effect on risk perception.
H6: Online trust has a positive effect on online shopping decisions.
H7: Online trust has a positive effect on online shopping decisions through perceived risk.

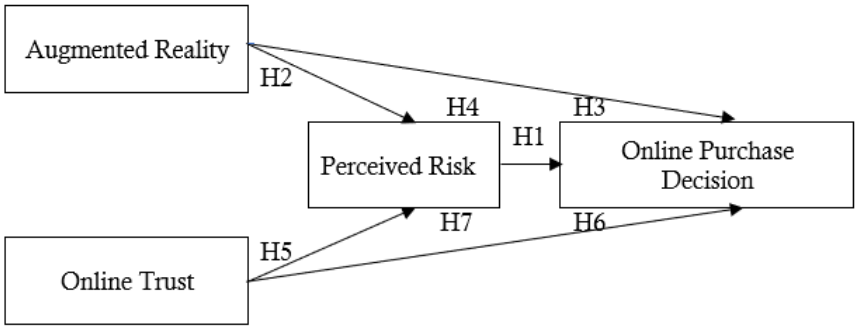

Figure 1. Research Framework

Figure 1 illustrates the conceptual framework of the study designed to explain the relationship between Augmented Reality (AR), online trust, perceived risk, and online purchase decisions. The framework proposes seven hypotheses that describe both direct and indirect relationships between the variables. The first hypothesis states that perceived risk has a negative effect on online purchase decisions, reflecting that the higher the perceived risk, the lower the consumer's propensity to purchase. Furthermore, AR is assumed to have two positive effects: directly on perceived risk and purchase decisions,

and indirectly through the mediation of perceived risk. Similarly, online trust is hypothesized to have a positive effect on perceived risk, directly on purchase decisions, and also indirectly through perceived risk as a mediator. This framework emphasizes the importance of understanding the mediating role of perceived risk in bridging the influence of technology and trust on digital consumer behavior, especially in the context of online shopping by the younger generation.

RESEARCH METHOD

This research method uses a quantitative approach research method with a survey approach. The population in this study were all students who had made online purchases using Augmented Reality (AR) technology. The sample was taken from the population with the criteria of students who had used AR at least once when shopping online. The sample selection aims to obtain relevant data related to user experiences and perceptions of AR technology in the context of online purchases. The sampling technique used purposive sampling, with participant criteria that are relevant to the context and objectives of the study. A total of 150 respondents who met the criteria were willing to participate in data collection. To process and analyze data, this study uses the Structural Equation Modeling (SEM) method based on Partial Least Squares (PLS) with the help of SmartPLS software. This analysis is used to evaluate the direct and indirect relationships between variables and to assess the role of perceived risk as a mediating variable in the relationship between augmented reality and online trust on online shopping decisions.

The research data was sourced from primary data, which was obtained through the distribution of structured questionnaires. The questionnaire was developed based on indicators that have been validated in previous studies and adapted to the context of this research. Then the Augmented Reality (AR), variable is measured through several indicators, including: visual engagement, interactivity, perceived realism, as well as ease of use of features and the excitement of the experience when shopping. The online trust variable includes indicators such as perceptions of seller honesty (OT1), e-commerce platform credibility, security in financial transactions, general platform reputation, ease of contacting customer service, and service consistency. The perceived risk variable is measured through indicators of financial risk, privacy risk, product quality uncertainty (PR3), delivery-related risks (PR4), doubts about warranty fulfillment, and concerns about product delay or damage. Finally, the online shopping decision variable is measured by indicators such as intention to buy products, consumer confidence in making purchases, satisfaction with the transaction process, and willingness to recommend the platform.

RESULTS

The measurement model analysis aims to assess the feasibility of the research instrument through two main tests: reliability and construct validity tests, and discriminant validity tests. Reliability and construct validity tests ensure that indicators are able to measure constructs consistently and accurately, while discriminant validity tests the extent to which a construct can be distinguished from other constructs. The results of these two tests are an important basis for assessing the suitability of the measurement model in supporting further structural analysis. Thus, the instrument used is considered valid and reliable to measure research variables empirically.

Table 1. Outer Model Results

Code	Indicators	Loading Factor
AR1	I find AR product visualization very interesting	0.867
AR2	I can interact directly with the product through the AR feature	0.845
AR3	The AR display feels real and resembles the original product	0.832
AR4	The AR feature is easy to use when shopping online	0.819
AR5	Shopping using the AR feature provides a pleasant experience	0.851
OT1	I believe that sellers on this platform are honest in offering products	0.888
OT2	This e-commerce platform has a trustworthy reputation	0.873
OT3	I feel safe when making financial transactions on this platform	0.891
OT4	In general, this platform has good credibility	0.866
OT5	I can easily contact customer service if I experience problems	0.828
OT6	The services provided by this platform are consistent and satisfactory	0.846
PR1	I am worried about losing money when shopping online	0.857
PR2	I am worried that my personal data will be misused by the platform	0.872
PR3	I have doubts about the quality of products sold online	0.841
PR4	I feel that product delivery is at risk of not being on time or being damaged	0.814
PR5	I doubt whether the warranty will actually be given	0.826
PR6	I am worried that the goods do not match the product description	0.833
SD1	I have a strong intention to buy products online	0.865
SD2	I am confident in making purchasing decisions through the online platform	0.881
SD3	I am satisfied with the online purchase transaction process	0.872
SD4	I am willing to recommend this platform to others	0.858

Table 1 shows that all indicators in this study have loading factor values exceeding the 0.5 threshold, indicating that each item meets the required standards of validity and reliability. This confirms that the indicators used are appropriate and effective in measuring their respective constructs, ensuring the accuracy and consistency of the measurement model used in the research.

Table 2. Composite Reliability

Variables	Composite Reliability
Augmented Reality	0.865
Online Trust	0.85
Perceived Risk	0.866
Online Purchase Decision	0.826

The results of the composite reliability test in Table 2 show that all variables have values above 0.8, namely Augmented Reality (0.865), Online Trust (0.85), Perceived Risk (0.866), and Online Purchase Decision (0.826). These values exceed the minimum threshold of 0.6, indicating that the research instrument has high reliability and strong internal consistency. Thus, the data collected is considered reliable and suitable for use in the next stage of structural model analysis, thus strengthening validity.

Table 3. Discriminant Validity Results

Indicators	Augmented Reality	Online Trust	Perceived Risk	Online Purchase Decision
AR1	0.867	0.512	0.384	0.478
AR2	0.845	0.493	0.401	0.465
AR3	0.832	0.475	0.392	0.453
AR4	0.819	0.461	0.405	0.446
AR5	0.851	0.487	0.399	0.471
OT1	0.494	0.888	0.476	0.628
OT2	0.477	0.873	0.462	0.613
OT3	0.468	0.89	0.489	0.641
OT4	0.455	0.866	0.471	0.622
OT5	0.472	0.828	0.468	0.607
OT6	0.481	0.846	0.474	0.615
PR1	0.419	0.456	0.857	0.392
PR2	0.407	0.441	0.872	0.384
PR3	0.395	0.438	0.841	0.372
PR4	0.381	0.426	0.814	0.361
PR5	0.404	0.444	0.826	0.376
PR6	0.412	0.452	0.833	0.385
SD1	0.498	0.638	0.388	0.865
SD2	0.504	0.654	0.401	0.881
SD3	0.519	0.667	0.412	0.872
SD4	0.486	0.635	0.396	0.858

The results of the study in Table 3 show that each indicator has the highest factor loading on the intended construct compared to other constructs, proving the existence of strong discriminant validity. This indicates that each measurement item is able to distinguish well between one latent variable and other variables in the model. High discriminant validity strengthens the reliability of the measurement model, ensuring that each construct has a clear identity and does not overlap. Thus, the model can be used accurately to test the relationship between variables in further structural analysis.

Table 4. Determination Coefficient (R-Square)

Variable	R-Square	R-Square Adjusted
Online Trust (Y1)	0.612	0.606
Online Purchase Decision (Y2)	0.683	0.677

The research results in Table 4 present the coefficient of determination (R-Square), which reflects the model's explanatory power. The R-Square for Online Trust is 0.612, indicating that 61.2% of the variance in Online Trust can be explained by Augmented Reality. Meanwhile, Online Purchase Decision has an R-Square value of 0.683, meaning that 68.3% of its variance is explained collectively by Online Trust, Augmented Reality, and Perceived Risk. The adjusted values, which are only slightly lower, confirm the model's robustness and relevance for further structural analysis.

Table 5. Predictive Relevance Results (Q2)

Endogenous Variable	Q^2 Value
Online Trust (Y1)	0.427
Online Purchase Decision (Y2)	0.493

Table 5 presents the Q^2 (predictive relevance) values generated through the Blindfolding procedure using SmartPLS. A Q^2 value above 0 indicates that the model has predictive capability for the endogenous variables. The Q^2 value for Online Trust is 0.427, reflecting moderate predictive power, while the Q^2 value for Online Purchase Decision is 0.493, indicating high predictive accuracy. These values demonstrate that the model effectively predicts the outcomes of the dependent variables, thereby reinforcing the robustness and validity of the proposed theoretical framework used in this research.

Table 6. Hypothesis Testing

Hypothesis	Original Sample (β)	Standard Deviation	t-Statistics	p-Values	Result
Perceived Risk → Online Purchase Decision	–0.097	0.073	1.329	0.185	Not Supported
Augmented Reality → Perceived Risk	–0.298	0.077	3.870	0.000	Supported
Augmented Reality → Online Purchase Decision	0.275	0.071	3.873	0.001	Supported
Augmented Reality → Perceived Risk → Online Purchase Decision	0.029	0.024	1.208	0.227	Not Supported
Online Trust → Perceived Risk	–0.256	0.07	3.657	0.000	Supported
Online Trust → Online Purchase Decision	0.392	0.068	5.765	0.002	Supported
Online Trust → Perceived Risk → Online Purchase Decision	0.025	0.021	1.19	0.234	Not Supported

The results of hypothesis testing in Table 6 provide a significant understanding of the relationship between the main variables in the research model. Augmented Reality (AR) is proven to have a positive and significant effect on online purchasing decisions (β = 0.275; p = 0.001), and has a significant negative effect on perceived risk (β = –0.298; p = 0.000). This means that the use of AR can reduce consumer risk perception and directly encourage purchasing decisions. Likewise, online trust has a positive effect on online purchasing decisions (β = 0.392; p = 0.002) and a negative effect on perceived risk (β = –0.256; p = 0.000), indicating that the higher the consumer's trust in the platform, the lower the risk perception. However, the effect of perceived risk on online purchasing decisions is not significant (β = –0.097; p = 0.185), indicating that risk perception does not directly affect purchasing decisions in this context. In addition, the role of risk as a mediator in the relationship between AR and online trust on purchasing decisions is also not significant. These findings underscore the importance of a hands-on approach to building trust and leveraging AR technology to drive online purchasing decisions.

DISCUSSION

Based on the results of data analysis, the use of Augmented Reality (AR) technology significantly reduces the perceived risk in bold shopping activities among students at the Institute of Business, Information Technology, and Business (Yoo, 2023; Barta et al., 2023a). These findings indicate that students are able to utilize the interactive visual features of AR to gain a more comprehensive understanding of the product before making a purchase. This finding is in line with Enyejo et al. (2024) who showed that AR plays an important role in reducing consumers' perceived risk by increasing the clarity of product information and providing a more immersive shopping experience. AR's ability to provide a more realistic and personalized digital experience positions it as a strategic tool to encourage informed and confident purchasing decisions. The findings of this study confirm that trust in digital platforms plays a significant role in reducing the perceived risk of students at the Institute of Business, Information Technology, and Business. These results highlight the importance of strengthening bold trust as a primary strategy to reduce risk in digital transactions. These findings are in line with research by Ashiq & Hussain (2024), Peña-García et al. (2024), and Hao et al. (2025) who showed a negative correlation between perceived risk and perceived risk. The higher the consumer's trust in a digital platform, the lower their concerns about potential losses, product inconsistencies, or security issues during transactions.

The use of Augmented Reality (AR) has a significant positive impact on online purchasing decisions among students at the Institute of Business, Information Technology, and Business. This finding highlights the potential for universities to integrate digital technology and consumer protection education into the curriculum, empowering students to become adaptive change agents in the ever-evolving digital

business ecosystem. This is consistent with research by Zimmermann et al. (2023) and Kour et al. (2025) which showed that interactive digital experiences supported by Augmented Reality (AR) increase consumer emotional engagement, strengthen perceived product value, and drive online purchasing decisions. The results of the data analysis showed that consumer trust in online platforms has a positive and significant effect on purchasing decisions among students at the Institute of Business, Information Technology, and Business.

The results of the study show that students have a high level of trust in the digital transaction system, which makes them more confident in making e-commerce purchases. This finding is in line with Liu et al. (2024), Kordzadeh and Bozan (2024), and Garrouch et al. (2024) who stated that online trust has a significant effect on purchasing decisions. However, risk perception did not show a significant effect, either directly or as a mediator between Augmented Reality (AR) and purchasing decisions. This is different from the previous findings of Pavlou (2003) who emphasized the importance of risk as a barrier to online transactions. Students, as digital natives, seem to focus more on convenience and interactive experiences than risk. AR provides added value through product visualization and emotional interaction, not simply because it reduces risk. In the context of ever-evolving e-commerce, trust and immersive technology are key in shaping the consumer behavior of the younger generation. Perceived risk does not play a significant mediating role in the relationship between online trust and purchase decisions among college students at the Institute of Business, Information Technology, and Commerce. This finding suggests that college students' trust in e-commerce platforms directly influences their purchase decisions without the need for perceived risk as an intervening variable (Kordzadeh & Bozan, 2024).

CONCLUSION

The results of the structural model analysis show that Augmented Reality (AR) and online trust have a direct, positive, and significant influence on purchasing decisions among students of the Institute of Information Technology and Business. In addition, AR and online trust significantly reduce risk perception in online shopping. However, risk perception does not have a significant direct influence on purchasing decisions, nor does it function as a mediating variable between AR or online trust and purchasing behavior. These findings indicate that among digital native consumers, digital experience and platform trust play a more determining role than risk perception in shaping purchasing behavior. The results offer several strategic implications. For digital business practitioners and e-commerce platforms, the strong influence of AR underscores the need to integrate interactive visual features to enhance consumer engagement. Meanwhile, the critical role of online trust highlights the importance of transaction security, data protection, and transparency. Educational institutions can also utilize these findings to align digital marketing education with current consumer trends. Despite these contributions, this study has several limitations. The sample is restricted to students from a single institution, limiting generalizability. Its cross-sectional design also prevents the observation of behavioral changes over time. Additionally, the reliance on self-reported data may introduce bias, and the exclusion of other potentially influential variables, such as perceived value, user satisfaction, or emotional involvement, may limit the explanatory depth. Future research should adopt longitudinal or mixed-method approaches, incorporate broader and more diverse samples, and examine additional mediating or moderating variables to better understand the evolving dynamics of online consumer behavior.

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