



The Impact of Augmented Reality Virtual Try-On on Consumers' Purchase Decisions in Online Fashion Shopping: A Randomized Controlled Experimental Study

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ABSTRACT

Augmented Reality (AR) Virtual Try-On technology has emerged as an innovative solution that enables consumers to virtually visualize fashion products in real time. This study aims to examine the effect of AR Virtual Try-On technology on consumers' purchase decisions. A total of 66 participants were randomly assigned to either an AR group or a non-AR group. The results revealed a significant difference in purchase decision between the two groups ($t = 3.54$, $p = 0.002$). Participants in the AR group reported a higher mean purchase decision score ($M = 4.04$) compared to those in the non-AR group ($M = 3.14$). Regression analysis demonstrated that AR usage had a positive and significant effect on purchase decision ($\beta = 0.62$, $p < 0.001$), explaining 38% of the variance in purchase decision ($R^2 = 0.38$). The effect size analysis also indicated a large effect of AR technology (Cohen's $d = 1.17$). These findings suggest that AR Virtual Try-On technology enhances consumer confidence and product evaluation, thereby increasing purchase decisions in online fashion retail. However, this study is limited by its relatively small sample size and the use of a simulated shopping environment, which may restrict the generalizability of the findings. Future research should involve larger and more diverse samples and examine additional factors, such as consumer trust, perceived fit, and user satisfaction, to provide a more comprehensive understanding of the impact of AR technology on online purchasing behavior.

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1. INTRODUCTION

The e-commerce sector in the fashion industry has experienced remarkable growth in recent years. According to the Ministry of Trade of the Republic of Indonesia, e-commerce continues to dominate the country's digital economy, generating transaction values of approximately US\$71 billion, representing a 14% increase compared to the previous year. Despite this substantial growth, one of the primary challenges in online fashion shopping is consumers' inability to physically try on products before making a purchase. This limitation creates uncertainty regarding how garments will fit and appear when worn, thereby increasing perceived risk, reducing customer confidence, and contributing to higher product return rates.

To address this challenge, Augmented Reality (AR) Virtual Try-On technology has emerged as an innovative solution that enables consumers to visualize garments on their own bodies in real time. By providing a more realistic and personalized shopping experience, AR has the potential to improve product evaluation, reduce uncertainty, and enhance consumer confidence during the online purchasing process. Previous studies have reported that AR technologies can positively influence consumer engagement, perceived usefulness, and purchase intention in retail environments. In addition, recent virtual try-on research suggests that AR can improve product visualization and support more informed purchasing decisions.

However, despite these promising findings, existing research has predominantly relied on cross-sectional survey designs and has primarily focused on attitudinal outcomes, such as user satisfaction, perceived usefulness, and purchase intention. Consequently, empirical evidence regarding the causal impact of AR Virtual Try-On technology on actual purchase decision remains limited. Furthermore, relatively few studies have employed randomized controlled experimental designs capable of isolating the effect of AR from other interface-related factors and establishing clear cause-and-effect relationships.

To address these limitations, the present study employs a randomized controlled experimental design to investigate the effect of AR Virtual Try-On technology on consumers' purchase decisions in online fashion retail. By focusing on actual purchase decision outcomes and utilizing an experimental approach, this study extends prior research and provides stronger causal evidence regarding the effectiveness of AR technology in digital commerce environments.

2. METHODS

2.1. Research Design

This study adopts a quantitative approach using a randomized controlled experiment (RCT) design to examine the causal effect of Augmented Reality (AR) Virtual Try-On technology on consumers' purchase decisions in the context of online fashion retail. The experimental design enables the researcher to isolate the effect of AR technology by comparing outcomes across two controlled conditions.

Participants were randomly assigned to one of two groups: (1) the experimental group (AR condition), which interacted with an e-commerce interface incorporating an AR Virtual Try-On feature, and (2) the control group (non-AR condition), which used an identical e-commerce interface without the AR functionality. Each participant was exposed to only one experimental

condition to prevent carryover effects and learning biases that could influence the validity of the results.

This study employs a causal research design with the objective of determining whether the use of AR technology directly influences consumers' purchase decisions. Through the manipulation of the independent variable within a controlled experimental environment, this approach provides stronger evidence of cause-and-effect relationships than conventional survey-based or observational research methods.

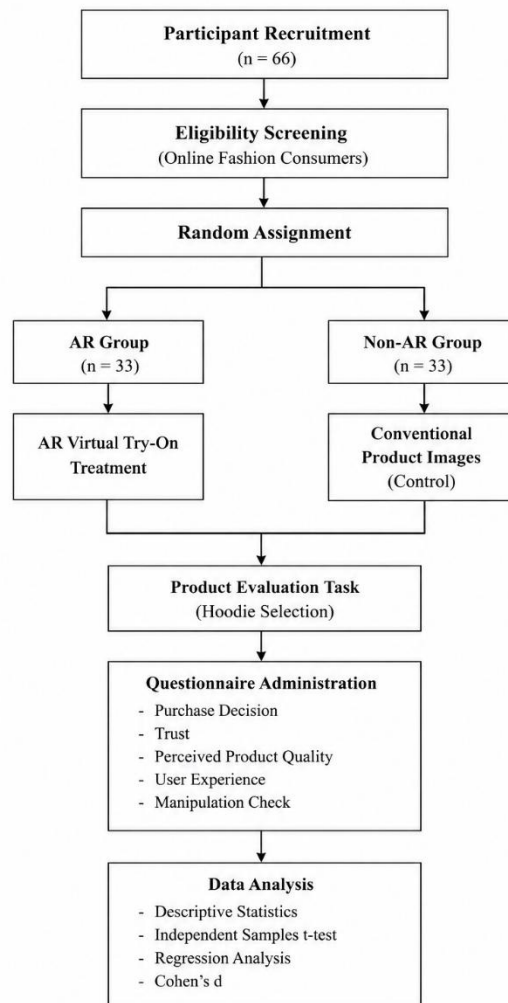


Figure 1. Research Design

To improve the transparency and reproducibility of the experimental design, the overall research procedure is illustrated in Figure X. The diagram summarizes the key stages of the randomized controlled experiment, including participant recruitment, eligibility screening, random assignment, treatment implementation, questionnaire administration, and statistical analysis. This visual representation provides a clear overview of the study workflow and facilitates the replication of the research methodology.

2.2. Participants and Experimental Procedure

The target population of this study consisted of individuals aged 18 years and above who actively use e-commerce platforms. A total of 66 participants were recruited using a purposive sampling technique based on the following criteria:

- a) having prior experience purchasing fashion products online,
- b) being familiar with mobile-based shopping applications, and
- c) possessing basic digital literacy skills.

These criteria were established to ensure that participants were representative of typical online fashion consumers and capable of interacting with the experimental platform. Following recruitment, participants were randomly assigned to one of two experimental conditions, with approximately 20 participants for non-AR group and 46 participants for AR group with total of 66 participants. The sample size was justified through an a priori power analysis. Following Cohen's (1988) [7] guidelines, a significance level of $\alpha = 0.05$ and a statistical power of 0.80 were adopted. Assuming a medium effect size ($d = 0.50$), the minimum required sample size for an independent samples t-test was estimated to be approximately 64 participants. Therefore, the final sample of 66 participants was considered sufficient to detect statistically meaningful differences between the experimental and control groups while maintaining adequate statistical power.

The experiment was conducted using a mobile-based e-commerce interface designed to simulate a realistic online shopping environment. Participants were instructed to browse and evaluate a fashion product (e.g., a hoodie) as if they were making an actual purchase decision. Depending on the assigned condition, participants interacted either with an interface equipped with an AR Virtual Try-On feature (experimental group) or with an identical interface without the AR functionality (control group). After completing the product evaluation task, participants were asked to indicate their purchase decision and complete a questionnaire measuring the constructs investigated in this study.

Table 1. Participants

Participants in the experimental group (AR condition)	Participants in the control group (non-AR condition)
They were given access to an AR Virtual Try-On feature, allowing them to virtually visualize and interact with the selected fashion product in real time.	They only evaluated the selected fashion product using conventional static product images, with no AR Virtual Try-On feature available

All other elements of the shopping interface, including product price, product description, layout structure, navigation features, and visual design, were kept identical across both experimental conditions to ensure experimental consistency and maintain internal validity. Consequently, the AR Virtual Try-On feature represented the sole manipulated variable between the two groups.

Prior to participation, all respondents were provided with information regarding the purpose of the study, the experimental procedures, and their rights as research participants. Informed consent was obtained from all participants before the experiment commenced. Participation was entirely voluntary, and respondents were informed that they could

withdraw from the study at any time without penalty. To ensure confidentiality, no personally identifiable information was collected, and all responses were analyzed anonymously. The study was conducted in accordance with the ethical principles for research involving human participants.

2.3. Research Variables

Table 2. Variables

Independent Variable	Dependent Variable
<p>The independent variable in this study is the use of Augmented Reality (AR) Virtual Try-On technology. This variable was manipulated experimentally and coded as follows:</p> <p>1 = AR condition (participants were provided with the AR Virtual Try-On feature)</p> <p>0 = non-AR condition (participants were exposed to a conventional shopping interface without AR functionality)</p>	<p>The dependent variable is Purchase Decision, which was measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The construct was assessed through the following dimensions:</p> <p>Purchase Intention: the participant's intention to purchase the selected fashion product.</p> <p>Purchase Likelihood: the perceived likelihood of completing the purchase.</p> <p>Willingness to Pay: the participant's willingness to spend money on the product after evaluating it.</p> <p>Higher scores indicate a stronger tendency toward purchasing the product.</p>
Control Variable	Additional Variable
<p>To minimize potential confounding effects and improve the internal validity of the study, several control variables were included in the analysis. These variables consist of:</p> <p>Age: the participant's age at the time of the study.</p> <p>Gender: the participant's self-reported gender.</p> <p>Online Shopping Frequency: the frequency with which participants purchase products through online shopping platforms.</p>	<p>In addition to the primary independent and dependent variables, several supplementary constructs were measured to provide a more comprehensive understanding of consumer responses to AR Virtual Try-On technology:</p> <p>Trust: the degree of confidence consumers have in the product representation and the online shopping platform.</p> <p>Perceived Product Quality: consumers' evaluation of the overall quality and attractiveness of the product based on the information provided.</p> <p>User Experience (UX): consumers' overall perception of usability, enjoyment,</p>

	satisfaction, and ease of interaction with the shopping interface.
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2.4. Research Instruments

Data were collected using a structured questionnaire administered immediately after the completion of the experimental task. All questionnaire items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The questionnaire consisted of the following sections:

- a) Purchase Decision, measuring participants' intention and willingness to purchase the selected fashion product.
- b) Perceptions of AR Virtual Try-On (experimental group only), assessing participants' evaluations of the AR feature and its usefulness during the shopping experience.
- c) Trust, Perceived Product Quality, and User Experience, measuring participants' confidence in the product and platform, their perceptions of product quality, and their overall experience while interacting with the shopping interface.

In addition, a manipulation check was included to verify that participants assigned to the experimental group had actively engaged with the AR Virtual Try-On feature during the experiment.

The collected data were analyzed using statistical software (SPSS 7.0 and Microsoft Excel). The analysis was conducted in several stages.

- a) Descriptive statistics were used to summarize participants' demographic characteristics and provide an overview of the study variables.
- b) Independent samples t-test was performed to compare purchase decision scores between the AR and non-AR groups and determine whether significant differences existed between the two experimental conditions.
- c) Regression analysis was conducted to examine the effect of AR Virtual Try-On technology on consumers' purchase decisions.
- d) Effect size analysis (Cohen's d) was calculated to assess the magnitude of the differences observed between the experimental and control groups. For all statistical analyses, a significance level of $p < 0.05$ was adopted.

Internal validity was ensured through the random assignment of participants and the standardization of experimental conditions across groups. Construct validity was established by adapting measurement instruments from previously validated studies in the fields of e-commerce, consumer behavior, and augmented reality.

The reliability of the measurement scales was evaluated using Cronbach's alpha, with a minimum acceptable threshold of 0.70, indicating satisfactory internal consistency.

To support the experimental manipulation, two versions of a mobile-based e-commerce user interface were developed: an AR condition and a non-AR condition. The interfaces were designed to closely resemble commonly used e-commerce applications familiar to participants in order to enhance ecological validity and create a realistic shopping environment.

Both interfaces contained identical product information, including product images, descriptions, prices, layout structure, and navigation elements. The only difference between the two conditions was the presence of the AR Virtual Try-On feature in the experimental interface. This design ensured that any observed differences in consumer responses could be attributed to the AR functionality rather than other interface-related factors.

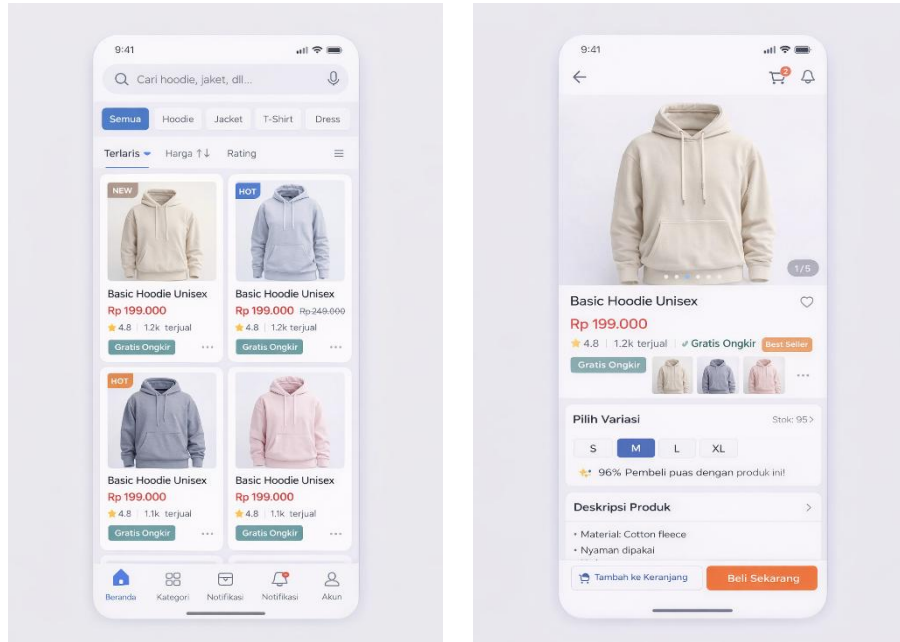


Figure 2. User Interface for Non-AR Users

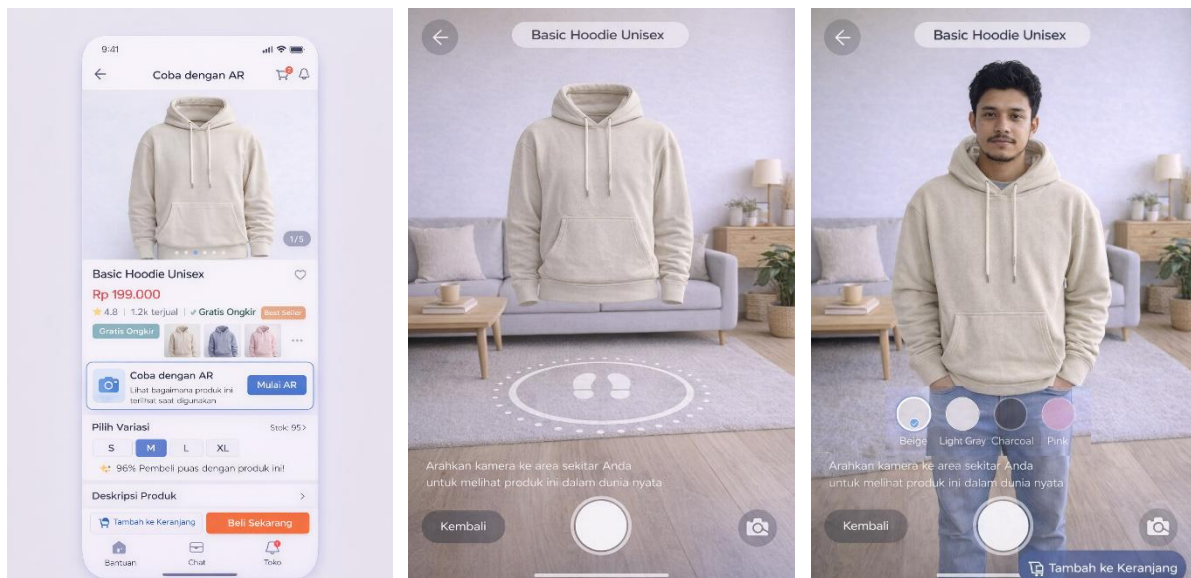


Figure 3. User Interface for AR Users

3. RESULTS AND DISCUSSION

3.1. Respondent Characteristics

This study involved a total of 66 participants who were active users of fashion e-commerce platforms. The participants were characterized based on demographic factors, including age, gender, and frequency of online shopping per month.

Table 3. Age Distribution

Age	Percentage
18–22 years	33,30%
23–27 years	47,00%
28–35 years	18,20%
>35 years	1,50%
Total	100%

As shown in table 3, the majority of participants were between 23 and 27 years old, accounting for 47.0% of the total sample, followed by those aged 18–22 years, who represented 33.3% of respondents. These findings indicate that the study was predominantly composed of young adults, a demographic group that is highly engaged with fashion e-commerce platforms.

Table 4. Gender Distribution

Gender	Percentage
Male	47%
Female	53%
Total	100%

Based on table 4, female participants constituted the largest proportion of the sample, representing 53.0% of respondents, while male participants accounted for 47.0%. This distribution suggests that female consumers were slightly more represented in the study and may be more actively involved in online fashion shopping activities.

Table 5. Online Shopping Frequency

Online Shopping Frequency	Percentage
1–2 times	7,60%
3–5 times	60,60%
more than 5 times	31,80%
Total	100%

Based on table 5, most respondents reported purchasing products online between three and five times per month, accounting for 60.6% of the sample. Additionally, 31.8% of respondents indicated that they engaged in online shopping more than five times per month. These results suggest that the majority of participants were active e-commerce users with substantial online shopping experience.

Table 6. Use of The AR Features

AR Usage	Frequency	Percentage
Yes	46	69,70%
No	20	30,30%
Total	66	100%

Based on table 6, the findings revealed that 69.7% of respondents utilized the AR Virtual Try-On feature when evaluating fashion products, whereas 30.3% did not use the feature. This result indicates a relatively high level of interest and willingness among consumers to engage with AR technology during the online fashion shopping process.

In addition to demographic information, the questionnaire measured several key constructs, including perceptions of AR Virtual Try-On technology (experimental group only), purchase decision, trust, perceived product quality, user experience, and manipulation check. The results of these measurements are presented in the following sections:

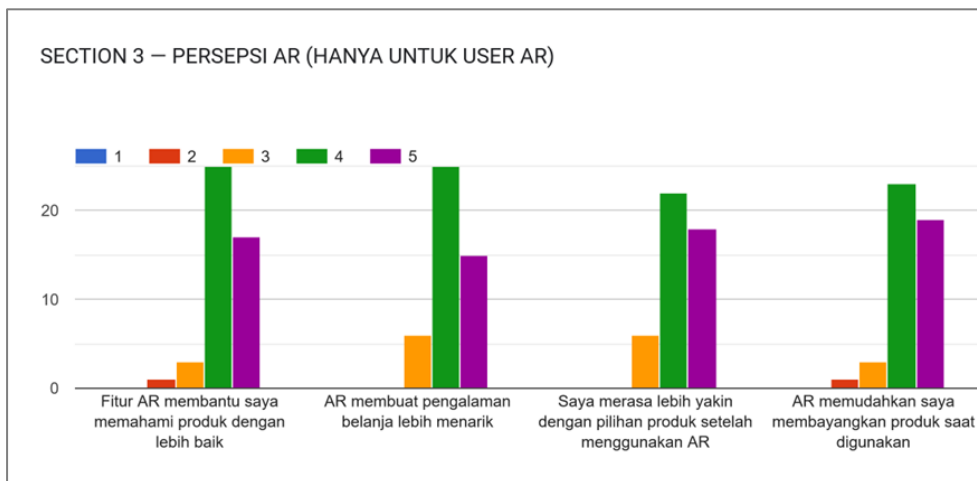


Figure 4. AR Perception Questionnaire (Experimental Group Only)

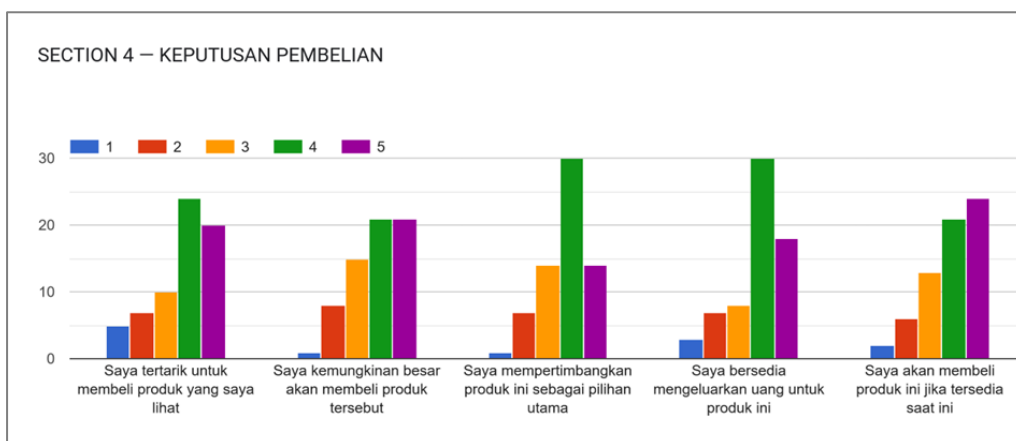


Figure 5. Purchase Decision Questionnaire

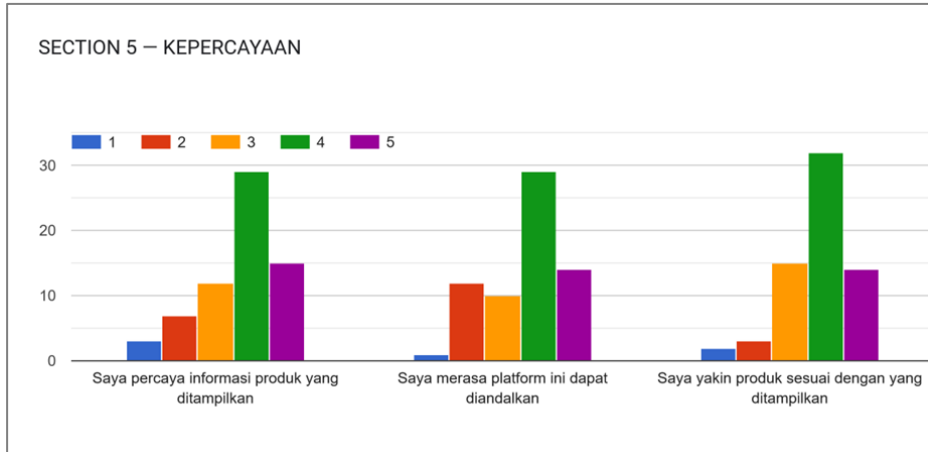


Figure 6. Trust Questionnaire

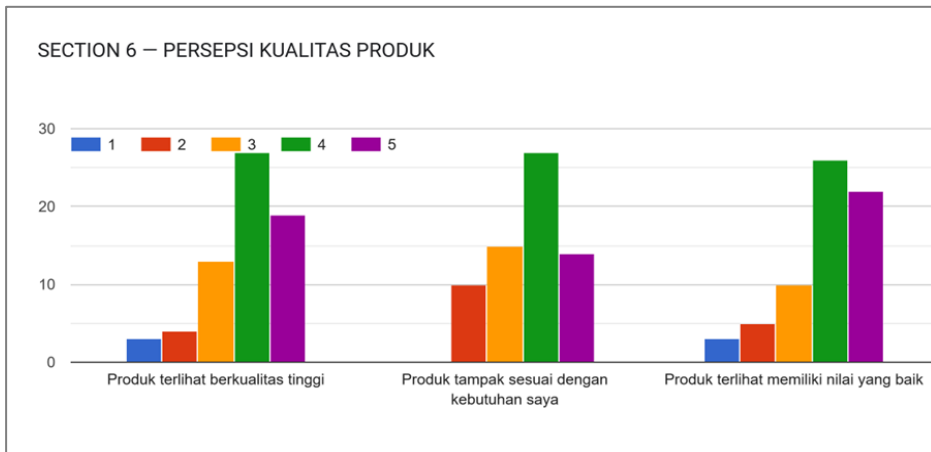


Figure 7. Perceived Product Quality Questionnaire

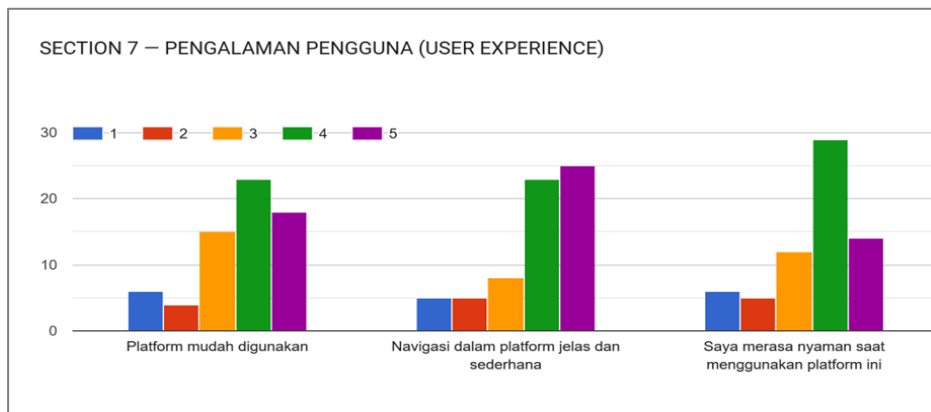


Figure 8. User Experience Questionnaire

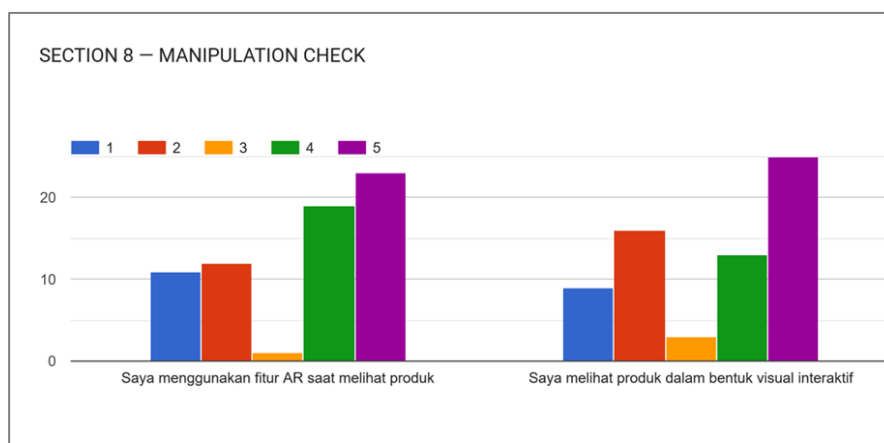


Figure 9. Manipulation Check

Based on figure 4 to 9 the questionnaire results indicate a generally positive perception of the AR Virtual Try-On feature among participants. Across all measurement constructs, the majority of responses were concentrated in the "Agree" (4) and "Strongly Agree" (5) categories, suggesting favorable evaluations of the technology and the shopping experience it provided.

For the AR Perception construct, most participants agreed that the AR feature helped them better understand products, made the shopping experience more engaging, increased confidence in product selection, and improved their ability to visualize products during use. These findings suggest that AR Virtual Try-On effectively enhanced product evaluation and consumer confidence.

Regarding Purchase Decision, respondents reported positive purchase-related intentions, including interest in purchasing the product, willingness to consider the product as a preferred option, readiness to spend money on the product, and intention to purchase if the product were immediately available. The predominance of high agreement scores indicates that AR technology may positively influence consumers' purchasing decisions.

The Trust results demonstrate that participants generally trusted the product information presented, considered the platform reliable, and believed that the product corresponded to its visual representation. Similarly, responses for Perceived Product Quality showed that participants viewed the product as high quality, relevant to their needs, and offering good value.

For User Experience, most respondents agreed that the platform was easy to use, provided clear navigation, and offered a comfortable shopping experience. Finally, the Manipulation Check results confirmed that participants recognized and interacted with the AR functionality, indicating that the experimental treatment was successfully implemented.

Overall, the findings suggest that AR Virtual Try-On technology positively influences consumer perceptions, trust, product evaluation, user experience, and purchase-related decision-making in online fashion shopping environments.

3.2. Independent Samples T-test

An independent samples t-test was conducted to determine whether there was a significant difference in purchase decision between participants who used the AR Virtual Try-On feature and those who were exposed to the non-AR condition. This analysis was

performed to evaluate the effect of AR technology on consumers' purchasing behavior by comparing the mean purchase decision scores of the two experimental groups.

Table 7. Purchase Decision

Group	N	Mean	Std. Dev
Non-AR	20	3,14	1,06
AR	46	4,04	0,6

Table 8. T-test Result

Variable	t-value	Sig. (p-value)
Purchase Decision	3,54	0,002

Based on the results of the independent samples t-test, a t-value of 3.54 was obtained with a significance level (p-value) of 0.002. Since the p-value was lower than the established significance threshold of 0.05 ($p < 0.05$), the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted.

These findings indicate that there was a statistically significant difference in purchase decision between the AR and non-AR groups. Participants who used the AR Virtual Try-On feature reported a higher mean purchase decision score ($M = 4.04$) compared to those in the non-AR condition ($M = 3.14$).

The results suggest that the use of AR Virtual Try-On technology has a positive effect on consumers' purchase decisions in the context of online fashion shopping. Specifically, the AR feature appears to enhance consumers' confidence in evaluating products, thereby increasing their likelihood of making a purchase.

These findings support the notion that AR-based visualization technologies reduce uncertainty during the online shopping process by providing a more realistic representation of products. Consequently, consumers may develop greater confidence in their purchasing decisions, leading to higher purchase decision scores compared to conventional non-AR shopping environments.

Table 9. Effect Size from Cohen-d

Effect Size	Score
Cohen's d	1,17

The calculated Cohen's d value of 1.17 indicates that the effect of AR Virtual Try-On technology on purchase decision is large according to Cohen's effect size classification. This result suggests that the observed difference between the AR and non-AR groups is not only statistically significant but also practically meaningful.

3.3. Regression Analysis

A simple linear regression analysis was conducted to examine the effect of Augmented Reality (AR) Virtual Try-On technology on consumers' purchase decisions within the context of online fashion retail.

The regression model employed in this study is expressed as follows:

$$Y = a + bX$$

Y = Purchase Decision

X = AR Usage (0 = Non-AR, 1 = AR)

a = Constant (intercept)

b = Regression coefficient

ϵ = Error term

Table 10. Regression Analysis Result

Variable	Beta (β)	t	Sig.
AR → Purchase Decision	0,62	4,87	0

Table 11. Model Summary

R	R ²	Adjusted R ²
0,62	0,38	0,37

The results of the regression analysis indicate that the use of the AR Virtual Try-On feature has a positive and statistically significant effect on consumers' purchase decisions, with a regression coefficient of $\beta = 0.62$ and a significance level of $p = 0.000$ ($p < 0.05$).

The coefficient of determination (R^2) was 0.38, indicating that the use of AR technology accounted for 38% of the variance in purchase decision. The remaining 62% of the variance may be attributed to other factors not included in the present study.

Several limitations of this study should be acknowledged. First, the study involved a relatively small sample size of 66 participants, which may limit the generalizability of the findings to broader consumer populations. Future studies should employ larger and more diverse samples to improve the external validity of the results.

Second, participants were recruited using a purposive sampling technique and were limited to individuals familiar with online fashion shopping. Consequently, the findings may not fully represent consumers with different demographic backgrounds, shopping habits, or levels of technological experience.

Third, the experiment was conducted in a simulated e-commerce environment designed to resemble a real shopping platform. Although this approach allowed for greater experimental control, it may not completely capture the complexity of actual online purchasing behavior. Future research could investigate AR Virtual Try-On technology in real-world retail settings or through field experiments involving actual purchase transactions.

Finally, this study focused primarily on the direct effect of AR Virtual Try-On technology on purchase decision. Future studies may extend the research model by examining additional variables, such as perceived fit, perceived risk, customer satisfaction, customer loyalty, and reuse intention, to better understand the mechanisms through which AR technology influences consumer behavior in digital commerce environments.

These findings provide empirical evidence that AR Virtual Try-On technology plays a significant role in influencing consumer decision-making processes in online fashion retail. By enabling consumers to visualize products in a more realistic and personalized manner, AR reduces uncertainty associated with online purchases and facilitates greater confidence in

product evaluation. Consequently, consumers become more inclined to proceed with purchase decisions compared to traditional non-AR shopping environments.

4. CONCLUSION

4.1. Conclusion

This study aimed to examine the impact of Augmented Reality (AR) Virtual Try-On technology on consumers' purchase decisions in the context of online fashion shopping. A quantitative approach employing a randomized controlled experimental design was utilized, involving 66 participants who were assigned to either an AR condition or a non-AR condition.

The findings indicate that the use of the AR Virtual Try-On feature has a positive and statistically significant effect on consumers' purchase decisions. The results of the independent samples t-test revealed that participants in the AR group reported significantly higher purchase decision scores than those in the non-AR group. Furthermore, the regression analysis demonstrated that AR usage contributed substantially to explaining variations in consumers' purchase decisions.

These findings suggest that AR Virtual Try-On technology can enhance consumer confidence and product evaluation, thereby increasing the likelihood of purchase decisions in online fashion shopping environments. However, the results should be interpreted within the context of this study, which focused on a specific fashion product category, involved a relatively small sample of online fashion consumers, and was conducted in a simulated e-commerce environment. Consequently, caution should be exercised when generalizing the findings to other product categories, consumer populations, or real-world retail settings. Future studies employing larger and more diverse samples, as well as field-based experimental designs, are recommended to further validate and extend these findings.

The study also found that AR technology enhances user experience, perceived product quality, and consumer trust throughout the online fashion shopping process. By enabling consumers to visualize products in a more realistic and personalized manner, AR helps reduce uncertainty and perceived risk associated with online purchases, thereby facilitating more confident purchasing decisions.

In conclusion, the implementation of AR Virtual Try-On technology represents an effective strategy for fashion e-commerce platforms seeking to improve customer shopping experiences and encourage purchase decisions. These findings contribute to the growing body of literature on immersive retail technologies and provide practical insights for e-commerce practitioners aiming to leverage AR as a tool for enhancing consumer engagement and purchasing behavior.

4.2. Suggestions

4.2.1. Practical Implications

The findings of this study provide several practical implications for fashion e-commerce platforms. First, the results demonstrate that AR Virtual Try-On technology can positively influence consumers' purchase decisions by enhancing product visualization and increasing confidence during the evaluation process. Therefore, fashion retailers are encouraged to adopt and further develop AR-based features to improve customer experience and reduce

uncertainty associated with online purchases. In addition, the implementation of AR technology may contribute to greater consumer trust and engagement, potentially leading to improved purchasing outcomes and customer satisfaction.

4.2.2. Limitations

Several limitations of this study should be acknowledged. First, the study involved a relatively small sample size of 66 participants, which may limit the generalizability of the findings. Second, participants were recruited using a purposive sampling technique and were limited to individuals familiar with online fashion shopping, potentially restricting the representativeness of the sample. Third, the experiment focused on a single product category within the fashion sector, and the findings may not necessarily apply to other product types. Finally, the study was conducted in a simulated e-commerce environment rather than an actual online retail platform. Although this approach allowed for greater experimental control, it may not fully capture real-world purchasing behavior.

4.2.3. Recommendations for Future Research

Future studies are encouraged to employ larger and more diverse samples to improve the external validity and robustness of the findings. Researchers may also investigate the effectiveness of AR technology across different product categories, such as accessories, cosmetics, furniture, and other retail products. Furthermore, future research should consider incorporating additional variables beyond purchase decision, including customer satisfaction, customer loyalty, perceived fit, reuse intention, and perceived risk, to provide a more comprehensive understanding of the mechanisms through which AR Virtual Try-On technology influences consumer behavior. Finally, field experiments conducted in real e-commerce environments would provide valuable insights into the long-term impact of AR technology on actual purchasing behavior.

AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. Prior to participation, all respondents were informed about the purpose and procedures of the study, and informed consent was obtained from all participants before the experiment commenced. Participation was voluntary, and respondents were free to withdraw from the study at any time without penalty. The study was conducted in accordance with ethical principles for research involving human participants. The data supporting the findings of this study are available from the corresponding author upon reasonable request. The authors further confirm that this manuscript is an original work, has not been published previously, and that all sources have been appropriately cited. The manuscript is free from plagiarism and complies with the publication ethics requirements of the journal.

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