A Foresight Study of Consumer Readiness on Virtual Fitting Mirror powered by Augmented Reality (AR) in the Fashion Retail Store

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Abstract

Virtual fitting mirror is a revolutionary concept that based on the advancements of augmented reality (AR) technology that allows users to digitally explore and experience products in the fashion retail store. This study aims to identify the trends, issues and challenges associated with virtual fitting mirror powered by augmented reality in the fashion retail store and the key drivers on the implementation of virtual fitting mirror and its potential future scenarios. The respondents for this study were visitors at Setia City Mall among Gen Z and Millennial. A questionnaire based on social, technological, environmental, economic, political, and value (STEEPV) drivers will be used to collect respondents' data. STEEPV analysis, reliability analysis, descriptive analysis and impact-uncertainty analysis used in this study. The data analyzed using the Statistical Package for Social Science (SPSS) software. The ten drivers had been identified and the impact-uncertainty analysis had been used to identify the future image of consumer readiness on virtual fitting mirror powered by augmented reality in the fashion retail store. A questionnaire was distributed to the visitors at Setia City Mall, Selangor with response rate of 100%. The study found that the drivers of entertainment and engagement and government and policy support have the highest uncertainty and impact and four scenarios were proposed at the end of the study. It were prospering entertainment-drive evolution, policy-led adoption, hybrid innovation eco-fashion and stagnation due to disparity.

1. Introduction

In recent years, technology has revolutionized the fashion industry across its various sectors. From design and production to marketing and retail, every aspect of the industry has been significantly influenced by technological advancements (Marshall, 2018). According to Company (2022), fashion companies are expected to increase their investment in technology from approximately 1.6 to 1.8 percent of revenues in 2021 to about 3.0 to 3.5 percent by 2030. The driving force behind this expected rise is the belief that technology can offer a competitive advantage, not only in customer-facing activities, but also in operational aspects. Robotics, advanced analytics, and in-store applications are among the technological advancements expected to optimize processes, foster sustainability, and enhance the overall customer experience in the fashion industry. Besides that, as stated by Byrne (2023), the rise of online shopping and social media has completely changed the way fashion are explored and purchased, thus with the introduction of virtual try-on technology has also undergone a transformation in the fashion industry.

According to Prafulla (2023), virtual try-on, also referred to as "virtual fitting" or "digital try-on," is an innovative technology that allows users to digitally explore and experience products. Fashion brands and businesses, as described by Dlook (2023), can utilize virtual try-on technology to merge the physical and virtual realms, providing customers with a safe, convenient, and efficient experience, both online and in-store. John (2023) highlighted that the evolving consumer demands will bring about a significant transformation for in-store shopping, specifically in fashion retail store in the future. Customers will become more selective in their purchases and choices, resulting in a shift away from abundant product showcases on the sales floor. Instead, this innovative experience driven by augmented reality (AR) technology will become the main attraction, offering customers immersive and cutting-edge retail experiences. Basically, virtual try-on is a revolutionary concept that based on the advancements of augmented reality (AR) technology.

1.1 Research Background

Virtual fitting mirrors, which utilize augmented reality (AR), have the potential to greatly impact the fashion retail sector by offering customers a personalized and convenient shopping experience. It is projected that more than 120,000 stores will adopt AR, with over 4 billion AR-capable devices available worldwide (P. Johnson, 2022). These virtual fitting mirrors are employed in the fashion retail industry through virtual fitting rooms, virtual try-ons, and virtual mirrors (Anonymous, 2021; Boardman *et al.*, 2019). However, there are several challenges that need to be addressed in order to fully utilize the potential of virtual fitting mirrors.

One challenge lies in the fact that some consumers still prefer visiting physical stores as they prefer to see and touch items before making a purchase (Anonymous, 2021; Hirschmiller, 2023). Additionally, virtual fitting mirrors may struggle to accurately represent the texture and feel of fabrics, which is an important consideration for many customers when deciding to buy (Boardman *et al.*, 2019). Another challenge is providing a personalized experience to customers, as this is another significant factor in their purchase decision-making process (Rhee & Lee, 2021).

To overcome these challenges, designers should focus on developing AR systems that add value to the customer experience, thus encouraging their adoption (Battistoni *et al.*, 2022). Furthermore, virtual fitting mirrors should offer personalized recommendations based on factors such as the customer's body measurements, style preferences, and purchase history (Boardman *et al.*, 2019). Ensuring the accuracy of virtual fitting mirrors is crucial in order to prevent customers from being dissatisfied with their purchases and having to go through the inconvenience of returns (Anonymous, 2021). Despite these challenges, virtual fitting mirrors have the potential to revolutionize clothes shopping and may become an important part in the fashion industry (Johnson, 2022).

1.2 Problem Statements

There are major issues that affected fashion retail stores, particularly in the fitting room area such as privacy and security, condition and space and long waiting times in-line. These issues need to be addressed in order to create an improved and satisfying environment for shoppers. One of the major issues highlighted regarding the fitting room in fashion retail stores is fitting room condition and space. The condition and usage of fitting rooms in fashion retail stores play a vital role in shaping the shopping experiences of customers. According to Ogunjimi *et al.* (2021), respondents expressed varying perspectives regarding the fitting rooms in clothing retail stores in the UK, particularly concerning the physical conditions of those rooms. One customer highlighted the issue, stating that the fitting room was often too small for them to comfortably use. Karolina (2022) highlights that this issue also becomes particularly problematic for customers shopping with babies and children, as it becomes challenging to keep an eye to them while trying on clothes.

Expanding on the issue, another problem highlighted regarding fitting rooms in fashion retail stores is long waiting times in line. This can lead to customer frustration and discourage them from trying on clothes or making purchases. As stated by Ogunjimi *et al.* (2021), the queues in clothing retail stores are a major problem impacting the shopping experience, leading to significant time consumption and dissatisfaction among customers. According to Tech (2015), poor queue management can be the downfall of potential purchases, with 75% of retailers losing sales due to wait-related issues. Furthermore, customers who leave without making a purchase are unlikely to return and are likely to share their negative experience with others. According to the research conducted by Lee *et al.* (2021), high traffic in a retail store often results in longer queues. Nearly 75% of surveyed individuals admitted to occasionally leaving a physical line before their turn. Moreover, approximately 69% of respondents expressed experiencing negative emotions when waiting in line, such as boredom, annoyance, frustration, and impatience.

Additionally, lack of privacy and security is another major issue that significantly impacts the fitting room experience in the fashion retail stores. Fitting rooms can be an opportunity to theft due to its private area. Shoplifters may take advantage of the privacy provided by fitting rooms to engage in actions such as hiding items through layering or using shopping bags, or even switching price tags to get items at lower prices

(Tagmax, 2019). Shoplifting refers to the act of taking retail products, such as food, clothing, or electronics, from a store without paying for them (Karpa, 2023). According to Turner (2019), shoplifting contributes significantly to total retail shrink, with an estimated $18 billion attributed to this issue. The average shoplifting incident value has doubled over time, reaching around $560 and reports indicate that one in 11 Americans participate in shoplifting, and a small percentage of customers enter stores with the intent to steal. Besides the privacy concern regarding shoplifters in fitting rooms, another issue arises with the use of drawing cotton lines as doors. This insufficient setup fails to ensure customer privacy, as it allows the possibility of unintentional entry by other customers while individuals are in the process of changing (Ogunjimi *et al.*, 2021). Moreover, according to Karolina (2022), customers face privacy problem in fitting rooms due to insufficient curtains or doors, resulting in self-consciousness about their body and appearance. Even upgraded doors may have design flaws, allowing others to see inside.

Therefore, to achieve the research objectives trends, issues, challenges and drivers on virtual fitting mirror powered by augmented reality in fashion retail store are determined. Consequently, the future images of consumer readiness on virtual fitting mirror powered by augmented reality in fashion retail store is identified.

1.3 Scope of the Study

This foresight study was carried out to explore the trend of virtual fitting mirror powered by augmented reality in fashion retail store, focusing the time horizon of 10 years in the future or in other words from the year of 2024 to the year of 2034. Various resources such as journals, books, blogs, articles, non-governmental organizations and research materials related to virtual fitting mirrors powered by augmented reality in fashion retail stores were collected and analyzed. This study specifically targeted among Gen Z to Millennials generation at Setia City Mall, Malaysia to assess their readiness towards the virtual fitting mirror powered by augmented reality in fashion retail store. Therefore, the questionnaires for respondents were distributed to gather data for analysis by using the survey forms.

1.4 Significance of the Study

This foresight study focused on the consumer readiness for virtual fitting mirror powered by augmented reality in fashion retail store in Malaysia, offering valuable insights for fashion retailer to enhance their understanding of both the opportunities and challenges associated with the new high technology. It can increase the consumer knowledge and familiarity with virtual fitting mirror, ultimately benefiting the Malaysian market. Additionally, this study paves the way for future researchers to explore the impact of uncertainties surrounding virtual fitting mirrors powered by augmented reality on the performance outcomes of fashion retailers. To ensure a successful and sustainable implementation, it is important for organizations and government sectors to prioritize security and privacy assessments, as well as establish regulations that promote effectiveness on virtual fitting mirror powered augmented reality. Therefore, the potential for revenue generation and brand recognition can be maximized, contributing to a prosperous future for the fashion retail industry. This research holds great significance as it addresses the evolving landscape of technology in the fashion retail sector and provides insights that can shape future strategies and decision-making processes.

2. Research Methodology

This chapter presents the research methodology employed to achieve the research objectives. This study utilized both qualitative and quantitative methods to analyze and interpret data. The qualitative approach involved using the STEEPV foresight analysis technique which stands for social, technological, environmental, economic, political and value, while the quantitative data was gathered through survey forms using Google Forms platform distributed to visitors at Setia City Mall, Selangor, focusing on their readiness for virtual fitting mirror powered by augmented reality in fashion retail store. Both methods were important to ensure the accuracy and reliability of the collected data. This chapter covers the research design, research process, unit of analysis, foresight process which includes the horizon scanning and STEEPV method, population and sampling, research instruments, data collection procedures, data analysis, and pilot study.

2.1 Research Design

According to Sileyew (2019), the selection of a research design is a significant decision in the research design process as it determines the manner in which relevant information for the study will be obtained. The research design serves as a framework for the study and the research approach chosen determines the methods used to gather data and conduct analysis. The research design adopted in this study was an exploratory sequential mixed-methods approach. It involved an initial qualitative exploration using foresight techniques, followed by a quantitative survey to gather additional data and insights. In order to explore the potential future trend of the main drivers, a STEEPV analysis was conducted. The major drivers of consumer readiness were then further

analyzed using a quantitative survey method. Questionnaires were used to assess the consumer readiness to use the virtual fitting mirror technology in fashion retail store in Setia City Mall in Selangor, Malaysia.

This study aimed to gather a larger sample size and explore future possibilities and opportunities to meet the needs of consumers. By adopting a mixed-method approach that incorporates both qualitative and quantitative data, the research strive to comprehensively interpret the collected data. The analysis focused on identifying the various issues, challenges, and trends associated with virtual fitting mirror powered by augmented reality in the context of fashion retail store, while also considering the key drivers that influence their future prospects. To facilitate this study, the foresight process, combining qualitative and quantitative methods, was employed to gain valuable insights into the future images of consumer readiness towards virtual fitting mirror with augmented reality in fashion retail store in Malaysia.

2.2 Data Collection

Simplilearn (2023) described that data collection is the systematic gathering and examination of reliable information from a variety of sources to address research inquiries, analyze trends, assess probabilities, and evaluate potential outcomes. According to Kabir (2016), data collection is an essential and demanding task in research. It involves meticulous planning, hard work, patience, and perseverance. The process begins with determining the necessary data and selecting a sample from the population. As stated by Mazhar *et al.* (2021), Data collection in behavioral sciences encompasses primary and secondary sources. Primary methods involve observation, interviews, questionnaires, and database analysis. Secondary data is obtained from published sources like books, magazines, journals, as well as unpublished materials such as autobiographies and biographies.

This study utilized both primary and secondary data collection methods. It was gathered from sources specific to virtual fitting mirror powered by augmented reality in fashion retail store. The goal was to analyze these sources and identify the key issues and drivers on virtual fitting mirror powered by augmented reality in the fashion retail store. However, secondary data collection was preferred for researchers due to its supportive nature, as it draws from primary data and provides more accurate information based on previous studies.

2.3 Population and Sampling

This research focuses on the consumer readiness on virtual fitting mirror powered by augmented reality in fashion retail store, specifically among the Gen Z to Millennials generation and it was conducted at Setia City Mall in Setia Alam, Malaysia, with the target population consisting of the shopping mall visitors which were 50,000 individuals. Next, according to Mcleod (2023), sampling is a process to choose a subset of individuals from a larger population for the purpose of the study and the individuals who take part in the study are referred to as respondents. This research sample size of 381 respondents was determined using the Krejcie and Morgan table (Bukhari, 2021) representing a subset of the total population of 50,000 individuals in Setia City Mall (B, 2022). The age range of the sample frame was set between 18 and 38 years old.

2.4 Research Instrument

The survey questionnaire used in this study to identify the key drivers of consumer readiness on virtual fitting mirror powered by augmented reality in the fashion retail store. It was distributed to the visitors at Setia City Mall, Selangor, specifically among the Gen Z to millennials generation towards their readiness on virtual fitting mirror powered by augmented reality in the fashion retail store. The questionnaire survey was classified into four sections which are Section A, Section B, Section C, and Section D.

Table 1 *Survey questionnaire structure*

Section	Items
A	Demographic information of respondents.
B	The importance of key drivers on virtual fitting mirror powered by augmented reality in fashion retail store
C	The level of impact of key drivers on virtual fitting mirror powered by augmented reality in fashion retail store
D	The level of uncertainty of key drivers on virtual fitting mirror powered by augmented reality in fashion retail store

2.5 Data Analysis

The survey questionnaire used in this study to identify the key drivers of consumer readiness on virtual fitting mirror powered by augmented reality in the fashion retail store. It was distributed to the visitors at Setia City Mall, Selangor, specifically among the Gen Z to millennials generation towards their readiness on virtual fitting mirror powered by augmented reality in the fashion retail store. The questionnaire survey was classified into four sections which are Section A, Section B, Section C, and Section D.

2.5.1 Descriptive Analysis

Rawat (2021) highlights that descriptive analysis is an important step in statistical data analysis, providing a comprehensive overview, summary, and visualization of data points. This analysis serves as a foundation for conducting subsequent statistical analyses, allowing researchers to gain insights into variable similarities and prepare for further investigations. Therefore, the data obtained in this study from the questionnaire were analyzed using the SPSS which stands as Statistical Package for Social Science (Team, 2022). It is a computer-based statistical package and can assist in generating statistical results based on numerical data and presents the collected data in the form of frequency, percentage, mean, and standard deviation (Quantilope, 2022). The use of SPSS is advantageous for handling large amounts of data and offers convenience and ease of data interpretation.

2.5.2 Reliability Analysis

According to Chiang (2015), psychologists described that reliability pertains to the consistency of a measurement. There are three types of consistency that are considered test-retest reliability which examines consistency over time, internal consistency which looks at consistency across items and inter-rater reliability which assesses consistency across different researchers. However, Cronbach Alpha was used to measure the internal consistency and reliability of the data collected (Laerd Statistics, 2018).

Table 2 *Rule of thumb on cronbach alpha*

Cronbach Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Very Good
$0.7 \leq \alpha < 0.8$	Good
$0.6 \leq \alpha < 0.7$	Moderate
$\alpha < 0.6$	Poor

2.6 Impact-Uncertainty Analysis

Scenario development was carried out by conducting impact-uncertainty analysis using the mean collected during data analysis to construct impact-uncertainty analysis. A list of drivers was generated and then narrowed down based on their importance, impact, and uncertainty. The two drivers with the highest impact and uncertainty levels were selected for scenario analysis.

2.7 Development of Scenario Analysis

Based on the top two drivers identified in the impact-uncertainty analysis, four alternative scenarios were developed. These scenarios depict potential future outcomes and trends in virtual fitting mirror powered by augmented reality in the fashion retail store, encompassing both favorable and unfavorable consequences. These scenarios provide insights into four possible outcomes that may occur within the period of 10 years (2024 to 2034), derived from empirical data analysis collected during the study. In the case of potential negative consequences, a strategic management system will be designed to mitigate and address any challenges. Conversely, if positive consequences arise, a strategic management system will be developed to leverage the benefits.

3. Research Methodology

According to Kabir (2018), literature review is a process of reading, analyzing, evaluating, and summarizing scholarly sources on a specific topic. The literature review offers a comprehensive summary of the present understanding, enabling the recognition of pertinent theories, methodologies, and research gaps. However, this research provided an overview of virtual fitting mirrors application using augmented reality in the fashion industry in Malaysia. Therefore, this research aimed to fill this gap by conducting a STEEPV analysis to provide an in-depth understanding of the issues on social, technological, economic, environmental, political, and value and its drivers, with a focused title "A foresight study of consumer readiness on virtual fitting mirror powered by augmented reality (AR) in fashion retail store."

3.1 Augmented Reality (AR) in the fashion retail store

Johnson (2022) highlights that augmented reality enables virtual objects to interact with the real world, enhancing understanding of the environment. By utilizing an AR device, 3D virtual objects can be seamlessly integrated into real-world objects and environments. As stated by Gillis (2022), augmented reality merges digital information with the real world in real-time, allowing users to experience the physical environment while overlaying generated perceptual information. Hence, the field of augmented reality (AR) in the fashion retail store is rapidly gaining momentum worldwide, emerging as a prominent component of extended reality. With continuous investments from various companies in AR technologies such as smart mirror and smart glasses, the augmented reality industry is undergoing constant transformation. This high technology is reshaping the way people perceive and interact with the environment in the fashion retail store.

3.2 Virtual fitting mirror in the fashion retail store

The virtual fitting mirror, commonly referred to as a virtual fitting room, is capable of assessing an individual's body shape and superimposing virtual clothing onto their image and real time video. The virtual garments or 3D cloth are automatically adjusted to fit the person's size in real time. making it an enjoyable option for events or a permanent fixture in retail stores as part of the fitting or dressing room mirror. (Virtual On Group, 2022). According to the DigitalDM (2021), the virtual fitting mirror also includes an interactive "Catwalk" feature that displays up-to-date fashion videos and seasonal collections, presented as either images or videos. This feature can be activated as a screen saver through proximity sensors or by simply waving a hand in front of the virtual mirror. Moreover, as stated by Admin (2022), the advanced A4 Fitting Tech ensures accurate measurements using an A4 paper, while Augmented Reality provides a live view of the avatar, enhancing the immersive experience. The outcome is the creation of a precise and proportional 3D avatar that replicates individuals and presents a range of 3D fashion products, enabling users to virtually try them on and assess their fit, similar to a physical fitting room experience. In other words, certain variations of the virtual fitting mirror incorporate augmented reality enhancements into the video display or utilize a fully virtual graphical avatar of the user. As a result, users can virtually try on a diverse range of 3D fashion products, immersing themselves in a lifelike and engaging fitting room experience.

3.3 STEEPV Analysis

To gain a comprehensive understanding of virtual fitting mirror powered by augmented reality (AR) in the fashion retail store, this study employed the STEEPV analysis framework which include the dimension of social, technological, environmental, economic, political and value. This STEEPV analysis enabled a comprehensive understanding of the trends, issues and challenges on virtual fitting mirror powered by augmented reality in the fashion retail store.

3.3.1 Social Trends, Issues and Challenges

The social aspect involved the trends of transformative potential of AR in brand-consumer connection and the enhancement of post-purchase experiences in using the technology but the issues and challenges are regarding its privacy safeguard, privacy risks and the developer need to understand user perception about the virtual fitting mirror powered by AR in the fashion retail store.

3.3.2 Technological Trends, Issues and Challenges

The technological aspect involved the trends of AR-driven 5G networks in retail and also showing that the rise of AR, enables new shopping experiences like the virtual fitting mirror, but some of the issues and challenges arise for this aspect which involved AR-content creation, AR-complexity and high costs development.

3.3.3 Environmental Trends, Issues and Challenges

The environmental aspect highlighted the trends of push towards sustainability which reflects prevalent trends like waste and carbon footprint reduction, alongside the eco-friendly alternatives. However, issues and challenges persist in the effectiveness of AR-integration sustainability for waste reduction and seamlessly integrating sustainable fashion technology within the retail store.

3.3.4 Economic Trends, Issues and Challenges

The economic aspect highlighted the trends of virtual fitting mirror in the fashion retail store where the augmented reality contributes to economic growth through the increased of sales conversion, and market growth, but the issues and challenges in this aspect involved in getting the funding infrastructure upgrade and financial support for the technology specifically from the government.

3.3.5 Political Trends, Issues and Challenges

The political aspect highlighted the trends where the 2017 budget emphasized that Malaysia's digital economy makes certain digital as a top priority for aiming a sustained economic growth. However, the issues and challenges arise in terms of privacy laws, government support, and shaping comprehensive legal and policy.

3.3.6 Value Trends, Issues and Challenges

The value aspect highlighted the trends involved AR-enhanced product value and customer shopping experiences. However, issues and challenges arise in terms of trust issues, entertainment value, accuracy of AR, and customer privacy and acceptance about the technology to be implemented in the fashion retail store in future.

3.4 Drivers

A total number of ten drivers has been developed after the merging process of STEEPV analysis key term that highlighted the trends, issues and challenges. These drivers will be included in the questionnaire for the purpose of collecting data. The table with the merged of 10 key drivers was shown in Table 3 as follows.

Table 3 *Drivers and the key terms of trends, issues, challenges*

No.	Drivers	Key terms of Trends, Issues and Challenges
1	Customer Experience	Virtual try-on
		Retailtainment
		Social media branding
		Immersive brand connections
		Post-purchase experiences
		Social shopping
		Customer engagement in-store
		Virtual try-on entertainment
		Social commerce
		Augmented reality-powered engagement
		Augmented Reality retail experience
2	Technological Advancement	AR-driven 5G networks
		AR-enabled retail transformation
		AR clothing visualization and customization mirror
		Virtual dressing rooms
		Virtual fitting mirror
		Mix and match technology
		Virtual try-on and evaluation
		Immersive retail experience
		AR-based inventory optimization in stores
		Fun retail entertaining
		Evolving smart mirror strategies
		Digital transformation
		Technology advancements
		Technology-driven workload reduction
		Augmented reality and IoT integration
		Augmented reality in digital mirrors
		Interactive augmented reality retail
3	Sustainability	Waste reduction
		Carbon footprint reduction
		Dynamically transformable
		Sustainable alternative
		3D virtual simulation for sustainability
		Sustainable fashion digitization
		Sustainable fashion technology

		Augmented reality for sustainability
		AR integration in spatial environments
		Fashion-tech sustainability
4	Consumer Behavior	Consumer privacy safeguards
		Consumer behavior shift
		Consumer privacy risks
		User perception of augmented reality technology
		Ethical concerns
		Hedonic consumers
		Representation and diversity
		Consumer empowerment
		Influencer culture
		Real-time adaptability
		E-commerce evolution
		Consumer inclusivity
5	Sales and Market Growth	Sales conversion
		Retail performance growth
		Market growth
		Augmented reality-driven sales
		Future growth of smart mirror
		Market size and growth of virtual fitting room
		Financial support for mirror solutions
6	Privacy and Ethics	Compliance with privacy laws
		Government support
		Legal and policy
		Trust issues
		Customer privacy and acceptance
7	Brand Enhancement	AR-enhanced product value
		AR-driven retail enrichment
		AR-driven value enhancement
		Brand perception and loyalty
8	Government and Policy Support	Digital economy focus
		Malaysia's commitment on the digital economy
		Civic engagement of augmented reality
9	Entertainment and Engagement	Entertainment value
		AR accuracy concerns
10	Product value	Personalized pre-purchase
		Customer experience and consumer engagement
		Enhanced customer interaction
		Co-designing in customer purchases
		360-degree view of smart mirror experience
		Time-saving shopping experience
		Data-driven customization
		Smart mirror value creation

4. Data Analysis and Findings

This chapter explained the result obtained from the data collected that was carried out through the survey questionnaire via Google Form and distributed physically at Setia City Mall, Selangor. The data collected were analyzed by the SPSS to obtain the overall demographic information of the respondent and the mean of each driver based on the importance, impact and uncertainty. The procured mean was arranged in descending order from high to the low average. The ten key drivers were chosen to construct the impact-uncertainty analysis. Lastly, two drivers with highest impact and uncertainty will be used in the next chapter to develop scenarios building analysis.

4.1 Reliability Analysis result for pilot test and actual study

Based on the Table 4 below, the Cronbach Alpha value for the pilot test was 0.957 which indicates 24 respondents and 30 items. The value of Cronbach Alpha in Table 4 below was excellent because it had exceeded 0.9. Therefore, the study was reliable and could be continue. Meanwhile, the Cronbach Alpha value for actual

study was 0.817 which indicates 381 respondents and 30 items. The result of the actual study was very good. Hence, this study illustrates excellent and high reliability of the variable.

Table 4 *Result of reliability analysis for pilot test and actual study*

	Cronbach Alpha	Number of items	Number of respondents
Pilot test	0.957	30	24
Actual study	0.817	30	381

4.2 Demographic Analysis Result

Based on the Table 5 below, the demographic analysis in this study involved gender, age, race, education level, occupation and six general questions about virtual fitting mirror powered by augmented reality in the fashion retail store.

Table 5 *Demographic analysis*

Item	Frequency	Percentage (%)
Gender		
Male	174	45.7
Female	207	54.3
Age (years old)		
18-23	92	24.1
24-30	189	49.6
31-38	100	26.3
Race		
Malay	250	65.6
Chinese	66	17.3
Indian	64	16.8
Others: Arab	1	0.3
Education Level		
High School/SPM	12	3.1
STPM/Foundation/A-Level/Matriculation	55	14.4
Diploma	77	20.2
Degree	180	47.2
Master/PhD	57	15.1
Professional certificate	0	0
Occupation		
Student	128	33.6
Self-employed	55	14.4
Government	110	28.9
Private Sector	85	22.3
Unemployed	3	0.8
Do you like to go to the shopping mall?		
Yes	369	96.9
No	12	3.1
How frequent do you shop for fashion items like clothing or accessories in the shopping mall?		
Very frequent	3	0.8
Frequent	134	35.1
Moderate	124	32.5
Not frequent	109	28.7

Very not frequent	11	2.9
Are you generally interested in exploring new technology while shopping?		
Yes	368	95.6
No	13	3.4
Have you ever heard about virtual fitting mirror powered by augmented reality in the fashion retail store?		
Yes	83	21.8
No	298	78.2
Do you think virtual fitting mirror powered by augmented reality in the fashion retail store will be implemented in future?		
Yes	83	21.8
No	67	17.6
In how many years, do you think virtual fitting mirror powered by augmented reality in the fashion retail store will be implemented in future?		
Immediately	116	30.4
4 to 7 years from now	131	34.4
8 to 10 years from now	91	23.9
In a decade	43	11.3

4.3 Mean of drivers result based on Importance, Impact and Uncertainty

Based on the Table 6, the mean value of drivers based on the importance, impact and uncertainty had been analyzed using descriptive analysis through SPSS software.

Table 6 *Mean of drivers based on the importance, impact and uncertainty*

No	Drivers	Mean		
		Importance	Impact (y)	Uncertainty (x)
1	Customer Experience	3.73	3.99	3.80
2	Technological Advancements	4.56	4.43	3.66
3	Sustainability	4.15	3.15	4.20
4	Consumer Behavior	3.84	3.76	4.33
5	Sales and Market Growth	4.16	3.57	4.17
6	Privacy and Ethics	4.01	4.25	3.38
7	Brand Enhancement	4.10	4.09	3.13
8	Government and Policy Support	3.75	4.52	3.94
9	Entertainment and Engagement	4.15	4.65	4.60
10	Product Value	3.59	3.95	3.51

4.4 Impact-Uncertainty Analysis

According to the Fig. 1 below, the leading drivers with high level impact and high level of uncertainty were coordinated on D8 which is Government and policy (3.94, 4.52) and D9 which is entertainment and engagement (4.60, 4.65). Government and policy support matters for this technology in the fashion retail store due to the highest level of impact while entertainment and engagement are important to embrace virtual fitting mirror powered by augmented reality in the fashion retail store due to the highest level of uncertainty. Thus, both of the drivers will be used to generate scenarios building analysis in chapter 5.
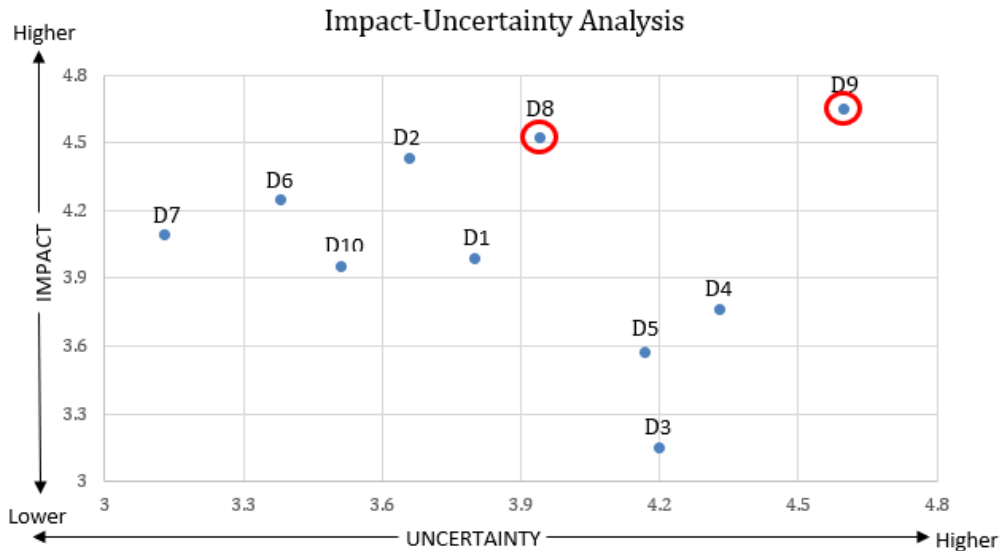
Fig. 1 *Impact-uncertainty analysis*

5. Discussion and Conclusion

Scenario building was used to develop a story line based on the analysis of the study and knowledge of recent and historical patterns and events for the vision of future situation.
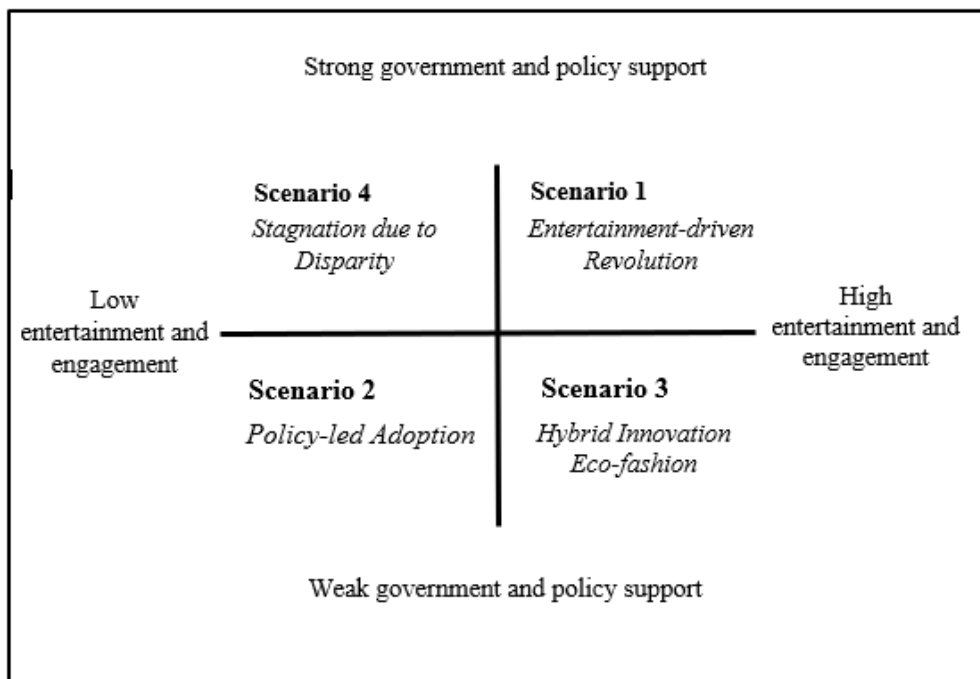

Fig. 2 *Scenario building analysis*

5.1 Scenario 1 "Entertainment-driven revolution"

The first scenario is the best scenario which takes place when there is a strong government and policy and high entertainment and engagement. The success of virtual fitting mirrors powered by augmented reality in fashion retail indicates that fashion retail stores in Malaysia will fully implement this modern technology of augmented reality in the coming years. A strong government and policy endorsement in support of technology integration and innovation within the retail sector plays a crucial role in shaping this scenario. This support might include incentives, regulations, or initiatives that encourage the adoption and implementation of augmented reality technology in retail environments. Meanwhile, a high level of entertainment and engagement in the context of these virtual fitting mirrors powered by augmented reality signifies an elevated consumer interest and involvement in interactive and immersive shopping experiences. This high entertainment and engagement value

mean that consumers are deeply engaged and excited by the AR-powered features, which transform the way they interact with fashion products virtually. It suggests that consumers are actively seeking and embracing more engaging, tech-enhanced experiences while shopping for clothes, indicating a significant shift in consumer preferences towards more interactive and entertaining retail experiences.

5.2 Scenario 2 "Policy-led adoption"

In this scenario, the least favorable outcome arises from inadequate policy support, characterized by weak government and policy and low entertainment and engagement value. This deficiency in policy and consumer engagement hinders the effective implementation of augmented reality-powered virtual fitting mirrors in Malaysia's fashion retail landscape. The consequence of this slow implementation is not only delaying the integration of this modern technology but also impacts consumer readiness for its adoption in the near future. This sluggish pace poses significant challenges for fashion retail stores, impeding their ability to keep up with technological advancements and meet evolving consumer expectations for innovative shopping experiences. The slow adoption of virtual fitting mirrors powered by augmented reality could lead to a widening gap between consumer expectations and the actual shopping experience offered by these stores. This gap might result in a loss of competitiveness for these retailers compared to others who swiftly embrace and implement AR technology. Moreover, the lack of readiness and adaptation to modern technological trends might impact consumer perception and trust in these fashion retail stores. Consumers may view these stores as outdated or less appealing, potentially leading to decreased footfall and sales. The failure to keep pace with technological advancements could hinder the stores' ability to attract and retain customers, affecting their long-term viability and competitiveness within the evolving retail landscape.

5.3 Scenario 3 "Hybrid Innovation Eco-Fashion"

This scenario occurs when there are high entertainment and engagement but weak government and policy. In this scenario, high entertainment and engagement among consumers coincide with weak governmental support and policy initiatives. Here, the focus is on the fusion of entertainment-driven engagement within augmented reality (AR) experiences and the promotion of eco-friendly fashion practices. Despite the lack of robust governmental backing, consumers exhibit heightened interest and active participation in immersive and engaging AR-powered features within fashion retail. The emphasis on entertainment and engagement signifies a strong consumer desire for interactive and entertaining shopping experiences. This inclination towards engaging AR features reflects a shift in consumer preferences towards more interactive and captivating retail experiences, despite the absence of strong governmental support. Moreover, the integration of eco-friendly fashion practices within the AR-driven environment signifies a growing consumer consciousness and interest in sustainable fashion. This combination of entertainment-driven AR experiences with eco-fashion practices showcases a potential direction for the future of fashion retail, driven primarily by consumer demand for engaging, tech-enhanced experiences and a preference for environmentally conscious choices.

5.4 Scenario 4 "Stagnation due to Disparity"

This scenario occurs when there is strong government and policy support yet low entertainment and engagement toward virtual fitting mirror powered by augmented reality in the fashion retail store. In this scenario, despite strong governmental backing and robust policy support, there exists a marked lack of consumer interest and engagement with virtual fitting mirrors powered by augmented reality within the fashion retail store. The disparity between the substantial governmental support and the minimal consumer enthusiasm for AR-powered experiences leads to a state of stagnation within the industry. The strong government and policy support aim to facilitate the integration and implementation of augmented reality technology within fashion retail settings. However, this initiative encounters a significant challenge due to the limited interest or engagement shown by consumers towards these virtual fitting mirrors. The disconnect between governmental efforts and consumer reception creates a stagnant environment, hindering the widespread adoption and effective utilization of AR technology within the fashion retail landscape. This disparity poses a substantial obstacle, as the absence of consumer enthusiasm limits the technology's impact and potential in enhancing the overall shopping experience. Despite governmental initiatives, the low consumer engagement might result in a slower uptake of AR-powered virtual fitting mirrors, impeding the transformative potential of this technology within the fashion retail sector.

5.5 Limitations

In this study, the researcher encountered a few limitations that are important to note. Firstly, the researcher faced difficulties in finding extensive research materials on the internet about virtual fitting mirror powered by augmented reality, which affected the depth of information included in the study. Secondly, although the sample

size of 381 respondents might seem large, the researcher focused solely on visitors from one shopping mall, Setia City Mall in Selangor. This means that while the data collected is valuable for this specific location, it might not represent the views of people from other places or malls in Malaysia. Lastly, there were limitations in terms of participation. Some individuals declined to take part in the survey, possibly because they were not familiar with the technology or were simply not interested in participating. These limitations, although present, were factors that influenced the scope and breadth of this study within the confines of Setia City Mall as well as to know about consumer readiness towards virtual fitting powered by augmented reality in the fashion retail store.

5.6 Recommendations

The current advancement of virtual fitting mirror powered by augmented reality in the fashion retail store suggests that Malaysia has the potential to change in the future. Hence, a few recommendations are needed for future research in order to decide the direction of this research before making plans to foresight into consumer readiness towards this high technology/ To begin with, an interview session can be carried during data collection. This will encourage the respondents to have a better understanding of the application of virtual fitting mirror powered by augmented reality in the fashion retail store, and they will be able to respond more effectively to open-ended questions that will help researchers learn more about this research problem. Moreover, in order to continue developing the most advanced virtual fitting mirror powered by augmented reality for fashion retail store in Malaysia, a strategy and a solution should be developed the negative forecast provide during scenario building. To effectively address the negative forecasts highlighted during scenario building, a multifaceted strategy needs to be devised. This strategy should encompass a comprehensive approach involving technological advancements, market adaptation, and consumer engagement initiatives. By focusing on these key areas, the potential hurdles identified in the scenarios can be effectively overcome.

5.7 Conclusion

In conclusion, the aim of the study is to identify the trends, issues and challenges of future image of virtual fitting mirror powered by augmented reality in the fashion retail store in Malaysia. The research about foresight study on consumer readiness towards virtual fitting mirror powered by augmented reality in the fashion retail store will provide a new trend in hiring process in the next 10 years. Besides, this study also provides the new knowledge and information as well as perception of the respondents on their readiness toward this technology in Malaysia. The top two drivers which were identify from impact-uncertainty analysis has been used to build scenario building analysis. Four scenarios analysis are built to determine the proposed future image of virtual fitting mirror powered by augmented reality in the fashion retail store. Furthermore, this study not only offers a panoramic view of the future image of virtual fitting mirrors but also contributes novel knowledge and insights into the perceptions and readiness levels of respondents within the Malaysian context. Thus, this research does not just envisage the future, it equips stakeholders with informed foresight to navigate and shape it.

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Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design**: A.N.H.A.H. and A.Z.A.; **data collection**: A.N.H.A.H. and A.Z.A.; **analysis and interpretation of results**: A.N.H.A.H. and A.Z.A.; **draft manuscript preparation**: A.N.H.A.H. and A.Z.A. All authors reviewed the results and approved the final version of the manuscript.

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