

# Designing Interactive Fashion Shows: Innovating through Multisensory Stimulations

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## Abstract

*The tremendous development of stereoscopic 3D visualization and multisensory simulations, had been fundamentally changing the ways that doing brand communication, consumer learning, product knowledge and decision-making process. This research aims to study the consumer learning in a designed interactive fashion show platform in order to deepen our understanding of the undiscovered framework. A designed self-directed interactive platform for consumers to organize their own fashion show is established in this research. The result of this study suggests three major domains for fashion retailing business to explore in order to cope with the challenges of digital age.*

**Keywords:** Consumers Experiences; Consumer Learning; Stereoscopic 3D Technologies; Multisensory Simulation; Virtual Reality

## **1. Introduction**

Fashion show, as an effective way of doing fashion promotion and public relationships for fashion industry, has commenced since 1900. Paul Poiret was probably the first fashion courtier that displayed his fashions with models in window displays in 1904 (Poiret, 1931). Fashion show is powerful because it provides customers with a unique experience, not only for enhancing consumers' apparel product knowledge but also offering a fantastic, prestige and exciting insights to consumers in their shopping process. This unique experience might not be obtained in traditional brick-and-mortar retail shops and promotional activities. Actually, fashion show is always a crucial communication channel for building relationship capital between the organizations and consumers. Indeed, the entire fashion retailing business is moving rapidly from a service- and product-driven consumer relationship to experience-based consumer relationship. Take an example from other retailing discipline, such as Disney Store (subsidiary of the Walt Disney Company) and the Apple Store, they are some of the pioneers that have highlighted the importance of enriching customers' experience in their promotional activities. It is because these pioneers believe that the customers' hedonic memory of their experiences is a key to increase organization's economic value.

The tremendous development of advanced technologies has also changed the entire fashion ecology on the other hand. These technologies, including web 2.0, virtual reality and mobile technology, have reshaped the ways that consumers are used to receiving promotional messages, building their brand recognition, understanding product/service knowledge. All these changes are leading to a new understanding of brand communication and consumer learning. Obviously, as researchers (Goldsmith and Fylnn, 2005; Ha and Lennon, 2007) highlighted that fashion shopping experiences is fundamentally different from other digital shopping modes due to the emphasis of physical inspections of garments and textiles. The traditional 2D displays of products might be a key obstacle for consumers' learning in product knowledge. However, there are some attempts to solve this problem, such as the 3D virtual garment simulation and body scanning technologies (Kim and Forsythe, 2009; Shim and Lee, 2011). One of the successful cases is the Bodymetrics. By using 3D body scanning technology of which equipped in home-based television, apparel retailers are able to collect consumers' measurements in order to provide them with customized

apparels (Brown, 2003). Currently, researchers (Yu and Damhorst, 2015; Shin and Baytar, 2014; Lee, Kim and Fiore, 2010) are putting efforts on exploring the use of 3D virtual technologies in mass customization and consumer online interactivity. A virtual fashion design software called “Optitex” has been used in the fashion industry currently to enhance product design and retailing practices. However, most of these current practices are focusing on the traditional desktop-based 3D virtual platforms, and fundamentally looking at the product design and retailing issues. Nonetheless, there are still very little research has been conducted in studying the relationships between fashion consumer learning and the advanced virtual technologies in particular to stereoscopic 3D virtual environment. In view of the new stereoscopic 3D (stereo3D) visualization technology and the multisensory simulation technologies for fashion consumer learning, reference research in these relationships is virtually non-existent. It is important to trigger further investigations in these areas in order to find out the theoretical and technical frameworks for actual implementation. This research aims at exploring the theoretical framework and developing advanced stereo3D virtual consumer learning platform with stereo3D and multisensory stimulation experiences. A meta-analysis is applied to study consumers’ brand/product recognitions and their decision-making in a designed stereo3D interactive platform. The design of this interactive platform focuses on providing fashion consumers with a chance to learn product knowledge and making effective purchase decision through a self-directed interactive fashion show. The research is also trying to find out the effective sizes of (1) stereo3D visualization; (2) multisensory stimulation; (3) self-directed product instruction; (4) game-based experience; and (5) the digital agent.

## **2. Consumer Learning with Advanced Technologies**

To define consumer learning, according to Arnould and his colleagues (2001), it is an individual information process that aims to change consumers’ memory, behavior and attitude towards the attributes of the brands. It is important to note that consumers are indeed flexible before making their purchase decisions. The emergence of social media has provided consumers with rich brand and product information that are potentially educating new consumers <sup>11</sup>. However, providing consumers with rich information might not be a panacea for altering consumers’ perceptions on decision-making. Retailers should pay attention on the use of advanced technologies and

pedagogies for delivering brand and product information for a long-term consumer learning process. Indeed, an interactive and engaging presentation is helpful to deliver an effective consumer learning process (Li, Daugherty and Biocca, 2003). The current development of stereo3D interactive platform might be a chance for furthering the consumers into an interactive, and multisensory simulating learning process.

Another key issue regarding the consumer learning process is the result. It implies consumers' final purchase decision-making. Researchers (e.g. Solis, 2011; Vitkauskaite 2011) believe that a new consumer segment is created on the online and virtual retailing market. Other researchers (e.g. Gatautis and Kazakeviciute, 2012) state that this is a new consumers' online purchasing behavior that is totally differ to traditional model of consumer behavior in purchase. Take a look at the traditional consumer decision-making process, it involves five linear stages of (1) recognize; (2) search; (3) identify; (4) purchase; and (5) evaluate. Some researchers (e.g. Batra and Holbrook, 1990) highlight the importance of understanding how consumers "feel" (experience) about the products in their decision-making process. Anyway, are there any differences between online and offline consumers in this decision-making process? How about the newly emerged stereo3D virtual shopping platforms? Do consumers decision-making changed in an interactive consumer learning platform? How the factors, like stereo3D visualization, multisensory simulation and interactivity, affect consumers' learning process and their decision-making? All these questions are asked by this research and they are the key focus of this study.

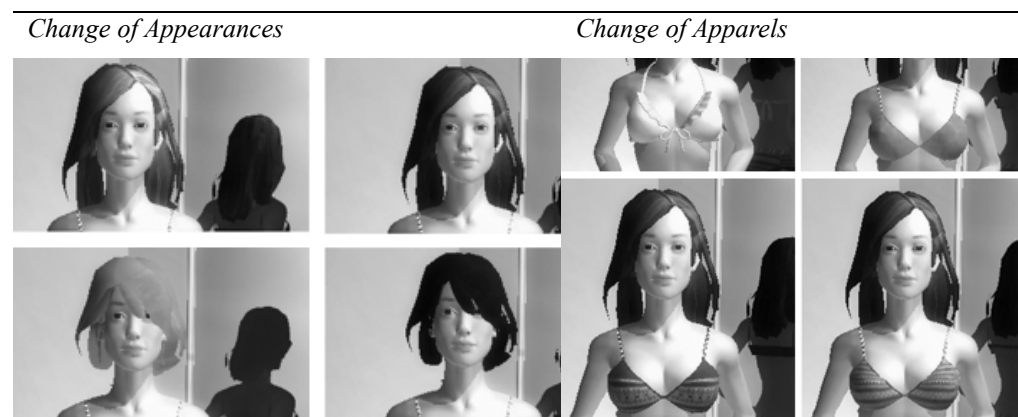
On the other hands, as mentioned in the first section, the consumers' virtual experience in the stereo3D virtual reality is also a key concern in this project. In view of the virtual experience design, the history of development can be referred to Morton Helilig's prototype called "Sensorama" in the 1950s. The Sensorama is probably the first virtual world with the stereo3D visual impacts. The stereo3D movies are also very popular from the 1980s to present in public markets. How stereo3D visualizations and impacts help in consumer learning process? One of the cases can be found from Rolf Jensen's prototype called "The Dream Society", the success of this experience design proved that the quality design of virtual human experience is able to enhance individuals' memory on the subject matter. This strong memory of consumers could be a key to deliver effective consumer learning. Back to the focus of fashion retailing and consumer learning, the current development of stereo3D

presentation creates unlimited possibilities to bringing fashion consumer learning to a new era. The mixture of stereo3D visualization, multisensory interactions, game-based presentation, and telepresence, enriches consumers' sensational and hedonic experiences in their learning process. Based on this assumption, this research reasons the use of an interactive stereo3D platform could enrich fashion consumers' learning process for brand and product knowledge, and this knowledge can help consumers to reshape their purchase decision making in digital retailing arena. Thus, the two key goals of this research are (1) designing a self-directed interactive fashion show platform for facilitating fashion consumer learning; and (2) conducting a meta-analysis to understanding fashion consumers' learning process in the designed platform in order to find out the factors and attributes to reshaping consumers' decision-making. Emphasis is placed on applying the features of stereo3D virtual technologies, such as visualization and multisensory interactions, for consumer learning in fashion retailing. The expected main contributions of this research are finding out the (1) consumers' behavior and attitude towards stereo3D simulations; (2) exploring the relationships between the stereo3D simulations and consumers' decision-making; and (3) an appropriate and effective implementation of stereo3D interactive platform for consumer learning in fashion business.

### **3. The Design of the Consumers' Stereo3D Virtual Learning Platform**

This research aims to provide a chance for consumers to organize their own fashion show in virtual reality in order to enhance consumers' product knowledge as well as facilitate their decision-making. Researcher believes that it is a process from consumers' learning to decision-making. Based on this assumption, this research established a self-directed interactive fashion show (SDIFS) with the stereo3D visualization and multisensory interaction for facilitating the distributed consumer learning practices. The entire period of development of this interactive platform was 12 months. The final presentation and display of this interactive fashion show was on stereo3D home-based television. This SDIFS has a tailor-made control system by using a simple and cognitive control approach. It implies that consumers need not to learn any operational skills while controlling the digital models, selecting apparels, and the navigation within the virtual environment. By this advanced programming,

consumers are able to change the digital models' appearances and apparels easily for preparing their own catwalk shows (See figure 1).

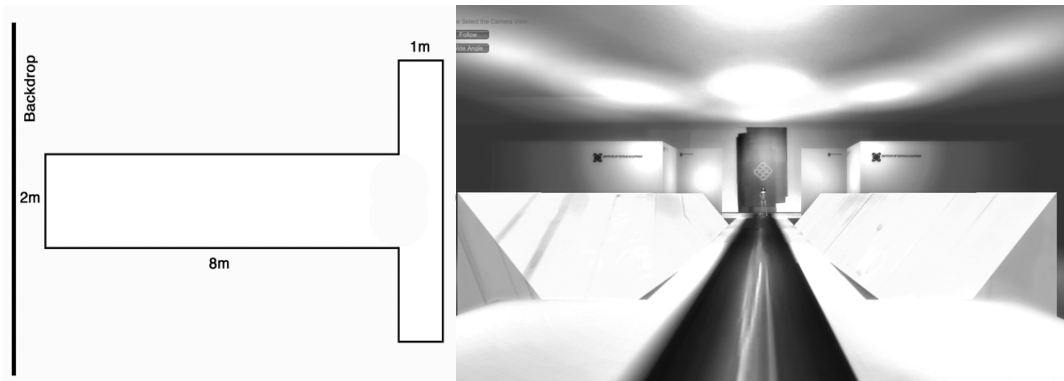


*Figure 1: Consumers can change the appearances and apparels in the system*

This development of this SDIFS is expected to achieve four main goals, they are (1) to provide consumers with a self-directed product learning experiences; (2) to provide consumers with an interactive presentation of product knowledge; (3) to provide consumers with a game-liked shopping experience for facilitating their decision-making; and (4) to provide consumers with a strong sense of telepresence in the stereo3D virtual reality for future development of virtual shopping.

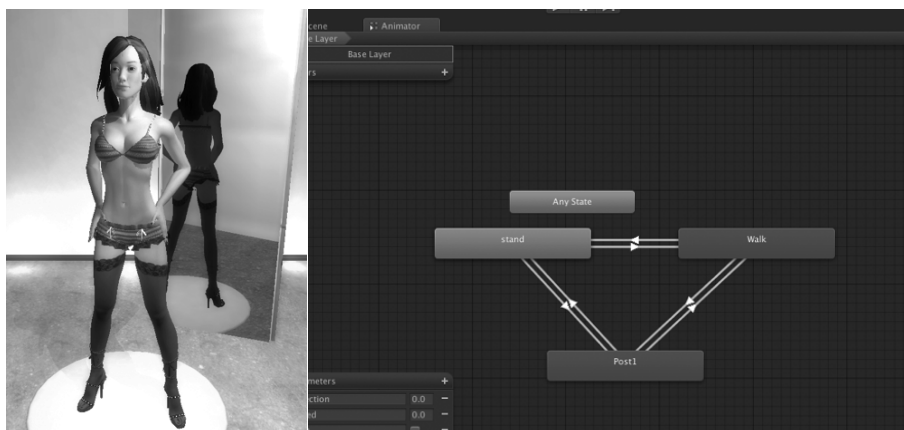
Regarding the details of the establishment of the SDIFS, the entire focus is divided into two directions, they are (1) the building of virtual objects (including digital models, apparels and catwalk venue); and (2) the design of interactivity. All virtual objects are built with a software called “Maya” from Autodesk. It is a software specialized in 3D modeling, animation, rendering and visual effects. For the design of interactivity, all finished virtual objects and rendered animation are exported to game design software called “Unity” from Unity Technologies. It is a software specialized in designing interactivity and prototyping for virtual objects and environments.

In view of the venue design of the SDIFS, it referenced from traditional T-shaped runway and stage design (See figure 2). The backdrop and decoration designs are also simulate to real fashion show setting. Different from physical fashion show, the T-shaped runway in SDIFS can be enlarged or reduced depending on consumers' expectation. It is important to note that the runway, venue and digital models are displayed in stereo3D visualizations and multisensory interactive.

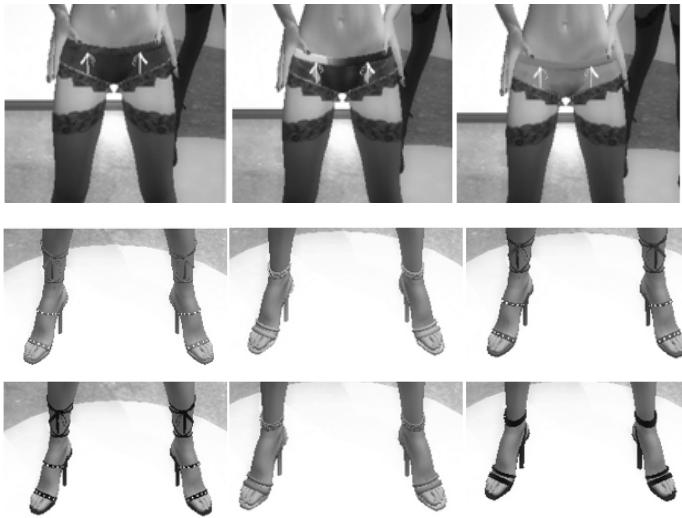


*Figure 2: The T-shaped runway design*

Designing an interactive digital model for consumer education is another key challenge of this research. The measurement of the digital model should base on actual female figure of fashion model. This research also studied various local professional female model in able to generate the standard height, weight and appearance of digital model (See figure 3). The second step is designing the interactions and the attributes of the digital model. The model consists of a set of features that allows consumers to change them, for instance, the model has four different sets of hairstyles, four sets of basic outfits, six sets of underwear, six pairs of shoes (See figure 4). Despite the design of adornments, the interaction of the digital model involves a set of default animations and postures. There are six different animations and twenty-four postures that the digital models can performance (See figure 5). These default interactions allow consumers to manipulate the digital model in organizing their personal catwalk show.



*Figure 3: The interactive digital model and its interaction design*



*Figure 4: Samples of adornments of the digital model*



*Figure 5: Samples of postures of the digital model*

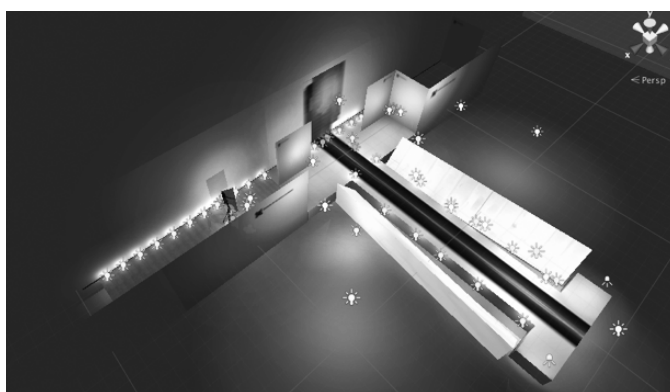
In order to simulate the actual fashion show preparation, the SDIFS provides consumers with a “fitting room”, which is a graphical user interface for changing the digital models’ appearance, apparels, and adornments (See figure 6). In this fitting room, consumers are allowed to zoom-in and zoom-out the digital models in order to looking at every small details before the actual catwalk performances. All the changes can be easily done in a control panel.





*Figure 6: The fitting room.*

The ambience, in fitting room and on the stage, is a key to create a simulated fashion show. The lighting effects are essential to create the ambience in this interactive platform (See figure 7). Four different colours of light effects illuminate the fitting room, whereas twelve different colours of lighting effects illuminate the catwalk stage. In addition, there are three sets of camera angles that consumers can adjust for their self-directed fashion show, they are wide-angle, close-up angle and the bird view angle (See figure 8). In other words, consumers play a role of broadcasting director during the catwalk show by keep changing the angles of shooting. It is important to note that the final recording of the self-directed fashion shows can be generated as a compact movie. Consumers can unload the movie on social networks for sharing.



*Figure 7: The design of lighting effects of the self-directed fashion show*



*Figure 8: The camera angle of the self-directed fashion show*

Besides, the audio effects and the gravity issue, which are the general concerns of designing a simulated scenario in virtual reality, are also being addressed to enhance the sense of telepresence and simulation of the SDIFS.

#### **4. Research Design**

The use of meta-analysis in this research explored the impact of a designed stereo3D interactive fashion show platform. The meta-analysis is one of the common methods that used by researchers in understanding the impact of technology on human behaviors. In this research, some of the crucial correlated factors have been studied in order to reveal consumer learning experience in the designed interactive platform, they are (1) stereo3D visualization; (2) multisensory stimulation; (3) self-directed product instruction; (4) game-based experience; and (5) the digital agent. The objective of this research is using quantitative synthesis to deepen the understanding of the use of the self-directed consumer learning with the stereo3D features as well as how to implement this game-based consumer learning strategies effectively in the future.

To collect quantitative data from fashion consumers for meta-analysis, this research adopts quasi-experimental method. The use of experiments can increase the validity of the research (Carlberg et al., 1984). In this study, the use of quasi-experiment approach is going to compare the control group and experimental group for the final meta-analysis. In details, the recruited fashion consumers in the control group are asked to watch fashion shows on the social media, such as Facebook and Youtube, in

order to gather brand and product information, whereas the consumers in experiment group are asked to participate in a journey of the designed self-directed interactive fashion show platform, and preparing their own catwalk shows. In this case, the experimental group will experience the stereo3D visualization, multisensory simulation, self-directed instruction, game-based experience and the use of digital agent. For the control group, the consumers are simply receiving a paper-based instruction for searching brand and product materials online.

The experiment took one month, with totally sixty hours, to complete. The reason behind is that the experimental group members should take average one to two hours for preparing their fashion shows. Upon the completion, the fashion consumers' perceived knowledge is examined from both control and experimental groups by a simple self-reflected questionnaire with 5-Likert questions (e.g. 5-point Likert-type scale 1=strongly disagree, 5 = strongly agree). The consumers' knowledge indicators are used as a post-test to assess their understanding of brand and product knowledge. The four indicators are (1) brand recognition – it indicates how much consumers recognize the brand after the experiments; (2) brand literacy - it indicates how much general knowledge that consumers obtained about the brand after the experiments; (3) product details - it indicates how much consumers understand the details of apparel, textures and functions after the experiments; and (4) product differences - it indicates to what extent the consumers can identify the product differences after the experiments.

As mentioned, this research also concerns that perceived consumer decision-making process in digital platform, four out of five stages of the classical decision-making model is applied for both control and experimental groups. The four stages are (1) recognition; (2) search; (3) identification; and (4) purchase. The reason of excluding the fifth stage, which is evaluation, is that the participated consumers from both groups are not able to evaluate their purchase product in this experiment setting. This experimental design model is shown in figure 9.

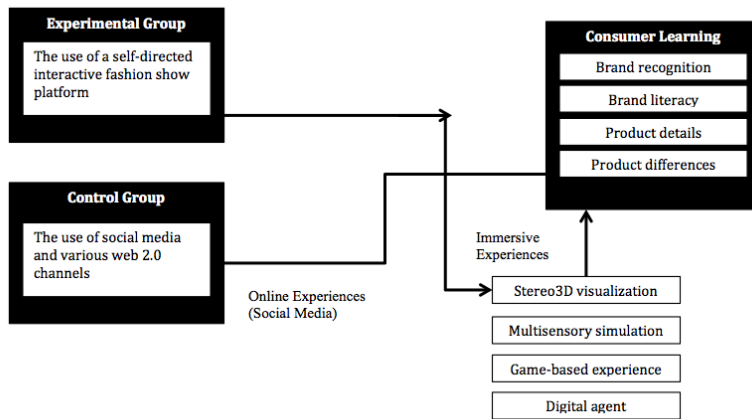


Figure 9: The experiment design

Through the understanding of fashion consumers' learning and perceived decision-making processes from both groups, researcher is able to identify the knowledge scope and generate theories for the future development of self-directed consumer learning activities with the stereo3D visualization and multisensory simulation.

#### 4.1 Sampling

This research recruited a same set of fashion consumers for both control and experimental groups in order to help the researcher to remove a key source of variation between the sets of qualitative data. The sample of this research consisted of 40 fashion consumers from the age group 21-30 years old. Regarding the recruitment of the participants, this research applied the Purposeful Sampling (Patton, 1987) and the Criterion-based Selection (LeCompte and Preissle, 1992). The criteria of recruiting appropriate participants are (1) young and independent fashion consumers with the age from 21 to 30; (2) obtained certain shopping experiences on online platforms, social media (e.g. Facebook and Youtube) and simulated virtual reality. Both control and experimental groups of this research are conducted in the university's computer centre with desktop computers, and university's simulation laboratory with stereo3D displays and multisensory technologies respectively. Gender is mixed in this research, and there is no particular brand of the fashion product is named in this research for both groups. The final stereo3D fashion show is viewed in a stereo3D theatre with multisensory feedback system. Moreover, there are few

technological limitations of this research, such as this research is only focusing on a digital fashion show and female avatars.

#### *4.2 Analysis Methods*

The aforesaid features in the self-directed interactive fashion show platform, namely the (1) stereo3D visualization; (2) multisensory stimulation; (3) self-directed product instruction; (4) game-based experience; and (5) the digital agent, are the dependent variables of this research. Beside, the four independent variable in the consumers' knowledge indicators, namely the brand recognition, the brand literacy, the product details and the product difference, are accepted as the scale of measures on the effectiveness of consumers' perceived knowledge in the self-direct consumer learning platform. In view of the measurement of fashion consumers' perceived change in purchase decision-making, the four perspectives of consumers' decision-making are being applied as independent measures, they are (1) recognition; (2) search; (3) identification; and (4) purchase. The fashion consumers' perceived knowledge in the consumer learning process from the indicators is contributing to the calculation of the overall effect size in the meta-analysis process. The method of Cohen's effect size is adopted in this research in order to find out the standardized estimate of the diverse perceived knowledge between the consumers' learning within the self-direct interactive platform. The mean scores of the simple post-tests from two groups are divided by the average standard deviation for establishing the effect sizes. Finally, the average effect size will be calculated to create an overall effect size for the meta-analysis. The Correlation Factor Analysis (Hedges, Shymansky and Woodworth, 1989) will also be applied to remove the bias of each biased effect size in both control and experimental groups. The ANOVA method is applied in this correlations analysis to study the heterogeneity of the dependent variables and the effect sizes. This research sets the p-value for the ANOVA is 0.01.

### **5. Results and Discussion**

The eight independent effect sizes are calculated (See table 1) to compare the consumer learning with the focuses of the consumer knowledge indicators and the

decision-making indicators in both the self-directed interactive fashion show platform and the traditional social media platform (e.g. Facebook and Youtube). The overall weighted mean of effect size is 0.15 (SD = 0.59). The overall mean of the sampling is 45.7 (SD = 13.4). The standard deviation of fashion consumer learning in this experiment is 2.55. The higher consumer knowledge indicator is “brand recognition” with the average effect size of 0.52, and the independent variable “product difference” in consumer knowledge indicators is relatively lower with 0.11. The two higher consumer’s decision-making indicators are “recognition” and “identification” with the effect sizes of 0.45 and 0.435 respectively. The independent variables “search” and “identification” are apparently lower with the average effect sizes of 0.11 and 0.08 respectively.

**Consumers Learning in Self-directed Interactive Fashion Show**

Variables	Average Effect Size
<i>(Experimental and Control Group)</i>	
<b>1: The Effect Size of the Consumer Knowledge Indicators</b>	
Brand recognition	0.52
Brand literacy	0.3
Product details	0.31
Product differences	0.11
<b>2: Consumer’s Decision-making Indicators</b>	
Recognition	0.45
Search	0.11
Identification	0.435
Purchase	0.08

*Table 1. Mean unbiased effect sizes by variable*

Table 2 showed the unbiased effect sizes related to the five features in the self-directed interactive fashion show platform. All the effect sizes are subjected to Cohen’s threshold for marginal magnitude is below 0.45, and the greater effect size, which is 0.8, is cutoff in this analysis as well. The five features studied in this synthesis reached a heterogeneity value over 5.0. Each ANOVA result showed that there is no significant difference between levels of variables at the alpha level of 0.01.

Features in the Self-directed Interactive Fashion Show	ANOVA Alpha Value
Stereo3D visualization	0.433
Multisensory stimulation	0.377
Self-directed product instruction	0.377
Game-based experience	0.417
Digital agent	0.410

*Table 2. The ANOVA Result*

In meta-analysis, the sample variance of the studied features is 0.466. The between-study variance is 0.402. As the overall effect size is 0.15, which is a small positive result. The standard error of the weighted average is 0.13. A small positive effect size has been found in this analysis. This result revealed that the designed self-directed interactive fashion show platform is not particularly effective when comparing to the traditional social media platform (e.g. Facebook and Youtube) in delivering consumer learning practices.

This meta-analysis involves the quantitative data extracted from 40 fashion consumers. The overall effect size for the use of the design self-directed interactive fashion show platform is the small positive of 0.15, accounting for sampling error and variance. The confidence interval is 95% in weighted effect size is between -1.075 to 1.452. According to the comparison of variables in the consumers' knowledge indicators, there is no significant difference is found about the consumers' perceived knowledge in both groups. Therefore, the use of a self-directed interactive platform with stereo3D visualization and multisensory simulation in consumer learning can be expected at least similar to traditional social media platform (e.g. Facebook and Youtube) in consumer learning practices.

## **6. Conclusion and Implications**

This research attempts to deepen our understanding of how different between the use of self-directed interactive platform for consumer learning and traditional social media platforms. The foci are placed on comparing the two consumer learning approaches by examining fashion consumer's knowledge indicators and decision-

making indicators. Surprisingly, the result is out of the researchers' expectation that the self-directed interactive fashion show platform can enhance fashion consumers' perceived knowledge as well as changing their purchase decision-making. The interactive platform with the stereo3D visualization and multisensory simulations is working similarly to the traditional ways of social media practices. In other words, there is no obvious difference in both consumer learning approaches. This result implied that, both consumer learning practices for fashion consumers are equally important in enhancing consumers' perceived knowledge and altering their decision-making. It could be explained that any kind of consumers' interactive engagement via digital channels could possibly enhance brand advocacy (Straker and Wrigley, 2016).

In conclusion, although the use of the designed self-directed interactive fashion show platform is empirically find not significant in fashion consumer learning practice, however, the reasons behind might be, fashion consumers are different from other type of consumers that they are more eager to acquire knowledge (e.g. brand and product knowledge) from social media platform in particular to Facebook, youtube and fashion blogs, the new type of self-directed, and game-based consumer learning platform might not be familiar with them. Regarding the consumers' decision-making process, there is no significant difference has found in this research, one of the reasons might be, as pointed out by current researchers (e.g. Marsden, 2011; Edelman, 2010), the nowadays consumer's decision-making process is no longer a linear format with clear stages, but rather a complex one with collaborative consumption (e.g. Garrett, Straker and Wrigley, 2017). It is a key factor that could possibly affect our research results. All in all, fashion show is always an effective brand communication and consumer learning platform for fashion consumers in fashion retailing industries. This research has demonstrated an authentic case of exploring and developing new type of consumer learning platform for fashion retailing and communication. In this research, an authentic case has been established and proven for other future attempts on developing virtual reality and mix-reality fashion platforms. In addition, because of the tremendous development of stereo3D technologies and serious game approaches are potentially changing the entire fashion consumer learning. For fashion business practices, this research suggests there are three major domains have to explore in order to cope with the challenges, they are;

- (1) It is essential to study the theoretical framework of designing interactive consumer learning platform;



- (2) It is crucial to explore the effective use of stereo3D visualization and multisensory simulation in fashion retailing context; and
- (3) It is always important to understand consumer's learning experiences in diverse digital platforms.

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