

Augmented Reality in customer interaction for branding of high-end vehicles

Yufan Lin

Adam Smith Business School, University of Glasgow, Glasgow G12 8QQ, United Kingdom

Abstract. In recent years, augmented reality (AR) technology has found wider and wider application in marketing, providing new opportunities for companies to better display their products to customers. For high-end brands, richer interactive customer experience can help them stand out in highly competitive market. In this paper, the concept of AR marketing and its related theories are analyzed. Then, the impact of AR technology on the changes in marketing approaches is discussed by summarizing the existing cases of AR marketing. Finally, with high-end automobile brands as the research object, the application of AR technology in customer interaction is explored.

Keywords: Augmented; Reality; Customer interaction; High-end vehicles.

1. Introduction

In recent years, augmented reality (AR) technology has made great progress in practice, making the concept of AR known to more people. The display effect achieved with the help of AR technology is very suitable for product display. With the popularity of AR concept, more and more manufacturers turn to AR technology to display their products to customers. Compared with the traditional way of displaying products in the form of pictures or videos, the application of AR technology can not only make the display effect of the product more realistic, but also add interactive modules to it. Therefore, users can actually experience some functions of the product without leaving home, which undoubtedly enhances its user experience when the product is marketed and displayed.

In the survey of customers' responses to the advertisements of AR mobile apps, Eunyoung Sung (2021) found that under the economic framework of the interactive customer experience, the immersive brand experience enabled by AR technology has a positive impact on customers' responses, significantly improving the efficacy of traditional marketing approaches. Currently, the integration of AR technology into existing marketing approaches can help marketing activities stand out in the fierce competition among brands [1].

2. literature review

2.1 The concept of AR marketing and related work

Augmented reality (AR) is an interactive technology that alters the physical environment through superimposed virtual elements. This virtual layer, located between the physical environment and the user, can add text information, images, videos or other virtual items for people to view the physical environment. AR technology has been applied to education, marketing, tourism, design, architecture, industry, games and other fields. Researchers have discussed the customer experience brought by AR technology from different perspectives. AR technology can help form a close and intimate (but not transactional) relationship between brands and users, thus affecting the customer experience.

Patrick van Esch (2019) argued that the anthropomorphization of AR will affect customer experience of AR. It proposed that AR technology stimulates vivid memories in customers, a positive impact on exploratory consumption experiences (i.e., concentration, exploratory behavior, playfulness, and time distortion). Among them, perception of ownership and the degree of spontaneous touch demand play a regulatory role [2].

Mathew Chylinski (2020) defined ARM as a customer-facing interface for the application of digital marketing technologies in physical settings. By categorizing the research on AR marketing of inclusion, embodiment, adaptability, and shared experience, Mathew Chylinski discussed how

various types of ARM experiences shape unique customer experiences in ways that differ from existing marketing approaches. [3]

Lana Mulier (2021) stated that the current mobile environment is undergoing a vertical video revolution. With three studies, it examined the efficacy of mobile vertical video advertising and horizontal video advertising in terms of consumer interest, engagement, and processing fluency, as well as the underlying mechanisms for efforts to watch video advertising on smartphones [4]. What's more, in AR marketing, mobile vertical video advertising increases customers' interest and engagement, and mobile users process vertical video advertising more smoothly than horizontal video advertising.

2.2 Related theories

2.2.1 The theory of presence

Presence (also known as telepresence) is defined as experiencing a virtual environment far from the actual location [5]. Presence is considered a key factor in understanding how people experience the environment created by technology. Presence refers to the sense of being in a local environment created by a medium. Compared with the traditional research method of two-dimensional display, presence can enhance a participant's sense of being in a store, thereby adding a sense of reality to the selected environment. Compared with the use of product pictures, virtual reality can enhance presence [6]. AR technology results in customers' presence [7]. According to the presence theory, presence is applicable to both AR environment and VR environment. Therefore, it is believed that the application of smartphone-based augmented reality can also enhance presence.

Hao Shen, Meng Zheng, and Aradhna Krishna (2016) found that when customers order food with electronic devices, like iPad, the presence formed through a touch interface will encourage more hedonic options. Taking fast food as an example, customers' decisions made through a touch interface may be different from those made in a physical store [8]. In a store, at the sight of a hedonic food item, a customer may feel the urge to grab it, but serving himself may require multiple steps (e.g., walking to the option, reaching for it, and placing the food into the shopping cart). Therefore, serving oneself may give an individual more time to think and reduce the possibility of choosing hedonic foods. However, the presence formed through a touch interface simplifies the shopping process due to "just one touch", leading to different shopping decisions.

2.2.2 The theory of mental imagery

Mental imagery is the mental representation process of sensory experience. The theory of mental imagery believes that people have two kinds of mental processing, that is, discourse processing and image processing. Sensory information is processed through imagery rather than images. 3D advertisements, product videos, interactive websites, and AR technology can stimulate mental imagery in customers, allowing them to imagine their practical or expected sensory experience with a product or service. Existential experiences and mental imagery can have an impact on customers' attitude, intention, and behavior. For example, mental imagery directly affects attitude and intention by mediating the influence of two-dimensional or three-dimensional website features [9], reinforcing the idea that imagery can powerfully alter customers' mental states. According to the theory of mental imagery, dynamic images are more vivid than static ones. The vivid performance of products will affect mental image processing. Vividly depicted products can stimulate customers' imagination of products or hypothetical consumption.[10]

The theory of mental imagery can interpret the relationship between waiting time and satisfaction in customers' shopping experience. Jing Wang (2017) found that it is often the perceived waiting time, instead of the actual waiting time, that determines customer satisfaction. Customers usually rely on their subjective feelings as the basis for their judgment about the duration. Many thoughts unrelated to waiting during the waiting process distract their attention, making the waiting experience less boring. Therefore, they consider it shorter[11].

The theory of mental imagery is also applicable to the research on customers' shopping decision. Yoonho Jin [12] found that in the visual gloss of products, the use of metaphor "smooth" to refer to "ease" may enhance customers' goal perception and persistence. Presenting products in a smooth background makes customers feel their goals are easier to achieve, which drives their behavior in the desired direction.

Wenbo Wang (2016) found that companies can reduce the consumption of resources and cost savings by influencing consumer behavior, which leads to the co-development of companies, consumers, and the environment.[13]

2.3 Case studies on marketing with customer interaction based on AR technology

2.3.1 Experience of product trials

At present, many brands have applied AR technology to product marketing. Zara, a fast fashion brand, has launched the Zara AR software with a two-week AR experience. Using the software to scan specific augmented reality icons (as shown in Figure1) on the store windows, in-store booths, packaging boxes or the brand's official website, you can see the models in ZARA Studio's new collection come alive, walking around and posing. In the software, customers can buy the products worn by avatars with a click on the "shop the look" button at the bottom of the screen. Customers can also use the software to take photos or videos which can be shared directly on social media platforms.[14]



Figure 1. Zara AR app

In addition, product trials based on AR technology have another advantage that other applications do not have, that is, the simulation of social scenes. Customers have choices to try different products in the same scene for comparison. Or they can try the same product in different scenes in order to choose a suitable occasion. The simulation of different social scenes can help customers buy products that are more suitable for specific occasions.

2.3.2 Experience of customized service

In order to achieve product customization, first it is necessary to collect the information about the customer's body dimension. The Kinect scanner or other scanning equipment can be used to record the body dimension information under static and dynamic conditions. Then the information is sent to the Mash viewer software to generate an all-round 3D human model which will be imported into the G-ERP system. Customers match their models with various parts of clothing in the existing database, including fabric, color, style, decoration, pattern and other elements. With the preliminary design and

virtual sewing finished, clothes are generated and worn on the models. After matching their models, customers need to check whether the clothes fit well. The CLO3D clothing software can be used to put the designed clothes on the models. Customers can use the poses that come with the software through the file option in the toolbar, so as to make the dressed models assume different poses. Then the fitness of the clothes can be examined from the front, the side, the back and other angles. Customers can also use the actions that come with the software through the file option in the toolbar, so as to make the models dynamically display the clothes like a catwalk, and to observe the swing of the clothes. Based on this, customers can make improvement on details in the design.

Nike, a fashion brand, has launched a real-time AR projection to customize shoes. Each invited customer will be provided with a blank version of the Nike shoe, a sample shoe specifically designed for experience. Customers can choose among the graphics options generated from Nike's traditional designs or on-site designs. Besides, they can change the size and color of the graphics. Once selected, AR will turn the image into a real look and put it on the customer's foot, so as to realize the design of the sneaker. After the final design is determined, the shoes will be made on the spot, a process that takes about an hour. This experience of customized Nike shoes takes a short time, and is full of fun and interaction. Most of the time in the whole process is spent on customers choosing the design they want, and the time to manufacture shoes is very short [15] (as shown in Figure 2).



Figure 2. NIKE AR app

2.3.3 The increase of product purchase rate due to deep interaction

Be it used online or offline, AR technology has improved customers' buying intention to a certain extent. Beauty, clothing, home furnishing, entertainment, education, medical and other industries have tried AR. Both online and offline experiences can stimulate customers' curiosity and lead them to have a try, thus increasing the product purchase rate to a certain degree.

Perfect Corp., an Internet service company in Taiwan, China, has two applications, YouCam Makeup and YouCam Perfect, which can use intelligent face detection technology to accurately detect users' facial features and dynamically apply makeup within 0.1 seconds. YouCam Makeup has achieved 900 million downloads. With its patented AR and AI technologies, such as facial recognition, skin tone analysis and texture matching, YouCam Makeup has created a digital space where users can try out different looks and share selfies on social media platforms. If they like, they can also buy related products online. YouCam Makeup has cooperated with many major brands. For example, Lancome Paris and L'Oreal Group once embedded their products into YouCam Makeup, so as to provide users with a virtual experience of makeup trial.[16] In 2017, Perfect Corp. commissioned

Intage, a research institute, to investigate the shopping behavior and shopping history of 25,000 female consumers aged 15 to 69 in Japan, including users of YouCam Makeup developed by Perfect Corp. and respondents who do not use the app. The survey data of respondents who do not use the app is considered as base 1. The results show that the shopping conversion rate of users of YouCam Makeup is 1.6 times that of respondents who do not use the app, and the former spends 2.7 times more on makeup than the latter. The AR trial section on the app has doubled the sales of beauty products and even increased some brands' sales to more than six times.[17]



Figure 3. YouCam Makeup AR APP

3. The application of AR technology in customer interaction of high-end automobile brands

3.1 The level of product

In terms of product, AR marketing transforms product display from two-dimensional display to three-dimensional display, from single-sensory display to multi-sensory display, and from single display to product experience. In advertising and marketing process, previous marketing approaches encode the information about products and brands into information that the medium can carry, such as the text information of newspaper advertisements, the image information of magazine advertisements, and the information of online pre-movie advertisements. Such information not only is lost in the process of encoding, but also affects the users' understanding of the real products. AR marketing can represent the state of the product as much as possible, transform product display from two-dimensional state to three-dimensional state, and present the whole image of the product directly to users. Newspaper advertisements, video advertisements, and online advertisements are all marketing content developed for people's certain senses. Newspaper advertisements based on text and images mobilize people's visual sense with their expressive text and detailed information, but the visual impact is not enough. Although television advertisements mobilize people's visual and auditory senses, they lack the tactile perception of real objects. On the other hand, previous product promotion, be it 4P or 4C, abstracts physical products into symbols, function points, and satisfaction points, so as to present them to consumers, while AR marketing can turn the product into an experience to provide consumers with the feeling and state of use.

In automobile marketing, it's essential for the enterprise to tell customers why the product is different. However, what's more important is to display the product to customers. When demonstrating the excellent internal workings of a car, the enterprise usually dismantles individual parts of the car or cut the car in half to display its various parts. BMW has created an interactive X-ray application to help consumers see for themselves what makes its car's interior unique. With the help of AR applications, the engine, high-strength steel structure, smart packaging, and other features can be presented to customers, resulting in a customer experience that is more influential than simply observing a simulation model. Vincent Chi Wong (2020) found that consumers' purchase decisions were positively influenced when they were prompted to focus on trends in the improvement of consumer products rather than their negative nature [18]. Generally, customers can't see what makes a product unique. Nowadays, such immersive experiences make it easier for customers to better understand what they're buying, boosting their buying confidence as well as shortening the sales cycle.



Figure 4. The body structure of a car presented by the AR-based application [19]

3.2 The level of brand

In terms of brand, AR marketing provides customers with brand stickiness and brand value. It is the inherent interactivity of AR technology and its access to experience that the relationship between brand and consumer aims at. Branded AR technology can not only reveal that the brand keeps pace with the times, but also create affinity by narrowing the distance with consumers. What's more, it can forge the experience economy of the brand, providing consumers with product trials. By implanting brand information into the daily life of users, AR technology also meets the needs of brands' social interaction. While meeting people's needs of daily life and use, AR technology imperceptibly enhances consumers' attention to and use of the brand. In the era of abundant products, brand owners must consider the homogeneity of products and brands. With gradually shrinking marginal utility, newspaper advertisements and TV advertisements cannot reach the target group. Under such circumstances, increased brand owners are turning their funds and attention to AR marketing. Due to its forward-looking and topical nature, it is easy for AR marketing to give avant-garde and trendy labels to brands in marketing. At the same time, the relaxed and pleasant interactive experience can easily accumulate users' goodwill and loyalty to the brand, activate the brand stock, and reduce the loss of users.

Audi has released an AR smartphone application due to its TV advertisements. With the help of the application, the car drives out of a big screen, into the living room and the driveway. According to the news from Audi, Audi's Quattro Coaster AR app is able to identify its specific TV advertisements.

The application shows a sedan with a four-wheel drive system, dashing off the TV screen and driving directly into the user's living room or driveway. With this application, a vehicle can be shrunk down to the size of a matchbox, creating a Hot Wheels-style track on which the vehicle can ride.

The Quattro Coaster app is jointly created by Audi Norway and POL Oslo, a Norwegian creative agency. Anna Adamson, the project leader, talked about the process of realizing this idea through Apple's AR Kit and computer vision, "To achieve a seamless transition from TV to AR, we adopted computer vision to detect Quattro Coaster TV advertisements. Next, we write the data simultaneously to hard drives and locate the content on the screen that needs to be augmented. After the advertisement is over, the car remains indoors. Apple's AR Kit allows us to tell new stories freely and cross several media easily."



Figure 5. Audi AR APP

3.3 The level of consumer

In terms of consumer, AR marketing develops the concept of 4C to a new level of experience. AR marketing provides consumers with convenience in time, space and access. AR can amplify or compress the time and space in the physical environment, allowing consumers to experience richer effects in less time and in a shorter path. Meanwhile, AR marketing can make consumers' behaviors three-dimensional when they contact or use products, thus reducing their unfamiliarity with the products and services. In terms of cost, it is difficult for AR technology to reduce the cost of products, but the purchase cost of customers can be greatly reduced, which reduces their time cost and risk.[20] AR marketing deeply learns the needs and desires of customers at the point of contact between consumer and brand, so as to display products and services to users. At the same time, AR technology also completes the communication between products and users. In fact, the biggest change brought by AR marketing is to create value for customers and provide them with greater convenience. In consumers' living environment and life path, the product or brand information points are superimposed in their environment quietly with the help of AR technology.

When dealers around the world were closed during the pandemic, BMW began to seek a way for buyers to continue exploring the vehicle, not just to have a look. BMW has cooperated with 8th Wall to launch Virtual Viewer, a WebAR with more details and interactions in car viewing experience. In the form of AR filters, it allows users to view the cockpit interior, roof and exterior of BMW X5 and BMW X1, BMW's new plug-in hybrid vehicles, and those of BMW3 Touring. With the help of WebAR, BMW is creating an experience that multiple customers can share on their phones, which allows customers to place these vehicles in their own environment. The final experience is accessible on mobile devices, so that users can explore the interior and exterior of a virtual BMW. Users navigate the experience, take tests, and talk to chatbots through voice commands.



Figure 6. BMW WebAR

3.4 Marketing approaches

In terms of changes in marketing approaches, the AR marketing medium is an integrated marketing medium in real sense. On the one hand, AR marketing medium can integrate the vast majority of current marketing media, such as newspaper advertisements, DM advertisements, TV advertisements, and online pre-movie advertisements. The marketing information of products or brands can be superimposed in AR. Or AR can be used to make newspaper advertisements, DM advertisements, TV advertisements, and online pre-movie advertisements. The series connection of the contact points in AR marketing is exactly the media integration pursued by the integrated marketing communication. Under the unified marketing strategy of the enterprise, the publicity effect can be maximized by using AR technology with different communication methods to exert the communication function of different media. Besides, the influence of AR on changes in marketing media lies in that, as a new type of narrative medium, AR marketing coordinates the presentation of text, images, videos, H5 and other contents. When delivering powerful sensory experiences, such as vision, hearing, and touch, to consumers, AR marketing brings an experience of a story to the user. In this era, products and services with a story lead the trend.

A car showroom not only is responsible for the sales, but also displays the model and style of the car. The communication between display and information is the core function of the car showroom. For high-end automobile brands, the display platform is of great importance. It enables more people to have a comprehensive understanding of the brand and its products, stimulates consumers' desire to buy, and directly affects the brand's image in consumers' minds.

The good design of a car showroom can bring huge benefits to an enterprise. First, it increases the popularity of the enterprise, so that the brand information can be effectively transmitted. Second, it effectively promotes the products of the enterprise through product publicity. Third, in terms of consumers, through product display, it helps consumers find suitable products themselves. Finally, it provides opportunities for the enterprise to improve technology and services. The enterprise can gain face-to-face opportunities with consumers and other enterprises with the help of the car showroom, so as to adjust and modify business plans in time. Hence, the enterprise can meet the market's demand, a key auxiliary factor for the future development of enterprises.

As one of luxury goods, high-grade automobiles are different from ordinary commodity purchase decisions in terms of hedonism and uniqueness represented by automobile brands [21]. In addition, the face-oriented consumption is a unique phenomenon in the premium car consumption market, and the face orientation represented behind the brand has a greater impact on consumers' consumption tendency.[22]

The “AR Smart Showroom” launched by Mercedes-Benz breaks the barriers of time and space, allowing customers to visit 4S stores without leaving home. Through the smart showroom, users can browse car models, view discount information, and horizontally compare the advantages of various store, so as to select a satisfactory model. Such a convenient and quick way to view the car significantly saves users’ time and cost, and also gives users a good shopping experience. The “AR Smart Eye”, a kind of car manual, allows users to superimpose the introduction information on the car buttons and functional areas by scanning the interior structure of the car on the mobile phone without carrying an operation manual.

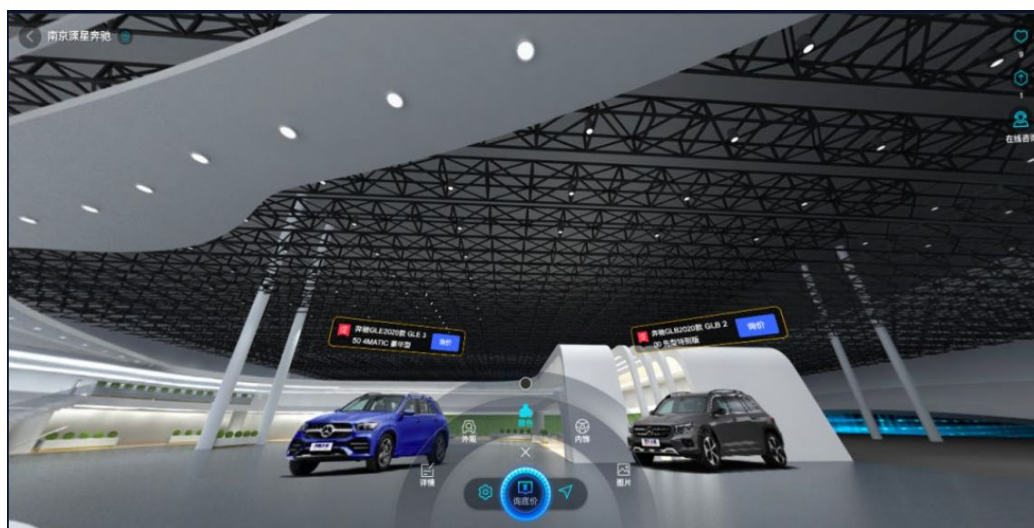


Figure 7. “AR Smart Showroom” launched by Mercedes-Benz[13]

4. Conclusion

As an innovative way to help consumers use digital tools in their decisions, AR technology ensures that potential customers not only get real help when choosing a car, but also enjoy the fun and friendliness of digital tools at the same time, thus improving customers’ purchase desire to a certain extent. Compared with traditional marketing approaches, AR marketing saves customers plenty of time. It is intuitive, convenient and interesting. Its creative virtual scenes can arouse customers’ curiosity and attract customers to experience. In the future, AR will continue to be used increasingly in high-end car retailing, so as to improve customer experience and ultimately boost sales.

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