

Augmented Reality Marketing: Breakthroughs and Opportunities

Limin Niu*

School of Business Administration, Guizhou University of Finance and Economics, Guiyang 550025, China

*Corresponding author: Limin Niu, niulimin1227@163.com

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Abstract: The impact of augmented reality (AR) technology on consumer behavior has increasingly attracted academic attention. While early research has provided valuable insights, many challenges remain. This article reviews recent studies, analyzing AR's technical features, marketing concepts, and action mechanisms from a consumer perspective. By refining existing frameworks and introducing a new model based on situation awareness theory, the paper offers a deeper exploration of AR marketing. Finally, it proposes directions for future research in this emerging field.

Keywords: Augmented reality; Augmented reality marketing; Situation awareness

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1. Introduction

Augmented reality (AR) is an immersive technology that merges computer-generated objects with the real world, enabling individuals to interact with both in real time. Faust defined AR as the overlay of virtual objects (such as computer-generated images, text, and sound) onto the user's real environment ^[1]. Similar to virtual reality (VR), AR aims to enhance or enrich the viewer's experience. However, unlike VR, which generates an entirely virtual scene, AR creates an overlay in the real-world view, allowing users to interact with both virtual and physical environments simultaneously ^[2]. AR is more advantageous for both retailers and consumers than VR because it enables consumers to visualize various virtual products on themselves without the need for physical trials in stores. This not only enhances consumers' understanding of products but also provides greater enjoyment while saving time, making shopping easier and more engaging ^[3].

Integrating AR with marketing not only expands the channels for disseminating marketing information but also elevates interactive and experiential marketing to unprecedented heights. The dual potential of AR in enhancing interactive experiences and improving marketing efficiency offers consumers an unparalleled shopping experience while driving technological innovation in marketing. AR can be categorized into consumer-level and enterprise-level markets. In the consumer sector, major brands and retailers are increasingly

developing AR features for smartphone apps, leveraging the convenience of mobile devices to allow consumers to use AR anytime, anywhere. For example, cosmetics companies like Sephora and L'Oréal have launched AR mirrors that enable customers to virtually try on makeup, while companies such as Nike, Adidas, IKEA, and Houzz have implemented AR technology to enrich the shopping experience and help consumers make more informed purchasing decisions.

However, the development of augmented reality marketing is still in its early stages. Due to the limitations of technical devices and application scenarios, AR technology has not yet been widely adopted in the consumer sector, and most consumers remain unfamiliar with AR shopping experiences. Over the past few years, AR marketing has largely relied on the novelty of the technology to generate short-term effects, without establishing strong customer-brand relationships or delivering a deeper and more enriching shopping experience for consumers.

The academic community urgently needs to strengthen its exploration of the concepts, applications, theoretical foundations, and underlying mechanisms of AR marketing. Most studies in AR marketing focus on the impact of AR's technical features on consumers' purchase intentions ^[2-4]. Some scholars, focusing on specific technical aspects of AR, have delved into how these features influence consumer behaviors such as willingness to pay and choice ^[5]. Theoretically, many scholars have used frameworks such as the Stimulus-Organism-Response (SOR) model and the Affect-Cognition-Behavior model to examine the impact of AR experiences on consumer behavior ^[6,7]. Popular theories in this field include mental imagery theory ^[5], flow theory ^[8], and the elaboration likelihood model (ELM) ^[8]. Additionally, several researchers have applied AR technology in real-world contexts to investigate its impact on consumer behavior and decision-making ^[9-11].

However, current research on AR marketing still faces many challenges, such as a lack of theoretical innovation, limited research models, insufficiently diverse application scenarios, and an incomplete understanding of how AR affects consumer decision-making. Compared to other marketing fields, scholars have paid relatively little attention to AR marketing, and research in this area is fragmented across different industries and application scenarios without effective integration.

2. Augmented reality and the characteristics of AR

Augmented reality refers to the overlay of virtual objects (such as computer-generated images, text, and sound) onto the user's real environment ^[1]. AR primarily uses head-mounted displays to layer virtual objects onto the physical world, offering users a fully immersive experience that blends virtual content with reality. Users can interact with people or objects within the AR environment, creating a sense of being fully integrated into the virtual scene. Interactivity, vividness, and telepresence are the three main characteristics of AR. Interactivity refers to the technology's ability to allow users to easily interact with, control, and engage with content ^[12]. In virtual contexts, it describes the extent to which users can modify the form and content of the environment in real time ^[13]. AR's vividness refers to its capacity to provide users with a rich sensory experience ^[14], focusing on the realism of virtual content and the intensity of users' perceptions. Telepresence is the immersive feeling users experience when interacting with virtual content, making them feel as though the virtual elements genuinely exist in their real environment.

3. Theoretical exploration of augmented reality marketing

Much of the academic exploration of AR marketing theory is based on information systems research. The SOR Model has been widely applied in the field of AR marketing ^[15]. The novelty of AR technology lies in its interactivity, vividness, and telepresence, which provide consumers with unique stimuli in terms of perception and cognition. Due to these features, SOR models (**Figure 1**) have been suitable for early AR research. However, in the long term, there is a need to develop or adopt new theories to better explain the distinct consumer experiences AR offers. Building on existing theoretical exploration, this paper proposes a new research framework based on situation awareness theory (**Figure 2**) to further investigate models applicable to AR.

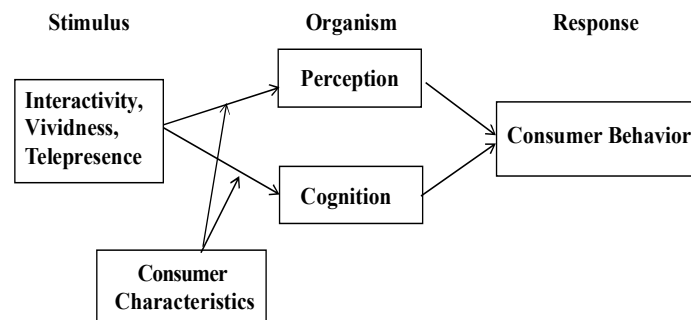


Figure 1. SOR model

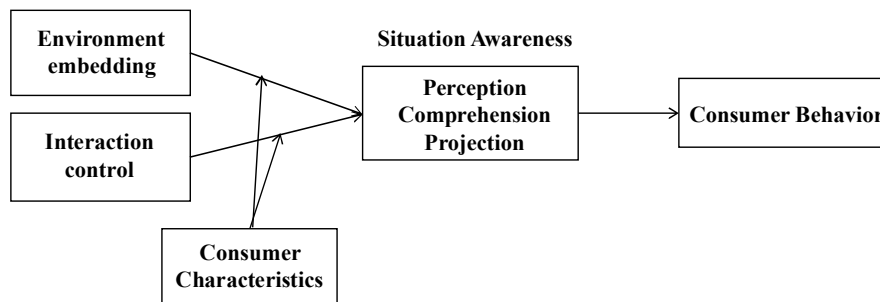


Figure 2. SA model

Situation awareness (SA) refers to the perception of elements in the environment within a specific time and space, the comprehension of their meaning, and the projection of their status in the near future ^[16]. According to Endsley ^[16], when an individual encounters a dangerous situation, they require an appropriate and accurate decision-making process that includes pattern recognition and matching, forming complex schemas, and prototype knowledge that aids in correct decision-making. The formal definition of SA is commonly described in three levels ^[17]: (1) Perception: the perception of elements in the environment; (2) Comprehension: the understanding or awareness of the situation; (3) Projection: the prediction of future states.

The first level, perception, involves sensing the current situation, which can also be understood as the sensory stimulation provided by AR technology to the user. The second level, comprehension, refers to the individual's understanding or awareness of the situation, primarily on a cognitive level. The third level, projection, relates to the prediction of future states ^[18].

4. Future research directions for augmented reality marketing

Current AR research predominantly applies theories such as Mental Imagery, Flow, Perceived Value, Media Richness, ELM, TAM, and SOR. These theories have become saturated in AR studies, and new theoretical frameworks are needed. Many of these applied theories focus on AR's technological features without fully integrating the research context. Future studies should explore context-relevant theories, such as cognitive load theory, embodied cognition, situated cognition, and situation awareness, to better understand the impact of shopping contexts on consumer decision-making.

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