

# Audience Engagement and Decision-Making through Augmented Reality Technology in Advertising

Fatrisha Mohamed Yussof, Sabariah Mohamed Salleh, Abdul Latiff Ahmad

**Abstract**—The effect of globalization and technological advancements has transformed the manner in which individuals connect and associate inside social norms. In line with this, worldwide advertising industry has moved to digital advertising for effective outreach target audience. Along these lines, to keep pace with the fourth industrial revolution era, prior researchers asserted the importance of novel approach advertisers incorporating virtual and reality worlds like augmented reality (AR) technology as an alternative advertisement platform. In addition, information pertaining to augmented reality advertising consumer behavior are still scarce and this warrants a systematic literature review in order to answer the following questions: (1) What were the main applications involved and describe the way they have change over time? (2) What methodologies have been employed in augmented reality advertising research? (3) What are the variables or theme utilised in augmented reality advertising research? (4) For future direction guide, what are the critical issues identified in augmented reality advertising? The study is a systematic review of publications published over a ten-year period spanning from 2010 to 2019.

**Keywords:** Advertising, augmented reality, consumer behavior, technology.

## I. INTRODUCTION

The growth of digital technologies and media advancement offer numerous chances for advertisers, and marketers to create advertisements that boost product awareness and consequently encourages consumers to take note and invest their energy in the products, while at the same time getting the messages known and digested by the masses. That said, taking hold of consumer's attention and alertness is no easy feat, thanks to competitive message environment that is on the rise which consequently urges a more significant brand of advertising [1], [2]. According to the 'Advertising Expenditure' (ADEX) reports that were released in early 2017, allocations for advertisements via traditional channels such as magazines, newspapers and televisions have been steadily facing a consistent decrease over the past few years [3], [4]. Hence, 'augmented reality' (AR) as one of the current components of digital advertising medium that have emerged as a marketing device for marketers [5], considering its novel features like

interactivity that induces a natural feeling of perceiving information on the outer sphere of reality [6].

Interactivity is an element that further expands the function of product promotions and is not a feature equipping traditional media advertising [7], [8]. Ad design with interaction-based feature makes it possible for consumers to have a closer scrutiny of the advertising message and come to a better comprehension of it [9]. Apart from that, AR technology advertising activities strives to guide consumers into immense real world-like experience [5]. Irrefutable advantage is also at its side, for AR technology contributed greatly in integrated marketing programs and offers a great of experience marketing potentials that can boost brand communication [10], [9]. Marketers can also swiftly afford the upper hand over their competitors with its help [11].

Hence, augmented reality is a useful marketing tool that could be utilized to guide the masses into turning their attention towards the advertisement appeal thus enhancing their perception, with the added effect of better advertising message retainment that will eventually bring them to purchasing intention behaviour. However, what with us riding the advancing technology wave and all its perk, empirical studies on consumer behaviour towards augmented reality adopted advertising strategy pales in volume when compared to other fields like education, gaming, science and health. With that in mind, this paper strives to uncover augmented reality scenario in regard to consumer behaviour amidst technology application in advertising platform, or any probable further research within the context.

To develop an overview, the authors performed a Systematic Literature Review (SLR) research. SLR can be defined as in-depth reviewing of past literatures that touched on the problems via identification, critical determination and synthetization of the discoveries reported by all relevant and outstanding quality individual studies covering one or more research questions [12]. Through mapping the known, this review proceeds with presenting insights or intensive outlook for future research in augmented reality advertising which are rapidly rising as crucial field of studies. With that said, this study aimed to seek answers for these research questions: (1) What were the main applications involved and describe the way they have change over time? (2) What methodologies have been employed in augmented reality advertising research? (3) What are the variables or theme

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utilised in augmented reality advertising research? (4) For future direction guide, what are the critical issues identified in augmented reality advertising?

## II LITERATURE REVIEW

### *A Augmented Reality Overview*

Augmented Reality (AR) is a merging of real world and virtual objects that running in real time and is interactive to engage in realistic experience [13], [14]. Initially, Ivan Sutherland created and developed AR back in 1960 for the purpose of application in health, engine maintenance and information systems [15]. Nevertheless, AR technology has been reached out to a few new functions in several fields, such as advertising, gaming, tourism and education since the rise in smartphone and digital device consumption. AR technology can be experienced in multiple ways through devices like head mounted display, laptops, smartphones, tablets, and most recently via smart glasses.

There are two known categories of AR, which are marker-based AR and marker-less AR [16]. A marker-based AR Images are required to be labelled specifically in order to locate 3D object positions on real-world images in [17] whilst marker-less AR involves a combination of compass and location (GPS) with the addition of electronic devices and consequently pointing to a targeted position in the physical world in order to transmit information in 3D [11]. Users can expect significantly relevant and enjoyable information from the technology. Novel and unlimited experiences can be accomplished when interacting with different environments via AR [18]. The omnipresent acceptance of smartphones has spark developers and companies' interest in using AR. As a result, AR moves from the laboratory to consumer markets [19].

### *B Augmented Reality Technology Adoption*

The advertising sector is currently in a critical state. Due to the advent of new media, it encountered a period of unmatched change that antagonizes both business models and industrial structures [20]. AR appears to provide the sector with benefits that should be embraced in order to win the choice of customers and have a positive effect on customers [21], [5]. According to [10], AR has excellent possibilities to contribute to integrated marketing communications (IMC) programs by enhancing consumer communication in achieving advertising goals, to present distinct and interesting thoughts so that customers are more likely to participate in social media and encourage word of mouth indirectly. On the flip side, underdeveloped approach initiatives will prompt an inability to link consumers and unfavourably sway branding images, initiate resource waste and ruining programs that employs AR in the future [10]. Although undeniably, there is a lack of knowledge among customers about AR technology in the current world of high technology [22]. Despite that, most consumers have voiced their aspiration to utilize AR due to its innovative and attention attracting features.

## III METHODOLOGY

The study conducted a descriptive systematic literature review (SLR). The descriptive review consists of narrative

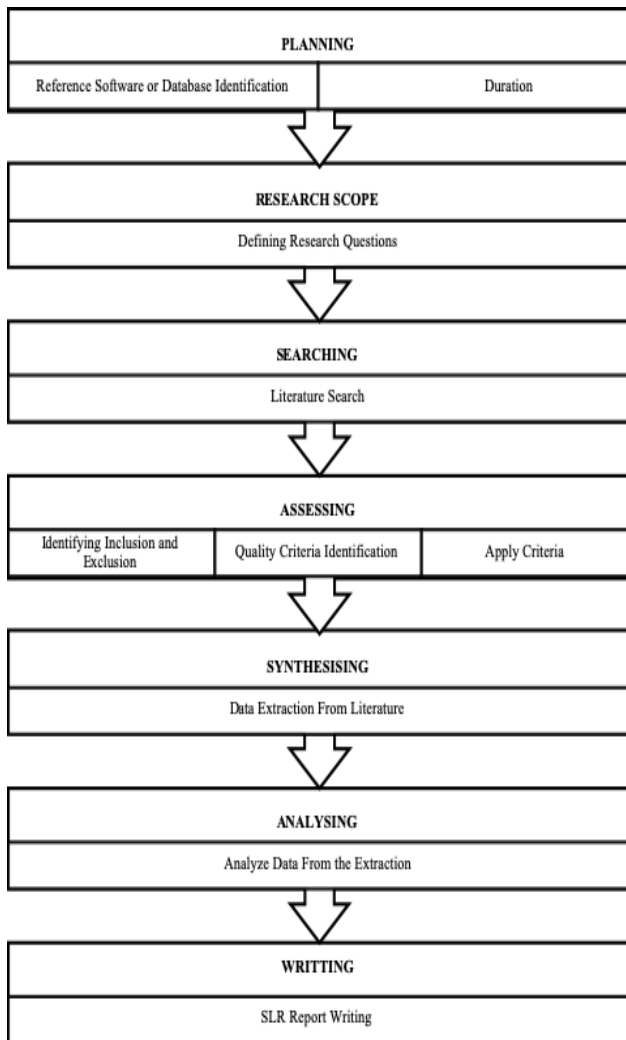
review, textual narrative synthesis, meta-summary, meta-narrative and scoping review [23] which was an array of methods determining, analysing and integrating of data. For the study, the author seeks to focus on the scoping review, which extracts as many appropriate literatures as possible from each piece of article, including methodology and any significant inclusion to give a full overview of what has been accomplished [23]. With that said, although research quality is not a prerequisite, it is compulsory for the scoping review to be comprehensive [24]. Hence, in the glaring scarcity of augmented reality advertising discourse, the method was identified as the most suitable to accomplish the purpose of this paper.

In the matter of ensuring no data will be overlooked, the author employed iterative assortment process. As reported in an earlier paper by [25], iterative assortment is used to obtain the most relevant data via analysing and continuously refining to preserve research quality. In order to ensure the appropriateness of the sources in conducting SLR, the author has set the exclusion of patterns, news report, thesis, and blogs as a limitation parameter. During careful reviewing of articles in the course of the research, keyword filters were applied as a measure to exclude vague or ambiguous search results. Articles with augmented reality marketing or advertising studies as their core matter were identified. Lastly, AR publications were assigned into categories by the author according to components such as audience engagement and decision-making in augmented reality advertising.

### *A The Process*

The primary objective is to define the extensive perspective of future study opportunities in augmented reality advertising field, thus providing evidence to fill the study gaps. In the following subsection, the six steps employed in the study will be outlined and presented in a flow chart of Fig. 1.





**Fig. 1. The process of conducting SLR**

**Step 1- Planning**

Planning is an imperative step at the initiating phase of SLR. For its meticulous research characteristics, Google Scholar, Scopus and WOS database was used. Publications published in the time frame of ten years spanning from 2010 – 2019 were designated as samples.

**Step 2- Research scope**

Following planning phase, research scope was identified in order to establish answerable research questions. An initial brainstorming was held, concentrating on context and literature search as it was described as an iterative method at prior stage. The research questions finalized were:

RQ1: What were the main applications involved and describe the way they have change over time?

RQ2: What methodologies have been employed in augmented reality advertising research?

RQ3: What are the variables or theme utilised in augmented reality advertising research?

RQ4: For future direction guide, what are the critical issues identified in augmented reality advertising?

In order to aid the researcher in establishing an overview of future opportunities in Augmented Reality Advertising, the research questions were set.

**Step 3- The search**

The search phase is carried out by browsing through the databases using the keywords "Augmented Reality" AND "Advert\*" AND "Marketing". The inclusion of word

marketing in the keywords due to some research has referred advertising and marketing as similar category. To broaden the search, the inclusion is valid. The keyword designation was based on research questions specified in the previous section. In order to achieve accurate screening, the word "AND" was used. The search was initiated on March 3<sup>rd</sup>, 2019 which is the paper is an extended and refined version of prior article that has been published in Intelligent and Interactive Computing, Proceeding of IIC 2018, Scopus Indexed, Springer. Prior article has included the marketing and advertising in behavioural study while the current study is solely focusing on advertising platform in context of consumer behavioural study. In addition, the prior proceeding articles were compilation of indexed and non-indexed journal or proceeding. In contrast, the current selection is based on indexed journal with impact factor and proceeding indexed Scopus.

The time allotted for research duration depended on the availability of research and until all relevant research have been exhausted. A total of 10,300 documents have been curated from Google Scholars, 49 documents from Scopus, and 26 documents from WOS at the end of the search.

**Step 4- Assessing**

The objective of the assessing stage is to go through on the most relevant discourse by finalizing the amount of papers appropriate to the context study. The inclusion and exclusion criteria described as below.

First, initial screening was carried out via title, publications and abstracts checking using the following inclusion criteria:

- 1) Studies that primarily represented augmented reality in advertising.
- 2) Studies that covers augmented reality in marketing advertising.
- 3) Consumer behaviours context study.
- 4) Indexed proceedings or journals

Then, a number of articles with the following criteria will be excluded in a deep screening step:

- 1) Articles solely discussing about advertisement platform
- 2) Non-English language articles
- 3) Documents dated pre-2010
- 4) Redundant articles
- 5) Confirmation journal indexing and impact factor at Scimago or Master Journal List Clarivate Analytics
- 6) Sourced from ambiguous origins like website pattern, thesis, news report, and blogs

Ultimately, a total of 46 articles were deemed relevant at the end of initial screening. After the application of exclusion criteria, 11 articles Indexed journal and 3 articles proceeding remained as the final most relevant ones as shown in Table I and II.

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**Table- I: Indexed journal**

No.	Author	Name of Journal	Quartile /IF
1	McLean, Graeme, and Alan Wilson. [35]	Computers in Human Behaviour	Q1 1.71
2	Smink, Anne R., SanneFrowijn, Eva A. van Reijmersdal, Guda van Noort, and Peter C. Neijens. [27]	Electronic Commerce Research and Applications	Q1 1.07
3	Feng, Yang, and QuanXie [36]	Journal of Promotion Management	Q3 0.32
4	Phua, Joe, and Jihoon Jay Kim. [29]	Telematics and Informatics	Q1 1.21
5	Brengman, Malaika, Kim Willems, and Helena Van Kerrebroeck [28]	Virtual Reality	Q2 0.48
6	Feng, Yang, and QuanXie [36]	Journal of Current Issues and Research in Advertising	Q2 0.41
7	Pantano, Eleonora, Alexandra Rese, and Daniel Baier [31]	Journal of Retailing and Consumer Services	Q1 1.21
8	Hopp, Toby, and HarshaGangadharbatla [37]	Journal of Current Issues and Research in Advertising	Q2 0.41
9	Yaoyuneyong, Gallayanee, Jame Foster, Erik Johnson, and David Johnson [5]	Journal of Interactive Advertising	1.15
10	Baek, Tae Hyun, Chan Yun Yoo, and Sukki Yoon [34]	International Journal of Advertising	Q1 1.38
11	Sung, Jungyeon, and Kwangsu Cho [38]	Lecture Notes in Electrical Engineering	Q3 0.13

**Table- II: Indexed proceeding**

No.	Author	Published	Indexed
1	Nazri, NurIntanAdhani M., DayangRohayaAwangRambli, and AzfarTomi [39]	Proceedings of the 12th International Conference on Advances in Computer Entertainment Technology	Scopus
2	Wang, Chao-Hung, Yi-Chen Chiang, and Mao-Jiun Wang [33]	Procedia Manufacturing	Scopus
3	Stoyanova, Jasmina, Pedro Quelhas Brito, Petia Georgieva, and Mariofanna Milanova [32]	In 2015 International Symposium on Innovations in Intelligent Systems and Applications (INISTA),	Scopus

## IV RESULTS AND DISCUSSION

The researcher proceeded to analyze and perform data synthesizing after document assessment were done, as to formulate answers to RQ1 to RQ4. To establish the study trend, the data were tabulated into Table III. Earlier studies dating from 2010 until 2019 revealed two topics of interest perfectly aligned in the context of augmented reality

advertising relating to consumer behavior. The “consumer decision making” or CDM context emerged as consistent and most studied by researchers compared to “consumer engagement” or CE. This may be due to the introduction of industrial revolution 4.0 and the rise of its global discourse by scholars and practitioners that makes the context is being elevated into a crucial component of the field in recent years. This in line with [26] found that CDM was the most produced articles in past indexed or non-indexed journal. The SLR also discovered that there are no indexed articles on CDM context in AR advertising was published from 2010 to 2014.

**Table- III: Trend of study 2010-2019**

Year 20_	10	11	12	13	14	15	16	17	18	19
Consumer Engagement (CE)			/			/	//			//
Consumer Decision Making (CDM)						//	/	/	////	/
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
McLean and Wilson										CE
Smink et al.									CDM	
Yang Feng and QuanXie										CE
Phua and Kim									CDM	
Brengman et al.									CDM	
Feng and Xie									CDM	
Pantano et al.								CDM		
Hopp and Gangadharbatla							CE			
Yaoyuneyong et al.							CE			
Baek et al.							CDM			
Sung and Cho			CE							
Nazri et al.						CE				
Wanga et al.						CDM				
Stoyanova et al.						CDM				

According to [26], in earlier studies focus exclusively on empirical data processed via either a quantitative or qualitative research method. The bulk of the research was assessed through quantitative method, 63.3%, with the remaining took the qualitative approach at 36.3%. In early stage of AR advertising research, around year 2011 to 2015 many researchers employed qualitative studies to grasp a clearer picture of consumer behavior and to address possibilities like the lack of prior information on AR advertising and marketing. In the SLR, the researcher found that the form of quantitative research employed can be described as an experimental design drafted to test the concepts. Most commonly, the one way and two ways



factorial experiment or quasi experiment design.

In decision making context, in [27] examines the effects of self or model representative through AR on purchasing intention, brand attitude, and word of mouth through the processes which are perceived informativeness, enjoyment and intrusiveness. However, for different objectives, in [28] tested variables such as perceived ownership, interactivity and product type to gauge the influence of augmented reality using touch screen mobile phone or laptop interface which played a hand in attitudes towards products and purchase intentions. Another study was concurrently performed by [29] employed self-reference, self-brand congruity, perceived humour and attitude to evaluate purchasing intention in examining self-endorsed brand advertisements on brand-related preferences. Among these three studies, none of researchers has adopted the same independent variables to measure the same problem. The inconsistent variables may be related to different objectives. Thus, the replication framework testing must be done and carefully identified and tailored to the needs of the study.

Recently, in [30] employed qualitative method by coding themes based on ad-related cognition, brand related cognition, ad related affect, ad related behavioural intention and brand related behavioural intention. The exploratory study was conducted to comprehend consumer evaluation and attitude that leads to intention to purchase. On the other hands, a study of decision making by comparing two countries of youth market was conducted by [31] which quantify interactivity, response time, information quality, aesthetic quality, usefulness, enjoyment, ease of use and attitude on purchase intention. Another comparison type of study by [32] between interactive and magic mirror AR shopping platform to understand the phenomenon of attitude towards brand and purchasing intention. The variables measured through personal emotion, usability and appearance. Another study using magic mirror to understand the attributes of AR that makes shopping decision more effective by [33] that utilised attractiveness, perspicuity, efficiency, dependency, stimulation and novelty variables for understanding the purchasing decision. While research performed by [34] focused on narcissism and self-viewing on brand perception and purchasing intention through AR media made a unique contribution that is relevant to the current behavioural issues.

Despite all this, in the recent years there are several studies have been carried out regarding 'consumer engagement' or CE. A study on examining consumer engagement through augmented reality mobile applications was conducted by [35] which measured AR Attributes (vividness, novelty and interactivity) and the technology acceptance attributes (enjoyment, usefulness, perceived ease of use, and subjective norms). In the same year, in [30] conducted a study to examine the role of ad creativity which are ad-consumer association, message usefulness, and ad novelty on brand message recall, brand name recall ad attitudes and brand attitudes. While in [7] conducted a study about how users engage with the technology that quantifies product relevancy, perceived technological, familiarity, self-concept, gender and self-efficacy on attitudes shown towards brand. In other studies, in [5] aimed to identify consumer preferences and attitudes towards hypermedia

print ads. Thus, the variables of Attitude toward the Ad, informativeness, irritation, advertising value, novelty, entertainment, time-effort, and ad Effectiveness were measured. The prior studies once again show inconsistent variables were measured in consumer engagement context of study. However, there is one similarity was identified in these three articles that used novelty variable as measurement. Hence, the novelty is indeed a crucial variable for current of period.

In prior research of AR advertising in CDM context, in [27] found that the AR showed a significant effect on perceived informativeness as well as enjoyment. The informativeness message will affected purchase intention and WOM, while enjoyment enhanced brand attitude. In addition, the presence of one's own face increased the perceived level of intrusiveness of online product presentations. In relation to that, in [29] indicated by imagining oneself being depicted next to a brand in the ad will generate greater perceived self-brand congruity and this may lead to significantly welcoming attitude and establish purchase intention of the advertised brand. This claim also supported by [34] that self-viewing in the AR virtual mirror stimulates the purchasing intentions. The study also discovered ads that prompt greater perceived humor significantly produces more positive brand attitude and purchasing intent when compared to ads with lower perceived humor [29]. In [28] discovered that perceived ownership positively impacts product attitudes and purchasing intentions. Moreover, no link was observed pertaining to the types of product or there is significant difference in discerning ownership between mobile phones and the interfaces of the laptop. Perceived ownership would be highest for the mobile augmented reality interface and the lowest level of perceived ownership in the laptop condition.

According to [36], the novelty concept of AR held a positive attitude and feeling. Moreover, enjoyable feelings toward the AR ad campaigns also contribute to successful AR campaign. In addition, in the focus group interview in their study, none of the informants touched upon the message relevance in the ad but their point of interest in discussing the ad elements such as the adoption of AR in the ads, the executions quality, authenticity audience reactions in the campaign video, campaign location, interactions with AR-enabled virtual objects, background music, brand firm of the ad. In the interview session, the informant's attitudes diverge on the brands when the researcher showed known brand ads. The researcher found that informants pre-existing brand attitudes affected their post-exposure brand attitudes. Another significant variable found in prior research are aesthetic quality, interactivity and response time which portray as the most important elements that able to solicit positive emotions and online purchasing [31]. In line with the claims, in [32] also found that the pleasure and perceived interface aesthetics are strongly related to purchase intention. On the other hand, in [33] found that participants spent more time on the AR content they had more positive feelings about it. In contrary to [37] found that exposure

time was negatively related to attitudes toward the AR environment. Furthermore, a prolonged exposure to AR advertising environments was associated with diminished attitudes toward the AR advertisement. Thus, this warrant for further investigation on exposure time to contribute to AR literature.

In context of consumer engagement, in [35] found that positive perceptions of the AR attributes and technology acceptance attributes positively influence brand engagement. In addition, AR enabled brand engagement results in increased satisfaction with the mobile application experience and future brand usage intention. While, in [30] found that perceived creativity of an ad for the unfamiliar brand is mostly shaped by their ad evaluations. Moreover, results revealed that the three dimension of ad creativity (message usefulness, ad novelty, and ad-consumer association) which play different roles in ad effectiveness. Besides that, according to [5], respondents have rated AR advertisement as the most informative platform and equipped them as they had spent their time effectively. It is also increased the ads novelty and effectiveness. Moreover, the interactivity become an important element of AR ads to prolong the exploration of a message that able to promote the sales performance as well as spreading word of mouth of AR media [32].

**V CONCLUSION**

The SLR was conducted to resolve key research questions. Findings regarding AR advertising were thoroughly discussed with the SLR as point of reference. The extraction process of data was detailed thoroughly and applied systematically. Summaries of latest adopted technologies reported by the 14 articles have been presented in this paper. Generally, in order to keep up with the advent of industrial revolution 4.0, further research must be done since AR technology employment in advertising is still in its infancy especially the adoption of AR in the developing countries. With that said, the author firmly believes that the SLR done contributed to AR in advertising discourse. Anyone intending to approach AR utilization in these contexts at the industry level and the academia could benefit from this study. In Table IV and V depict future study recommendations from previous research, where it may close the gaps AR advertising of future research endeavors. The researches have split the gap into two categories which are study gap and contextual gap. The researcher addressed the gaps of the study for future researcher to enhance and extend variables in developing the AR model while the contextual gaps described in the table meant to be replication framework for AR study in different context to encounter the limitation of prior study.

**Table –IV: Future recommendation for future researcher**

Name	Ar Marketing Paradigm	Research Design	Research Dimension	Future Recommendations
McLean, Graeme, and Alan Wilson [35]	Geo Layer	Online Survey	<p align="center"><b>IV</b> AR Attributes (Novelty, Interactivity and Vividness)</p> <p align="center"><b>MV</b> Technology Acceptance Attributes- (Perceived Ease of Use, Usefulness, Enjoyment and Subjective Norms)</p> <p align="center"><b>DV</b> Experience Satisfaction, Brand Usage Intention.</p>	<p align="center"><b>Study Gap</b></p> <p>1) To measure positive or negative influence of subjective norms against AR content perceived novelty.</p> <p align="center"><b>Context Gap</b></p> <p>1) Adopting and reviewing various types of augmented reality applications with varying levels of AR, including features of low-level augmented reality vs. medium level vs. high-level AR.</p> <p>2) To examine consumer perceptions of augmented reality features against those that does not provide it.</p> <p>3) To use postulated experimental design.</p> <p>4) To manipulate the different types of information procured.</p>
Smink, Anne R., SanneFrowijn, Eva A. van Reijmersdal, Guda van Noort, and Peter C. Neijens. [27]	Geo Layer	Factorial Experimental Between Subjects Design.	<p align="center"><b>IV</b> Perceived Informativeness, Perceived Enjoyment, Perceived Intrusiveness.</p> <p align="center"><b>DV</b> Brand Attitude, Purchase Intention, Willingness to Share Personal Data.</p>	<p align="center"><b>Study Gap</b></p> <p>1) To investigate the effect of gender and age on the effectiveness and use of AR applications.</p> <p>2) To measure behavioural attributes, such as real time buying behaviour, actual personal data disclosure, and providing data on whether AR helps to reduce return rates.</p> <p align="center"><b>Context Gap</b></p> <p>1) Diverse user population as research samples.</p>
Feng, Yang, and QuanXie [30]	Active Print/ Packaging Featuring YouTube Video	True Experiment	<p align="center"><b>IV</b> Ad Creativity (Message Usefulness, Ad Novelty, Ad Consumer Association).</p> <p align="center"><b>DV</b> Ad Attitudes, Brand Attitudes.</p>	<p align="center"><b>Study Gap</b></p> <p>To focus on uncovering novel advertising and marketing practices that may persuade change in consumers’ pre-existing brand impressions.</p> <p align="center"><b>Context Gap</b></p> <p>1) To provide more stimuli featuring a variety of product categories.</p> <p>2) To compare video ads to different types of ad creativity-related AR paradigms.</p>

Phua, Joe and Jihoon Jay Kim [29]	Magic Mirror	Survey	<p style="text-align: center;"><b>IV</b> Self-Brand Congruity, Self-Referencing, Perceived Humor. <b>DV</b> Purchase Intention, Brand Attitude</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>1) To explicitly lay out the theoretical mechanisms behind personalized AR and VR ads, in order to better comprehend their persuasive communication effects. 2) To implement creative messaging strategies that effectively and optimally represent consumers alongside advertised brands within augmented and virtual reality (VR) settings.</p> <p style="text-align: center;"><b>Context Gap</b></p> <p>1) Need to utilize proposed experimental studies, such as inviting participants into a laboratory to view actual self-endorsed Snapchatgeofilter ads, so as to increase generalizability of current study's results. 2) Should perform pre-tests on Snapchatgeofilter ads sets and classifying them into relevant categories. 3) Should recruit participants from a wider age range, so as to obtain more applicable results better suited to general social media user population. 4) Availability of longitudinal data on their long-term effectiveness and utility.</p>
Bregman, Malaika, Kim Willems, and Helena Van Kerrebroeck [28]	Geo Layer	Experiment Two Way Factor Between Subjects Design	<p style="text-align: center;"><b>IV</b> Perceived ownership MV moderator Product type mediator Product attitudes <b>DV</b> Purchase intention</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>1) To explore the impact of device ownership. 2) To examine differences among product types on different consumers such as hedonic versus utilitarian shopper.</p> <p style="text-align: center;"><b>Context Gap</b></p> <p>1) Need other sample than students. 2) Test other than classroom environment setting.</p>
Feng, Yang, and QuanXie [36]	Active print/ packaging featuring YouTube Video	Interview	<p style="text-align: center;"><b>Theme</b></p> <p>1)ad-related cognition, 2)brand-related cognition, 3)ad-related affect, 4)brand-related affect, 5)ad-related behavioural intention, 6)brand-related behavioural intention.</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>Extending the scope of AR OOH product categories by including a number of hedonic and therapeutic products.</p> <p style="text-align: center;"><b>Context Gap</b></p> <p>1) To examine consumer reactions in live settings of sponsored AR events, since viewer reactions to YouTube videos featuring AR OOH promotions may vary from live event viewer reactions. 2) The use quantitative methods to evaluate the proposed theoretical framework, such as empirical experiments.</p>
Pantano, Eleonora, Alexandra Rese, and Daniel Baier [31]	Magic Mirror	Quasi Experiment	<p style="text-align: center;"><b>IV</b> Aesthetic Quality, Interactivity, Response Time Quality of Information <b>MV</b> Ease of Use, Usefulness, Enjoyment DV-Purchase Intention</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>1) In addition to creating modern digital multichannel shopping experiences, understanding how augmented reality technologies can be applied to smartphone scenarios. 2) Measuring the distribution and effect of AR technology particularly on retail over time.</p> <p style="text-align: center;"><b>Context Gap</b></p> <p>1) Necessitates older consumer sampling. 2) Should include samples consisting of online consumers. 3) Perform model testing in different fields. 4) Conduct the proposed experiment.</p>

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Hopp, Toby, and HarshaGangadhar-batla [37]	Active Print/ Packaging	Quasi Experimental	<p style="text-align: center;"><b>IV</b> Product Relevancy, Perceived Technological Self- Concept, Familiarity With AR. , Gender, <b>MV</b> Mediator- Attitude Toward The ARA Environment, Moderator- Technological Self-Efficacy. <b>DV</b> Attitudes Toward The Brand.</p>	<p style="text-align: center;"><b>STUDY GAP</b></p> <p>1) Considering the effect of novelty via exploring the relationship between experience with AR and behavioural expectations for potential adoption/use of AR applications. 2) To check the link between AR features, novelty effects, and individual disparity as a means of identifying the optimal conditions for the use and implementation of convincing AR messaging. 3) To define the relationship between the instrumentality of purpose/information and the decline of perceived novelty.</p> <p style="text-align: center;"><b>Context Gap</b></p> <p>1) To adopt different AR ad applications 2) To use true experiment</p>
Yaoyuneyong, Gallayane-Jamye Foster, Erik Johnson, and David Johnson [5]	Active Print/ Packaging	Factorial Experimental Between Subjects Design.	<p style="text-align: center;"><b>IV</b> Attitude toward the Ad Informativeness, Entertainment, Irritation, Advertising Value, Time-Effort, Novelty Ad Effectiveness <b>DV</b> Exposure to AR media and QRcode</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>1) Comparison of ad-type 2) Conduct Attitude-to-the-Ad test to assess the suitability of the design with AR. 3) To study the probable moderating or mediating capacity of some of these variables in the overall attitudes of consumers. 4) Identifying the relations between customer expectations, attitude towards the ad, and real variables of behaviour.</p> <p style="text-align: center;"><b>Context Gap</b></p> <p>1) It may take a larger sample size to provide sufficient power to detect statistically significant differences between variables. 2) Using projective techniques may provide greater understanding of why respondents indicated that they favoured traditional advertising as a whole.</p>
Baek, Tae Hyun, Chan Yun Yoo, and Sukki Yoon [34]	Magic Mirror	1)Experiment One Factor Between Subjects Design 2)Experiment Two Factor Between Subjects Design	<p style="text-align: center;"><b>IV</b> Narcissism, Self-viewing, <b>MV</b> Self-brand connection <b>DV</b> purchase intention</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>1) To analyse how cultural narcissism variations could affect the results of AR campaigns.</p> <p style="text-align: center;"><b>Context Gap</b></p> <p>1) Replicating results with other types of items, such as home decor or cosmetics. 2) To adopt different AR environments. 3) To test on real consumers.</p>
Sung, Jungyeon, and Kwangsu Cho. [38]	Active Print/ Packaging	Experiment	<p style="text-align: center;"><b>IV</b> Entertainment, Informativeness, Interactivity, Telepresence <b>DV</b> Consumer attitude toward product</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>1) To measure the value of application on user response such as perceived hedonic, utilitarian and motivational values. 2) To connect the informativeness aspect with utilitarian value and the entertainment aspect with hedonic value.</p>
Nazri, NurIntanAdhani M., DayangRohayaAwangRambli, and AzfarTomi [39]	Geo Layer	Experiment	<p style="text-align: center;"><b>IV</b> Familiarity, Enjoyment, Ease of Use, Attitude to AR Game, Word of Mouth <b>DV</b> Product advertising</p>	none
Wang, Chao-Hung, Yi-Chen Chiang, and Mao-Jiun Wang [33]	Magic Mirror	Experiment	<p style="text-align: center;"><b>IV</b> attractiveness, perspicuity, efficiency, dependency, stimulation, and novelty.</p>	none
Stoyanova, Jasmina, Pedro QuelhasBrito, PetiaGeorgieva, and MariofannaMilanova [32]	Magic Mirror	Experiment	<p>1)Evaluating the personal emotions 2)usability and appearance 3)emotions 4)Attitudes towards the advertised brand 5) Purchase intention</p>	<p style="text-align: center;"><b>Study Gap</b></p> <p>1) To measure the aesthetics and easy to use system features. 2) To put emphasis on efficiency in the context of enhancement of usability and design.</p>

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