Investigating the effect of advertising irritation on digital advertising effectiveness: A moderated mediation model

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Abstract

The exponential growth of mobile phone usage has shifted the attention of marketers toward digital advertising as a tool for targeted communication. However, the increased usage of digital advertising exposes consumers to excessive amounts of advertisements, which may trigger their annoyance and raise concerns about overall advertising effectiveness. In a moderated mediation model, this study examined how digital advertising value influences consumers' attitudes toward advertising and purchase intention at different levels of advertising irritation using the S-O-R framework and the advertising value model. Data were collected from 272 university students to test the conceptual model, and a multi-analytic approach combining partial least squares structural equation modeling and necessary condition analysis (NCA) was adopted. Results show that advertising value has a stronger effect on purchase intention than attitude toward advertising and that advertising irritation is a strong negative moderator that significantly reduces overall advertising effectiveness. NCA results also show varying degrees of predictor necessity. These findings can help advertisers improve their strategies to maximize the effectiveness of digital advertising.

1. Introduction

Industries all over the world have experienced a paradigm shift in their technology adoption over the past decade. The introduction of high-speed wireless networks and the increasing penetration of mobile phones have drawn marketers toward using these devices as communication channels (Martins et al., 2019; Santoso et al., 2020; Sharma et al., 2021). Along with their rapid technology adoption, marketers have started to shift from traditional to digital advertising. As the fastest-growing advertising format today, digital advertising allows marketers to connect with their customers anytime and anywhere (Ma and Du, 2018). Despite the global recession and economic slowdown brought on by the COVID-19 pandemic, digital advertising spending is expected to exceed $500 billion by 2022 and reach $640.80 billion by

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2024, which accounts for 67.8% of the total global spending on advertising ("Global digital advertising market 2024 | Statista", 2022).

Researchers have recently explored digital advertising by using various terms, including digital media advertising (Pintado et al., 2017), digital signage advertising (Garaus et al., 2017; Lee and Cho, 2017), in-game advertising (Mishra and Malhotra, 2021), location-based advertising (Gutierrez et al., 2019; Lin and Bautista, 2018), mobile advertising (Wang and Genc, 2019), mobile app advertising (Sigurdsson et al., 2018), smartphone advertising (Kim and Han, 2014; Martins et al., 2019), SMS advertising (Bakr et al., 2019; Sharma et al., 2021), and social media advertising (Hanaysha, 2021; Shareef et al., 2019; Sharma et al., 2022). Given that all these types of advertising rely on digital media to reach consumers, we need to use a general holistic term that captures the essence of these different advertising types for the sake of consistency. Therefore, we introduce the umbrella term "digital advertising" (Santoso et al., 2020). Lee and Cho (2020) defined digital advertising broadly as a media convergence term encompassing any media that delivers digital advertising (i.e., online, social, mobile, and interactive). According to Lee and Cho (2020), digital advertising communicates products, services, or ideas to consumers through digital media, including traditional online media (the internet) and interactive media, such as digital signages, smartphones, and virtual reality platforms. Gordon et al. (2020) recently emphasized the importance of digital advertising in delivering location- and time-sensitive highly personalized advertising content to sophisticated target customers by presenting highly relevant advertisement content in online platforms to elicit the appropriate response behavior from these customers. This sophisticated targeting is a key component of behaviorally targeted advertising (Wang et al., 2022), which promotes data-driven advertising delivered via digital platforms to improve the efficiency and effectiveness of individual advertising campaigns.

Growing competition has compelled businesses worldwide to use cutting-edge technology to communicate with their customers and gain a competitive advantage (Dwivedi et al., 2021). This increased communication (i.e., advertising) exposes consumers to a plethora of information daily. This type of exposure improves consumers' information processing ability and allows them to filter out marketing stimuli, such as desired and unwanted advertisements. This act of filtering affects the overall efforts of marketers by triggering the perceived advertising irritation of consumers, which involves skipping or avoiding advertisements. In the digital media context, advertising avoidance behavior is a significant challenge for marketers

(Jung, 2017; Loureiro, 2018; Niu et al., 2021) that may arise due to various reasons, such as incompatibility with user needs, incorrect timing, functional mismatch, lack of appeal, ambiguity, exaggeration, and being too loud, long, or repetitive. According to psychological reactance theory (Brehm and Brehm, 2013) and brand avoidance theory (Knittel et al., 2016), the above factors contribute to a negative feeling of irritation. Advertising irritation drives consumers away from advertisements and negatively affects their attitudes toward advertising and purchase intention (Campbell et al., 2017; Kang et al., 2022). Previous studies on advertising avoidance have utilized various theories, such as information theory (Prendergast et al., 2014) and experience theory (Kolb, 1984), both of which posit that advertising avoidance factors negatively affect judgment and behavior of consumers. Experience theory also suggests that prior negative experience has a significant effect on the decision-making of consumers (Kolb, 1984).

Increased competition forces organizations to implement highly aggressive advertising campaigns and significant improvements in other aspects of their marketing mix. Recent technological advancements have enabled marketers to obtain highly personal, location-specific, and time-sensitive data to deliver precisely customized commercial messages to finely targeted consumers via digital media. Through this increased utilization of technology-enabled advertising, advertisements can reach a significant number of consumers. However, recent research shows that high advertising exposure leads to negative feelings and emotions among consumers (i.e., advertising irritation) (Kang et al., 2022; Loureiro, 2018; Niu et al., 2021). In the digital advertising context, advertising irritation has a significant negative effect on advertising value (Arora and Agarwal, 2019; Lin and Bautista, 2018; Martins et al., 2019; Pintado et al., 2017) and attitude toward advertising (Khasawneh and Shuhaiber, 2018; Sigurdsson et al., 2018; Wang and Genc, 2019). To the best of the authors' knowledge, no previous study has examined the moderating effect of advertising irritation (i.e., whether a low or high level of advertising irritation brings a negative effect) on the relationships among advertising value, attitude toward advertising, and purchase intention. This study may be the first to identify and empirically test this gap in the digital advertising literature. Moreover, to date, the required levels of advertising value antecedents (i.e., credibility, entertainment, informativeness, and message relevance), advertising value, and attitude toward advertising to elicit desired levels of purchase intention and advertising value remain unknown, and this work aims to fill such gap.

Marketers are constantly concerned about the effectiveness of their advertising. They have long struggled to determine the best place and time to insert their advertisements to minimize advertising avoidance and increase advertising effectiveness (Broeck et al., 2017). As a result, the effects of advertising on consumers' attitudes toward digital advertisements warrant examination (Tong et al., 2020). Given the practical importance of this topic and the theoretical gaps in this area, this study aims to (1) investigate the effect of the antecedents of advertising value on advertising value, (2) assess the mediating effect of attitude toward advertising on the relationship between advertising value and purchase intention, (3) examine the moderating effect of advertising irritation on the relationship among advertising value, attitude toward advertising, and purchase intention, and (4) determine the required levels of (i) credibility, entertainment, informativeness, and message relevance to achieve the desired level of advertising value and (ii) advertising value and attitude toward advertising to achieve the desired level of purchase intention.

Recent empirical studies (e.g., Herrando and Martin-De Hoyos, 2022; Lin and Bautista, 2018; Martins et al., 2019; Wang and Genc, 2019) have primarily used explanatory methods such as structural equation modeling (SEM) to analyze digital advertising. This study is the first to identify and validate variables' sufficient and necessary conditions in a digital advertising framework by using a multi-analytic approach that combines partial least squares structural equation modeling (PLS-SEM) with necessary condition analysis (NCA). This study offers an original contribution to the literature using the two logics of sufficiency and necessity in testing the conceptual model. As another significant contribution, this research provides insights into the influence of predictors on the effectiveness of digital advertising. We add value to research by proposing and empirically testing the moderating effect of advertising irritation on the relationships among advertising value, attitudes toward advertising, and purchase intentions. Results of this study are highly robust based on the sufficiency (should have) and necessity (must have) logics, hence offering a better understanding of the various determinants of purchase intention at different levels of advertising irritation.

The rest of this paper is organized as follows; a literature review, research hypotheses, research methodology, results, and discussion of the findings. The study's implications, limitations, potential future directions, and conclusion are all discussed in the final sections.

2. Theoretical Background and Literature Review

2.1. Advertising Value Model

This study uses the concept of advertising value to assess advertising effectiveness from consumers' perspectives (Kim and Han, 2014). Ducoffe (1995) defined advertising value as the utility or worth of an advertisement to consumers or a cognitive assessment of how well advertisements meet the needs of consumers. Ducoffe (1995) also created a framework for evaluating the advertising value of consumers and identified three factors, namely, entertainment, informativeness, and irritation, that contribute to such value.

Similar to previous studies, we use the Ducoffe advertising value model (AVM) to investigate the antecedents of advertising value that lead to the development of attitudes toward advertising and purchase intention. Credibility, entertainment, informativeness, and message relevance have been identified as determinants of the advertising value perceived by consumers when developing their purchase intention (Jebarajakirthy et al., 2021; Lin and Bautista, 2018; Martins et al., 2019). The AVM of Ducoffe (1995, 1996) is considered seminal in digital media (Martins et al., 2019) and has been widely applied and modified in various contexts. For example, Brackett and Carr (2001) added credibility as a predictor of advertising value, whereas Khasawneh and Shuhaiber (2018) and Lin and Bautista (2018) later discovered that message relevance significantly influences advertising value.

2.2. Stimulus Organism Response (S-O-R) Framework

According to Mehrabian and Russell (1974), environmental stimuli (S) influence the organisms (O) of consumers and lead to response behavior (R), such as purchase intention. The S-O-R framework has recently been replicated in the digital marketing domain to measure consumer purchasing behavior. For instance, Chopdar and Balakrishnan (2020) investigated those factors that influence the impulsiveness and perceived value of consumers and their effects on mobile commerce app repurchase intention and found that perceived value is a significant organismic variable that drives repurchase intention. Using the S-O-R framework, Sharma et al. (2021) investigated the impact of SMS advertising perception on advertising value, attitude toward advertising, and purchase intention and found that SMS advertising perception (i.e., stimulus) influences the internal psychological state of consumers (i.e., organism, advertising value, and attitude toward advertising) and eventually leads to a consumer response (i.e., purchase intention).

2.3. Antecedents of Advertising Value

Several studies on the effectiveness of digital advertising have concluded that credibility, entertainment, informativeness, and message relevance all influence the perceived advertising value of consumers (Herrando and Martin-De Hoyos, 2022; Falcao and Isaias, 2020; Martins et al., 2019; Shareef et al., 2019). Credibility is defined as the honesty and truthfulness of an advertisement (Gaber et al., 2019; Wang and Genc, 2019), which causes consumers to accept this advertisement and develop a positive perception toward its value (Martins et al., 2019), hence facilitating the development of behavioral intentions (Gaber et al., 2019). Meanwhile, advertising entertainment has been widely recognized as a fun and relaxing way of sharing marketing information with customers (Martins et al., 2019; Shareef et al., 2019). Consumers are drawn to entertaining digital advertisements (Hanaysha et al., 2021; Martins et al., 2019), which help shape their positive perceptions of advertising value (Lin and Bautista, 2018). Another critical aspect of digital advertising is its informativeness, which motivates consumers to view an advertisement (Falcao and Isaias, 2020; Shareef et al., 2019). Given that consumers value useful, relevant, and clear information about the advertised products or services, informative advertisements tend to receive positive responses (Bakr et al., 2019; Sharma, 2021). Message relevance is a critical antecedent, given that consumers seek advertising information that is tailored to their specific needs (Lin and Bautista, 2018; Sharma et al., 2021). If they do not have such matching information, they will reject the advertisement and the advertised brand. Relevant advertising also increases the perceived advertising value (Lin and Bautista, 2018). Following the above arguments, this study incorporates the digital advertising stimuli of credibility, entertainment, informativeness, and message relevance into the S-O-R framework for further investigation based on the preceding discussion and existing literature.

2.4. Consequences of Advertising Value

Previous studies have defined attitude as a mental state and inner feeling that manifests itself in consumers' favorable or unfavorable behavior. Given that advertising attributes (i.e., credibility, entertainment, informativeness, and message relevance) influence the attitudes of consumers toward digital advertisements (Sigurdsson et al., 2018; Wang and Genc, 2019), these attributes also determine how consumers respond to these advertisements (Wang and Sun, 2010). Previous studies show that consumers' attitudes toward digital advertising are related to their responses to advertisements and their behavioral intentions (Khasawneh and Shuhaiber, 2018; Tseng and Teng, 2016). As a result, digital advertising attributes act as stimuli

that shape consumers' attitudes (positive or negative) toward an advertisement, hence lending credence to the S-O-R framework that regards this construct as an organism.

Purchase intention refers to the future intent of a consumer to purchase a specific product or service (Islam et al., 2021; Jebarajakirthy et al., 2021; Rashid et al., 2022). As a primary predictor of actual consumer behavior, marketers must seek positive behavioral responses from their customers. In recent years, the increased reliance of consumers on mobile phones has allowed marketers to expose mobile phone users to promotional messages via digital advertising (Chopdar and Balakrishnan, 2020; Sharma et al., 2022). The frequency with which digital advertisements appear on their mobile phones can influence consumers' behavioral intentions and increase their likelihood of purchase (Martins et al., 2019; Sharma et al., 2021). As a result, studying customers' intentions to determine the effectiveness of digital advertising is critical because these intentions may lead to actual purchase behavior. Appendix A summarizes the relevant literature on digital advertising.

3. Research Model and Hypotheses

This study aims to demonstrate how various advertisement-related stimuli (S; credibility, entertainment, informativeness, and message relevance) elicit an emotional reaction (O; advertising value and attitude toward advertising) from consumers and lead to behavioral responses (R; purchase intention). Ducoffe (1995) investigated the net effect of informativeness, entertainment, and irritation on the perceived advertising value of consumers. Later, Ducoffe (1996) explored the effect of advertising value on attitudes toward advertising. While these two studies established a link between stimulus and emotional reaction, they do not find any link between emotional reaction and consumer responses. The S-O-R framework (Mehrabian and Russell, 1974) is the most appropriate theoretical framework for establishing such link given its wide application in studying the relationship among inputs (stimulus), processes (organism), and outputs (response) (Sharma et al., 2021, 2022). On the basis of the preceding discussion, we combine the S-O-R framework (Mehrabian and Russell, 1974) with the AVM (Ducoffe, 1995, 1996) to establish a clear theoretical framework for digital advertising effectiveness. Following the above arguments, this integration of the AVM and S-O-R framework is best suited to the needs of this study. Figure 1 presents the research model that connects the study variables based on the two aforementioned theories.
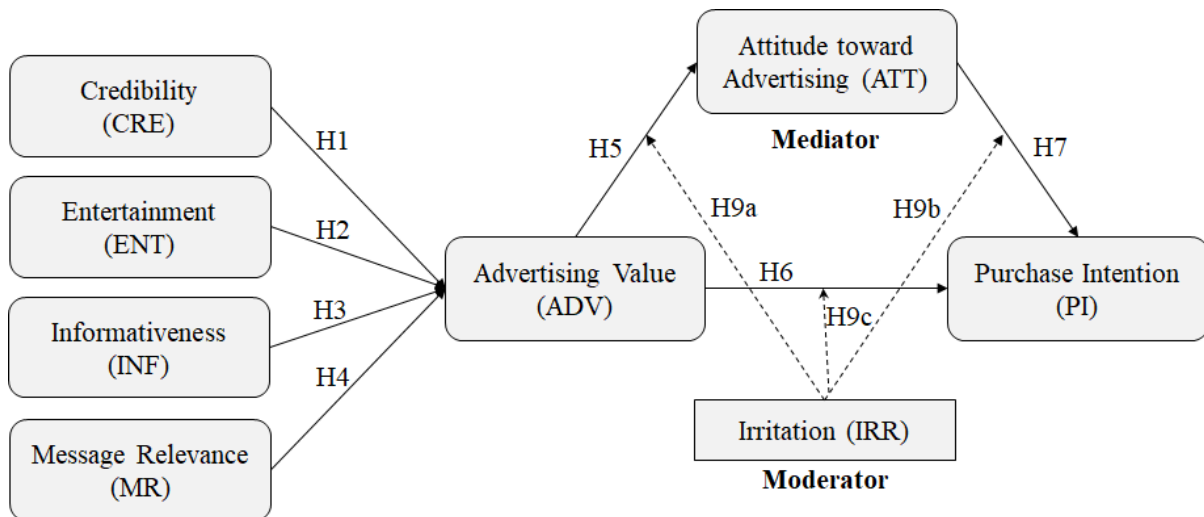
Fig. 1: The proposed research model

3.1. Credibility and Advertising Value

Advertisement credibility refers to the authenticity and trustworthiness of a brand's advertisement or the degree to which consumers believe that the information in an advertisement is trustworthy and reliable (Martins et al., 2019). This type of credibility requires trust in both the advertiser and the advertisement (Lin and Bautista, 2018). The perceptions of consumers toward the reliability, correctness, and trustworthiness of an advertisement influence their decision-making process. Previous research has confirmed that credibility significantly impacts the perceived advertising value of consumers (Falcao and Isaias, 2020; Herrando and Martin-De Hoyos, 2022; Jebarajakirthy et al., 2021). A credible advertisement content can also increase the trust of consumers toward an advertisement, hence increasing the likelihood for an advertisement to be accepted positively (Izquierdo-Yusta et al., 2015). Given its significance, credible advertisement content in digital advertising is likely to increase advertising value. The following hypothesis is then proposed:

H1: Credibility has a positive effect on advertising value.

3.2. Entertainment and Advertising Value

In advertising, the term "entertainment" refers to the enjoyment, pleasure, and fun feelings associated with an advertisement content (Ducoffe, 1995). For most mobile phone users, entertaining advertising content provides them with a pleasurable and relaxing experience, hence shaping their positive perceptions toward the advertisement and the advertised brand   (Sharma et al., 2021). Consumers' attention is also captured by entertaining

advertisements, hence leading to positive outcomes (Arora and Agarwal, 2019; Martins et al., 2019). Previous research shows that entertaining advertisement content predicts advertising value (Jebarajakirthy et al., 2021; Lin and Bautista, 2018; Martins et al., 2019; Shareef et al., 2019). The following hypothesis is then proposed:

H2: Entertainment has a positive effect on advertising value.

3.3. Informativeness and Advertising Value

In digital advertising, informativeness is measured by the amount of information provided in an advertising content (Ducoffe, 1995, 1996). The advertising literature has emphasized the importance of informativeness in attracting consumer attention and influencing their perceptions toward advertisements (Herrando and Martin-De Hoyos, 2022; Shareef et al., 2019). By promoting their awareness of the advertised brand, advertising information can improve the perceptions of consumers toward the value of an advertisement (Arora and Agarwal, 2019; Kim, 2020; Sharma et al., 2021). Consumers' liking and positive attitudes are also improved by accurate and timely information, which facilitates the formation of their purchase intention. Previous research has also shown that informativeness has a significant positive impact on the perceived advertising value of digital advertising (Bakr et al., 2019; Falcao and Isaias, 2020; Jebarajakirthy et al., 2021). The following hypothesis is then proposed:

H3: Informativeness has a positive effect on advertising value.

3.4. Message Relevance and Advertising Value

The relevance of an advertisement message refers to the degree to which the information shared is relevant and valuable to the needs of consumers (Khasawneh and Shuhaiber, 2018). Customers value advertisements that directly address their needs, and they are more likely to respond positively if they can relate to the advertised product or service (Lin and Bautista, 2018; Tseng and Teng, 2016). Given that mobile phones are inherently personal, consumers will only respond positively to advertisements if the advertised product or service is somehow related to their needs (Lin and Bautista, 2018). As a result, consumers place a higher value on a digital advertising service if they receive relevant advertising content (Khasawneh and Shuhaiber, 2018). Many studies have also shown that message relevance has a positive and significant impact on advertising value (Bakr et al., 2019; Lin and Bautista, 2018; Tseng and Teng, 2016). The following hypothesis is then proposed:

H4: Message relevance has a positive effect on advertising value.

3.5. Advertising Value and Attitude Toward Advertising

Advertising value is one of the primary indicators used to assess the effectiveness of advertisements. Ducoffe (1995) defined advertising value as the "utility and worth of an advertisement" to consumers. This perceived utility and worth, in turn, fosters a favorable attitude toward the advertised products (Arora and Agarwal, 2019; Sharma et al., 2021). Customers are more likely to respond positively to an advertisement that they consider valuable (Sharma et al., 2021). Consumers also develop favorable attitudes toward an advertisement with a high value (Shareef et al., 2019). Previous studies on digital advertising have also proven that a high perceived advertising value positively influences the attitudes of consumers toward digital advertising (Herrando and Martin-De Hoyos, 2022; Jebarajakirthy et al., 2021; Lee and Cho, 2017; Pintado et al., 2017; Shareef et al., 2019; Sharma et al., 2021). The following hypothesis is then proposed:

H5: Advertising value has a positive effect on attitudes toward advertising.

3.6. Advertising Value and Purchase Intention

Consumers value advertisements that provide many benefits in terms of relevance and usefulness. Given that consumers evaluate the advertisement of a brand based on the trade-off between what is promised and what is delivered, such perceptions are crucial in developing favorable behavioral outcomes, such as purchase intention, for the advertised brand (Jebarajakirthy et al., 2021). Many recent studies have confirmed a significant positive relationship between perceived advertising value and consumer purchase intention (Herrando and Martin-De Hoyos, 2022; Islam et al., 2018; Kim and Han, 2014; Sharma et al., 2021). Martins et al. (2019) confirmed that advertising value is an important predictor of consumer purchase intention. Except for a few notable studies (Herrando and Martin-De Hoyos, 2022; Kim and Han, 2014; Lin and Bautista, 2018; Martins et al., 2019; Sharma et al., 2021), only a few have investigated the relationship between advertising value and purchase intention in the context of digital advertising. On the basis of the preceding discussion and given the paucity of relevant literature, the following hypothesis is proposed for empirical investigation:

H6: Advertising value has a positive effect on purchase intention.

3.7. Attitude Toward Advertising and Purchase Intention

Many studies have shown that a positive attitude toward advertising increases purchase intention (Tseng and Teng, 2016; Sharma et al., 2021; Wang and Genç, 2019). As an internal mechanism, consumers' attitudes can influence their thought process toward any object or circumstance, which is then reflected in their behavior (Arora and Agarwal, 2019). By contrast, a favorable attitude toward advertising results in a positive behavioral outcome, such as purchase intention for the advertised brand (Wang and Genc, 2019). Several studies on digital advertising have then concluded that attitude toward advertising has a significant positive impact on purchase intention (Herrando and Martin-De Hoyos, 2022; Hsu and Lin, 2016; Hwang et al., 2021; Jebarajakirthy et al., 2021: Masuda et al., 2022; Sharma et al., 2021; Wang and Genc, 2019). The following hypothesis is then proposed:

H7: Attitude toward advertising has a positive effect on purchase intention.

3.8. Mediating Effect of Attitude Toward Advertising

A substantial amount of work has explored how the attitudes of consumers toward advertising influence their purchase intentions (Islam et al., 2017; Jebarajakirthy et al., 2021; Sharma et al., 2021; Wang and Genç, 2019). Although developing a positive attitude toward advertising increases the purchase intention of consumers, only a few studies (Herrando and Martin-De Hoyos, 2022; Sharma et al., 2021) have explored the indirect effect of attitude toward advertising on the relationship between advertising value and purchase intention, particularly in the context of digital advertising. Given the lack of research on attitude toward advertising as an underlying mechanism in digital advertising effectiveness, this study explores its mediation effect on the relationship between advertising value and purchase intention. The following hypothesis is then proposed:

H8: Attitude toward advertising mediates the relationship between advertising value and purchase intention.

3.9. Moderating Effect of Advertising Irritation

Advertising irritation is defined as offensive, displeasing, and annoying feelings induced by advertising (Arora and Agarwal, 2019; Kim, 2020), leading to negative feelings toward advertising (Martins et al., 2019). When consumers experience unfavorable emotions from an advertisement, they develop a negative attitude toward the advertised brand (Kang et al., 2022; Niu et al., 2021). Therefore, any aspect of an advertisement that irritates consumers will turn them away instead of persuading them to purchase the advertised product or service,

hence contradicting the primary goal of the advertisement (Shareef et al., 2019). Previous research shows that advertising irritation generates a negative response and reduces advertising value (Herrando and Martin-De Hoyos, 2022; Jebarajakirthy et al., 2021; Lin and Bautista, 2018; Martins et al., 2019; Shareef et al., 2019).

Several studies in the context of digital advertising have validated the negative influence of advertising irritation on perceived advertising value and attitude toward advertising (Herrando and Martin-De Hoyos, 2022; Maseeh et al., 2021; Shareef et al., 2019; Sheik et al., 2017; Wang and Genc, 2019). Kang et al. (2022) argued that advertising irritation could divert consumers' attention away from the true meaning of an advertisement. Given its implications for advertising value and attitudes toward consumers, irritation is critical for digital advertising researchers. Accordingly, some researchers have investigated the direct effect of advertising irritation on advertising value (Herrando and Martin-De Hoyos, 2022; Lin and Bautista, 2018; Shareef et al., 2019) and attitude toward advertising (Sigurdsson et al., 2018; Tseng and Teng, 2016; Wang and Genc, 2019). However, little to no research has explored the moderating effect of advertising irritation on digital advertising effectiveness (Tariq and Tanveer, 2020).

According to Memon et al. (2019), an antecedent makes a compelling case for testing the moderation effect. Researchers should provide strong theoretical support and justification for how the inclusion of a specific moderator improves our understanding of the phenomenon being investigated (Andersson et al., 2014). Such an analysis can significantly contribute to the extant body of knowledge. According to Andersson et al. (2014), researchers can test the moderation effect to develop a new theoretical understanding and fill the research gaps, provided that the moderating effect has a theoretical basis or is based on a systematic literature review. Numerous studies on digital advertising have discovered that advertising irritation predicts advertising value (Herrando and Martin-De Hoyos, 2022; Lin and Bautista, 2018; Martins et al., 2019) and attitude toward advertising (Maseeh et al., 2021; Wang and Genc, 2019). The majority of these studies have concluded that advertising irritation hurts both advertising value and attitude toward advertising, thereby implying that advertising irritation reduces advertising effectiveness. On the basis of this research gap and the above discussion, we identify advertising irritation as a moderator following the criteria of Memon et al. (2019). We then propose the following:

H9a-b-c: Advertising irritation negatively moderates the relationships between (a) advertising value and attitude toward advertising, (b) attitude toward advertising and purchase intention, and (c) advertising value and purchase intention such that when advertising irritation is high, these relationships tends to be weak, and vice versa.

4. Research Methodology

4.1. Data Collection Process

In line with previous studies on digital advertising, we collected our data from university students selected via purposive sampling (Alalwan et al., 2015; Chen and Lin, 2019; Sharma et al., 2022). This approach was chosen due to its cost-effectiveness in collecting specific data from the best-fit participants, allowing researchers to develop better insights and more precise results relevant to the research context. Purposive sampling also helps draw a homogeneous sample, which is preferable for theory development (in this case, for testing the moderating effect). This method also reduces the margin of error in data and facilitates theory testing (DuFrene et al., 2005). An online survey was created in Google Forms and distributed among public and private university students in the UAE. A brief definition and screening questions were included in the survey to ensure that the respondents were aware of and familiar with digital advertising. Each item in the survey was rated on a five-point Likert scale. The data were collected in May 2021. A total of 290 completed responses were received at the end of the data collection phase, of which 15 responses were deleted after filtering for straight-lining (Sharma et al., 2022) and missing data. One objective of this study is to determine the degree of necessity of various predictor variables by using NCA, which is sensitive to outliers (Dul, 2016; Dul et al., 2020). Accordingly, outliers were detected and removed from the dataset by performing an outlier analysis based on Mahalanobis distance using SPSS v.27. A significance test at the $p<0.001$ level was also performed to determine the statistical accuracy of outlier detection. Three multivariate outliers were identified and removed, leaving us with 272 usable responses for further analysis. Our sample primarily comprised male (57%) and undergraduate (70.6%) students. The majority of these participants (70.6%) were aged between 21 and 25 years (see Appendix B for the demographic statistics).

4.2. Sample Size

We adopted the approach Memon et al. (2019) proposed to determine the appropriate sample size for detecting the moderation effect. We used the G*Power v3.1.9.7 software to perform a priori and post-hoc power analyses (Faul et al., 2009; Kock and Hadaya, 2018).

Before collecting the data, we performed a priori power analysis to determine the required sample size, with a medium effect size of 0.15 (Cohen, 2013), alpha of 0.05, power of 0.90, and 6 predictors, yielding a required sample size of 73. Given that we obtained 272 usable samples at the end of the data collection and cleaning, we ran a post-hoc power analysis (Fink, 2017) to see if this sample size meets the predetermined power level of 0.90. Results of the post-hoc analysis revealed a power of 1.0. Given that the NCA does not specify a sample size (Richter et al., 2020), our sample size was deemed appropriate for both PLS-SEM and NCA based on the power analysis results.

4.3. Measurement Procedure

We adapted all our measurement items from widely used and validated scales to test our proposed conceptual model. We adapted three items each for advertising value, entertainment, informativeness, and irritation from Ducoffe (1995). We adopted four and three items from Liu et al. (2012) and Tseng and Teng (2016) to measure credibility and message relevance. We used five items from Wang and Sun (2010) to assess attitudes toward advertising and three items from Martins et al. (2019) to assess purchase intention. We conducted a pre-test with 10 students from our target population to ensure the content validity of the questionnaire and the wording and sequence of our questions. We made minor language modifications based on their feedback. Afterward, we piloted our questionnaire among 30 respondents to ensure that our survey design was free from errors (Hulland et al., 2018). We selected our sample size for the pilot study following the recommendations of Hertzog (2008), who recommended that the sample size should be 10% of the proposed primary study sample size or any number between 10 and 40 (Sharma et al., 2022). Therefore, our selected sample size for the pilot study was adequate (see Appendix C for a detailed description of the measurement items data).

5. Results

We used a multi-analytic approach to analyze our data. In the first step, we performed PLS-SEM using the SmartPLS v3.3.6 software (Ringle et al., 2015) to test the measurement and structural models (Hair et al., 2019, 2021). We used PLS-SEM due to its ability to test mediation and moderation in an integrated model (Sarstedt et al., 2020). Moreover, our data follow a non-normal distribution, which PLS-SEM is known to handle well (Hair et al., 2019, 2021). We used a web-based calculator to perform Mardia's (1970) multivariate normality test

to check for multivariate normality (Zhang and Yuan, 2018). Mardia's multivariate skewness (β=5.481, $p<0.001$) and kurtosis (β=85.287, $p<0.001$) were above the acceptable range (skewness ± 1 and kurtosis ± 20), thereby indicating multivariate non-normality.

Despite supporting and validating the sufficiency (should have) condition, PLS-SEM cannot test for the necessity (must have) condition. Therefore, we conducted NCA to test this condition (Dul, 2016; Dul et al., 2020). Specifically, we used NCA as a multi-method data analysis approach in the second step to further understand and gain deeper insights into the degree of necessity of the various predictors of advertising value (i.e., credibility, entertainment, informativeness, and message relevance) and purchase intention (i.e., advertising value and attitude toward advertising).

5.1. Common Method Variance

Our adopted measurement method may generate a common method variance (CMV), which we attempted to reduce by following the recommended procedures and using statistical methods. First, we used simple language and short questions in our questionnaire, avoided sensitive or identity-related questions, and ensured our respondents' anonymity and voluntary participation. Second, we performed a full collinearity test (FCT: Kock, 2015) to detect potential CMV. FCT results showed that the variance inflation factor (VIF) ranged from 1.764 to 2.936, which was below the 3.3 limit (Kock, 2015). Therefore, CMV is not a problem in this study.

5.2. Assessment of the Measurement Model

We used standard criteria to assess the convergent and discriminant validities of the measurement model. We used factor loadings (>0.708), reliability estimates (Cronbach's alpha, Rho A, composite reliability) (0.7 to 0.95), and AVE (>0.5) to assess convergent validity (Hair et al., 2019, 2021). The convergent validity criteria results in Table 1 show that all items exceed the recommended values, thereby indicating that convergent validity was established in this study. Afterward, we assessed discriminant validity using both the Fornell-Larcker criterion (1981) and the heterotrait-monotrait correlation ratio (HTMT; Henseler et al., 2015). Results in Table 2 show that the discriminant validity in this study is not a concern at the 0.85 conservative thresholds proposed by Kline (2015).

Table 1: Assessment of Reliability and Convergent Validity.

Construct	Item	Loading	Alpha	rho_A	CR	AVE
Advertising value (ADV)	ADV1	0.829	0.858	0.865	0.914	0.779
	ADV2	0.904				
	ADV3	0.913				
Attitude toward advertising (ATT)	ATT1	0.899	0.937	0.945	0.953	0.802
	ATT2	0.937				
	ATT3	0.934				
	ATT4	0.920				
	ATT5	0.777				
Credibility (CRE)	CRE1	0.871	0.893	0.898	0.926	0.757
	CRE2	0.901				
	CRE3	0.867				
	CRE4	0.840				
Entertainment (ENT)	ENT1	0.890	0.859	0.865	0.914	0.780
	ENT2	0.901				
	ENT3	0.858				
Informativeness (INF)	INF1	0.895	0.879	0.880	0.925	0.805
	INF2	0.886				
	INF3	0.911				
Irritation (IRR)	IRR1	0.929	0.937	0.938	0.960	0.888
	IRR2	0.953				
	IRR3	0.945				
Message relevance (MR)	MR1	0.898	0.912	0.913	0.945	0.851
	MR2	0.938				
	MR3	0.932				
Purchase intention (PI)	PI1	0.836	0.836	0.838	0.901	0.753
	PI2	0.879				
	PI3	0.887				

Note: Alpha=Cronbach's Alpha, CR=Composite Reliability, AVE=Average Variance Extracted

Table 2: Assessment of Discriminant Validity

Fornell-Larcker criterion (1981)	ADV	ATT	CRE	ENT	INF	IRR	MR	PI
Advertising value (ADV)	**0.883**							
Attitude toward advertising (ATT)	0.516	**0.895**						
Credibility (CRE)	0.585	0.440	**0.870**					
Entertainment (ENT)	0.637	0.444	0.613	**0.883**				
Informativeness (INF)	0.638	0.428	0.517	0.539	**0.897**			
Irritation (IRR)	-0.261	-0.639	-0.126	-0.207	-0.306	**0.943**		
Message relevance (MR)	0.607	0.260	0.491	0.562	0.507	0.014	**0.923**	
Purchase intention (PI)	0.614	0.481	0.460	0.582	0.597	-0.264	0.527	**0.868**
Heterotrait-Monotrait ratio (Henseler et al., 2015)								

Advertising value (ADV)							
Attitude toward advertising (ATT)	0.575						
Credibility (CRE)	0.666	0.481					
Entertainment (ENT)	0.737	0.498	0.698				
Informativeness (INF)	0.733	0.474	0.579	0.619			
Irritation (IRR)	0.287	0.674	0.137	0.233	0.338		
Message relevance (MR)	0.684	0.287	0.540	0.630	0.565	0.046	
Purchase intention (PI)	0.725	0.547	0.530	0.683	0.694	0.300	0.602

Note: The off-diagonal values (bold) in the above matrix are the square correlations between the latent constructs and the diagonals are AVEs. HTMT<0.85 (Kline, 2015)

5.3. Assessment of the Structural Model

Collinearity is a problem in structural model evaluation that may distort the overall results of a regression. VIF values at the factor level should be less than 5.0 (ideally less than 3.0) (Hair et al., 2019, 2021). Results in Table 3 show that the VIF values for all variables (1.121 to 2.458) met this threshold, thereby confirming that collinearity was not an issue in this study. We assessed the significance of the path coefficients using a percentile bootstrap procedure (Aquirre-Urreta and Ronkk, 2018) with 10,000 subsamples (Hair et al., 2019, 2021). Table 3 shows that the effects of credibility (β=0.166, t=2.482), entertainment (β=0.238, t=4.233), informativeness (β=0.303, t=5.432), and message relevance (β=0.238, t=3.963) on advertising value are statistically significant, thereby supporting H1, H2, H3, and H4. The impacts of advertising value on attitude toward advertising (β=0.329, t=6.688) and purchase intention (β=0.424, t=6.782) were also significant, thereby supporting H5 and H6. Attitude toward advertising demonstrated a significant relationship with purchase intention (β=0.210, t=2.795), thereby supporting H7. In sum, all direct hypotheses (H1 to H7) were supported.

We also assessed the in-sample predictive power of our models using the coefficient of determination (R^2). Our models showed a significant explanatory power as credibility, entertainment, informativeness, and message relevance explained 58.7% of the variation in advertising value, advertising value explained 58.3% of the variation in attitude toward advertising, and both advertising value and attitude toward advertising explained 44.4% of the variation in purchase intention. We also assessed the effect sizes (f^2) of the variables and found that advertising value (0.232) had the highest effect on purchase intention (Table 3). We evaluated the out-of-sample predictive power of our models using Q^2_predict. The Q^2_predict values for advertising value (0.571), attitude toward advertising (0.520), and purchase intention (0.425) were greater than 0, thereby validating the predictive relevance of our model (Shmueli

et al., 2019). We used standardized root mean square residuals (SRMR) to assess the model fit. The SRMR values of our saturated and estimated models were 0.049 and 0.065, respectively, both of which were below the recommended value 0.08 (Hu and Bentler,1999). We further tested the model fit using the normed fit index (NFI). Our saturated and estimated models obtained NFI values of 0.865 and 0.854 respectively, both of which were close to the recommended value of 0.9 (Bentler and Bonnet 1980). The results of both model fit measures (SRMR and NFI) confirm the fitness of our models.

Table 3: Assessment of Structural Model.

Hypothesis and Path	Coefficient	t-stat	BCaCI	VIF	f²	Remarks
H1) CRE → ADV	0.166	2.482**	[0.059; 0.278]	1.782	0.037	Supported
H2) ENT → ADV	0.238	4.233***	[0.147; 0.331]	1.976	0.070	Supported
H3) INF → ADV	0.303	5.432***	[0.213; 0.397]	1.628	0.137	Supported
H4) MR → ADV	0.238	3.963***	[0.139; 0.337]	1.637	0.084	Supported
ADV; R^2= 0.587; Q^2_predict=0.571						
H5) ADV → ATT	0.329	6.688***	[0.245; 0.407]	1.121	0.232	Supported
ATT; R^2=0.583; Q^2_predict=0.520						
H6) ADV → PI	0.424	6.782***	[0.318; 0.524]	1.668	0.194	Supported
H7) ATT → PI	0.210	2.795**	[0.088; 0.334]	2.458	0.032	Supported
ADV; R^2=0.444; Q^2_predict=0.425						
H8) ADV → ATT → PI	0.069	2.563**	[0.030; 0.120]			Supported
H9a) ADV*IRR → ATT	-0.263	4.430***	[-0.359; -0.164]			Supported
H9b) ATT*IRR → PI	-0.156	2.992***	[-0.241; -0.068]			Supported
H9c) ADV*IRR → PI	-0.112	1.800*	[-0.220; -0.014]			Supported

Note: *p<0.1; **p<0.01; and ***p<0.001; BCaCI (Bias-Corrected and Accelerated Confidence Interval)
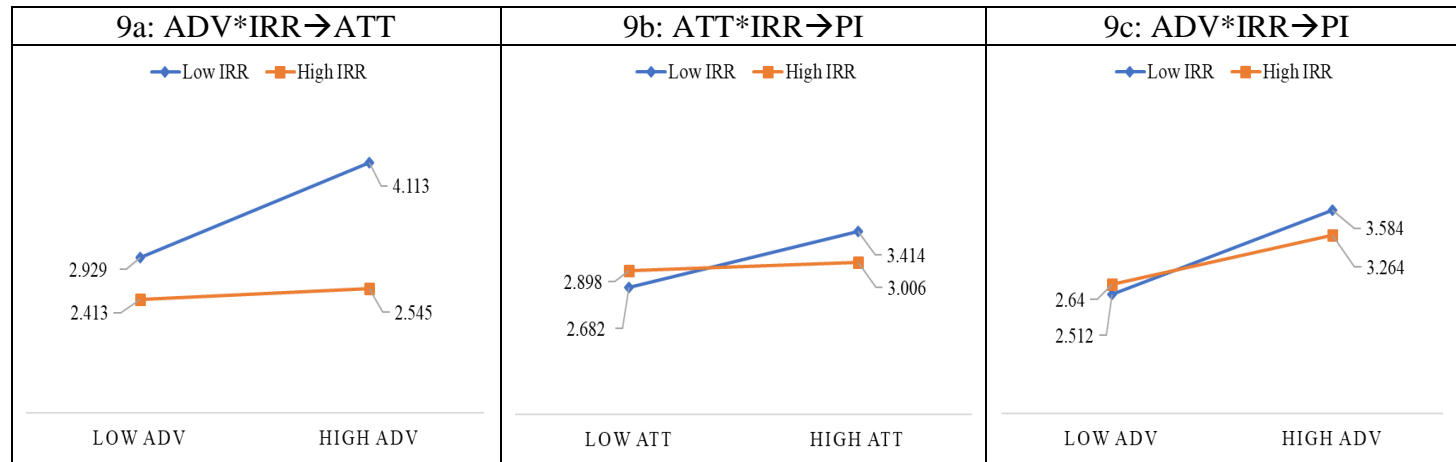
Fig. 2: Interaction effect graphs (advertising irritation as moderator)

5.4. Assessment of the Moderated Mediation Effect

To test the moderated mediation effect, we initially tested the mediation effect of attitude toward advertising on the relationship between advertising value and purchase intention. After using the transmittal approach to test for the significance of the indirect impact (Rungtusanatham et al., 2014), we performed a percentile bootstrap procedure with 10,000 subsamples. Results show that the indirect path (ADV→ATT→PI; β=0.069, t=2.563) was significant, thereby supporting H8. This mediation was a partial complementary mediation (Zhao et al., 2010), given that the inclusion of the mediator in the model did not lead to any sign changes. Afterward, we examined the moderation effect by using a two-stage approach (Becker et al., 2018) via creating an interaction term. Results highlight the significant effects of the interaction between advertising value and advertising irritation (ADV*IRR) on attitude toward advertising (β=-0.263, t= 4.430), the interaction between attitude toward advertising and advertising irritation (ATT*IRR) on purchase intention (β=-0.156, t=2.992), and the interaction between advertising value and advertising irritation (ADV*IRR) on purchase intention (β=-0.112, t=1.800), thereby supporting H9a, H9b, and H9c (Table 3 and Fig. 2). Overall, different levels of advertising irritation negatively affect the direct relationship among advertising value, attitude toward advertising, and purchase intention. These results confirm that advertising irritation has a strong negative effect on the ADV→ATT, ATT→PI, and ADV→PI relationships, such that a higher level of advertising irritation weakens the positive effect of these relationships, which is, in applied form, consistent with the findings of previous studies (Arora and Agarwal, 2019; Falcao and Isaias, 2020; Kim, 2020; Lin and Bautista, 2018; Martins et al., 2019; Sigurdsson et al., 2018; Wang and Genc, 2019). These findings also clearly demonstrate that advertising irritation negatively affects attitude toward advertising and purchase intention, thereby reducing the overall advertising effectiveness.

5.5. Necessary Condition Analysis

NCA (Dul, 2016; Dul et al., 2020) is a novel data analysis approach used to determine the size of "necessary-but-not-sufficient-condition" effects between the independent (X) and dependent variables (Y). This approach helps researchers identify the statistical significance of the "necessary-but not-sufficient-conditions" for an outcome to ensure that the effect size is not due to a random occurrence. According to Dul (2016), the NCA requires a scatter plot to be drawn for the X-Y relationship. The empty upper left corner in the scatterplot (without any data point) indicates the presence of a "necessary-but-not-sufficient-condition." The upper left

corner of the scatter plot was separated from the lower right corner by two ceiling lines, "Ceiling Envelopment – Free Disposal Hull" (CE-FDH) and "Ceiling Regression – Free Disposal Hull" (CR-FDH), which are appropriate for discrete (categorical) and continuous data, respectively (Vis and Dul, 2018). These two ceiling lines are drawn such that most of the observations are either on or below these lines. The accuracy of these ceiling lines depends on the percentage of observations either on or below them. Specifically, the accuracy of the CE-FDH by design is 100%, whereas that of the CR-FDH is typically more than 95% (Dul, 2016). The area above the ceiling line is the ceiling zone, representing the effect size (d) for the "necessary-but-not-sufficient-condition". Effect size (d) pertains to the ratio between the size of the ceiling zone (C) and the total space with observations or data points, which is also known as the Scope (S), such that (d=C/S). Given that effect size ranges between 0 and 1, Dul (2016) suggested 4 cut-off ranges determine the effect size. Effect sizes between $0<d<0.1$, $0.1<d<0.3$, $0.3<d<0.5$, and $0.5<d$ denote small, medium, large, and very large effects, respectively (for more details, see Dul, 2016). NCA calculates p-values using the approximate permutation test (Dul et al., 2020).

5.6. Use of Mediator and Moderator Variable in NCA

Mediator (M) is a variable used in the research model that relates to both the independent (X) and dependent variables (Y). In addition, the mediator explains more about the indirect relationship between X and Y. However, can we use a mediator variable in the NCA? This question arises because NCA is a bivariate technique (Richter et al., 2020), unlike PLS-SEM, which is a multivariate technique. Nonetheless, the answer is yes, based on both, the early work of Baron and Kenny (1986) and the recent works of Aguinis et al. (2017) and Rungtusanatham et al. (2014). In both the classic and modern approaches, a significant relationship should be established between X→M and M→Y to support the mediation hypothesis (for more details, see Aguinis et al., 2017; Rungtusanatham et al., 2014), which clearly indicates that the mediating variable has a direct effect on Y (M→Y) and carries the effect of X indirectly (through M) to Y (X→M→Y). Therefore, using a mediator variable (as an independent variable) in the NCA is appropriate to determine whether the mediator variable has a significant effect size in a "necessary-but-not-sufficient condition."

Another question is whether a moderator variable can be used in the NCA. A moderator (W) is a variable that affects either or both the strength (magnitude) and direction of the

relationship between the independent (X) and dependent variables (Y) (Aguinis et al., 2017). The moderator can be categorical (e.g., male and female) or continuous (e.g., high and low level of advertising irritation). Moderation analysis is conducted to "measure and test the differential effect of the independent variable on the dependent variable as a function of the moderator" (Baron and Kenny, 1986, p. 1174). For statistical purposes, the moderator is X and W's interaction effect (Z) (i.e., X*W). According to Hauff et al. (2021), "a necessary condition is not a moderator…at first sight. It might look like the moderator is a necessary condition for an outcome, but it is not." To understand the effect of the moderator through the necessary logic, we should understand the logic for the moderation analysis, which is based on the traditional regression-based additive approach. A simple moderation equation that encapsulates the relationship among X, Y, and W is $Y = \alpha + \beta 1 \cdot X + \beta 2 \cdot W + \beta 3 \cdot X \cdot W + \epsilon$, where W appears to impact Y. However, Y remains positive when W is 0, which is inconsistent with the necessary logic. The necessary condition suggests that a certain level of X (in this case, W) is required for the presence of Y. On the basis of these discussions and the present understanding of the role of the moderator in the model, including the moderator variable in the NCA is considered inappropriate in this study.

5.7. NCA Results

We performed NCA following the method of Richter et al. (2020). First, we defined our research objective as determining the degree of necessity of the various predictors of advertising value and purchase intention. Second, we examined the adequacy of our data in terms of distribution, measurement level, outliers, and sample size. Third, we used PLS-SEM to evaluate our measurement and structural models. Fourth, we extracted the latent variable scores from PLS-SEM and performed NCA using the NCA package for R v3.0.3 (Dul, 2020). The results of this package include the parameters for both the ceiling lines (CE-FDH and CR-FDH) and the bottleneck table.

The scatter plots in Fig. 3 suggest the possible presence of a "necessary-but-not-sufficient-condition," as indicated by the space in the upper left corner of these scatter plots. We used the parameters of the CE-FDH line from the NCA results for interpretation, given that this line is appropriate for survey data rated on a five-point Likert scale (i.e., discrete data) (Vis and Dul, 2018). The NCA results present several parameters (Table 4), of which effect size and conditional inefficiency are the most important. Effect size (d) is calculated based on the scope (S) and size of the ceiling zone (C) (d=C/S). In this study, the effect size ranged from 0.079 to

0.279. In contrast to the traditional notion of sufficiency, small effect sizes in NCA carry more meaning (Dul et al., 2020) and imply that a particular necessary condition must be available for the outcome to exist. The conditional inefficiency (CI) of credibility was 68.25%, which means that a credibility level above (100-68.25=31.75%) is unnecessary even for the highest level of advertising value. Similarly, the CI values for entertainment (33.38%), informativeness (63.68%), and message relevance (80.74%) indicate that entertainment (66.62%), informativeness (36.32%), and message relevance (19.26%) are not necessary above the highest level of advertising (>70%). In addition, the CI values of advertising value (25%) and attitude toward advertising (33.64%) indicate that advertising value (75%) and attitude toward advertising (66.36%) are above the highest level of purchase intention (>70%) are not necessary.
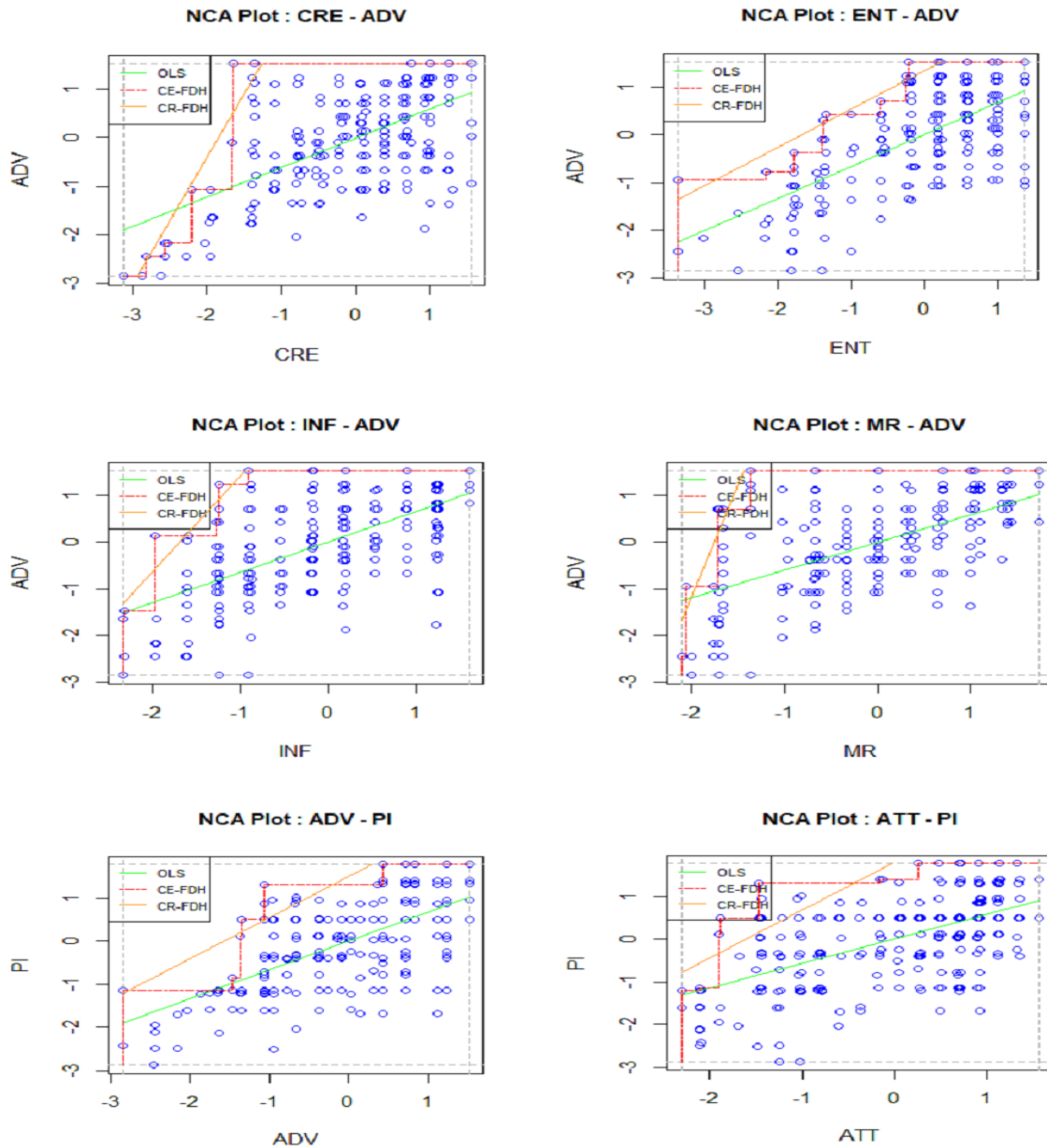
Fig.3: Necessary Condition Analysis Plots among the relationship of credibility (CRE), entertainment (ENT), informativeness (INF), message relevance (MR), with advertising value (ADV); and ADV and attitude toward advertising (ATT) with purchase intention (PI).

Table 4: Necessary Condition Analysis Result (Method: CE-FDH).

Construct	Ceiling Zone	Scope	Effect Size (d)	Conditional Inefficiency (%)	Outcome Inefficiency (%)
CR	5.127	20.462	0.251***	68.249	0.000
ENT	5.770	20.694	0.279***	33.383	43.429
INF	2.201	17.238	0.128***	63.680	27.703
MR	1.326	16.809	0.079***	80.739	9.257

ADV	5.363	20.274	0.265***	25.006	37.246
ATT	2.506	17.938	0.140***	33.635	27.363

Note (1) All the CE-FDH effect sizes are significant at p<0.001 level (see effect size column). (2) Accuracy of CE-FDH line is not mentioned in the table as it is always 100% by design. (3) CR-credibility; ENT-entertainment; INF-informativeness; MR-message relevance, ADV-advertising value; ATT-attitude toward advertising; CE-FDH, ceiling envelopment-free disposal hull

Table 5: Bottleneck Table for Advertising Value and Purchase Intention (in percentage).

	ADV				PI	
	CRE (from 0)	ENT (from 43.43)	INF (from 27.70)	MR (from 9.26)	ADV (from 37.25)	ATT (from 27.36)
0	NN	NN	NN	NN	NN	NN
10	12.2	NN	NN	1.3	NN	NN
20	19.6	NN	NN	1.3	NN	0.1
30	**19.6**	**NN**	**0.7**	**1.3**	**NN**	**10.6**
40	19.6	NN	9.3	1.3	31.6	10.6
50	31.5	33.4	9.3	10.2	34.1	10.6
60	31.5	41.8	9.3	10.2	34.1	10.6
70	**31.8**	**42.2**	**27.2**	**10.2**	**34.3**	**10.7**
80	31.8	58.4	27.8	10.2	40.7	21.5
90	31.8	66.0	27.8	19.3	40.7	21.5
100	31.8	66.6	36.3	19.3	75.0	66.4

Note: All abbreviations in this table are similar to table-4; NN-not necessary

The bottleneck table of the NCA (Table 5) shows the threshold (critical) values for credibility, entertainment, informativeness, and message relevance, which are individually necessary to achieve the desired level of advertising value. Table 5 also presents the critical levels of advertising value and attitude toward advertising to achieve the desired purchase intention level. The desired levels of advertising value and purchase intention were determined based on the criteria that 0%–30%, 31%–70%, and 71%–100% correspond to low, medium, and high levels, respectively. To achieve a low level of advertising value, credibility (19.6%), informativeness (0.7%), and message relevance (1.3%) are necessary. However, all four predictors (credibility, entertainment, informativeness, and message relevance) are necessary at medium and high levels of advertising value, although their level of necessity differs across levels. At a high level, entertainment (66.6%) is most necessary, followed by informativeness (36.3%), credibility (31.8%), and message relevance (19.3%). Similarly, only an attitude toward advertising (10.6%) is necessary to achieve a low level of purchase intention. However, both advertising value and attitude toward advertising are essential at medium and high levels of purchase intention, albeit at varying levels of necessity. Specifically, at a high level of purchase intention, advertising value (75%) is more necessary than the attitude toward advertising (66.4%).

The NCA significance test results (see effect size column in Table 4) indicate that all constructs had a moderate effect size ($0.1 < d < 0.3$, $p < 0.001$), except for message relevance, which had a small effect ($d < 0.1$, $p < 0.001$). Overall, the NCA results show that our data are consistent with the moderately "necessary-but-not-sufficient" relationships of credibility, entertainment, and informativeness with advertising value and those of advertising value and attitude toward advertising with purchase intention. Specifically, credibility ($d = 0.251$, $p < .001$), entertainment ($d = 0.279$, $p < .001$), and informativeness ($d = 0.128$, $p < .001$) are moderately necessary conditions for advertising value, whereas advertising value ($d = 0.265$, $p < .001$) and attitude toward advertising ($d = 0.140$, $p < .001$) are possible necessary conditions for purchase intention.

6. Discussion and Implications

6.1. Discussion of the Results

This study has four primary objectives. First, we investigated how advertising value is influenced by its antecedents, namely, credibility, entertainment, informativeness, and message relevance, in addition to exploring the impact of advertising value and attitude toward advertising on purchase intention. Second, we investigated the mediation effect of attitude toward advertising on the relationship between advertising value and purchase intention. Third, we tested the moderating effect of advertising irritation on the relationship between advertising value, attitude toward advertising, and purchase intention. Fourth, we determined the necessity of the predictors of advertising value and purchase intention (i.e., advertising value and attitude toward advertising). We tested our model in two ways. First, we performed PLS-SEM to evaluate the net effect of credibility, entertainment, informativeness, and message relevance on advertising value and the net effect of advertising value and attitude toward advertising on purchase intention. Second, we conducted NCA to explore the degrees of the necessity of credibility, entertainment, informativeness, and message relevance for advertising value and those of advertising value and attitude toward advertising for purchase intention. Results of PLS-SEM and NCA highlighted the statistically significant effects of the predictors of advertising value and purchase intention. Additionally, all predictors have varying degrees of necessity and net effects.

Credibility, entertainment, and informativeness were found to be significant predictors of advertising value, which support the findings of Herrando and Martin-De Hoyos (2022) and

Martins et al. (2019). Message relevance also showed a significant effect on advertising value, which aligns with the findings of Bakr et al. (2019) and Lin and Bautista (2018). We also find a significant relationship between advertising value and attitude toward advertising, which is consistent with the previous evidence reported in the literature (Herrando and Martin-De Hoyos, 2022; Jebarajakirthy et al., 2021; Sharma et al., 2021). Moreover, advertising value positively influences purchase intention, which corroborates the findings of Herrando and Martin-De Hoyos, (2022), Lin and Bautista (2018), Martins et al. (2019), Pintado et al. (2017), and Sharma et al. (2021). Similarly, the significant relationship between attitudes toward advertising and purchase intention is in line with the findings of Herrando and Martin-De Hoyos (2022), Jebarajakirthy et al. (2021), Khasawneh and Shuhaiber (2018), Sharma et al. (2021), and Wang and Genc (2019). Overall, our findings are consistent with those of earlier digital advertising studies, hence supporting the central idea that credibility, entertainment, informativeness, and message relevance play a crucial role in developing advertising value, and advertising value, in turn, influences the attitudes of consumers toward advertising and purchase intention.

Attitude toward advertising significantly affects the relationship between advertising value and purchase intention, which supports the findings of Herrando and Martin-De Hoyos (2022) and Sharma et al. (2021). Results of our moderation analysis also reveal that advertising irritation negatively moderates all the proposed relationships (i.e., ADV→ATT, ATT→PI, and ADV→PI), with ADV→ATT (β =-0.263) experiencing the highest moderation effect, followed by ATT→ PI (β=-0.156) and ADV→PI (β =-0.112). These findings indirectly validate the findings of previous studies that highlight the negative impact of irritation on advertising value and attitude toward advertising and, as a result, reduce advertising effectiveness (Herrando and Martin-De Hoyos, 2022; Jebarajakirthy et al., 2021; Khasawneh and Shuhaiber, 2018; Maseeh et al., 2021; Sigurdsson et al., 2018; Wang and Genc, 2019). The negative moderation effect implies that a higher advertising irritation reduces the effect of advertising value and attitude toward advertising on purchase intention. This novel finding fills the research gap and contributes to the digital advertising literature by providing empirical evidence on the moderating effect of advertising irritation on advertising effectiveness.

We used NCA in conjunction with PLS-SEM following the suggestions of Dul (2016) and Richter et al. (2020), who recommended the use of a complementary method that provides additional information. Results of our NCA show that entertainment (d=0.279) has the largest

effect size on advertising value, followed by credibility (d=0.251), informativeness (d=0.128), and message relevance (d=0.079). Moreover, advertising value (d=0.256) has a larger effect size on purchase intention than attitude toward advertising (d=0.140). Furthermore, our results for conditional inefficiency show that for the highest level of advertising value (>70%), the maximum required levels of entertainment, informativeness, credibility, and message relevance are 66.62%, 36.32%, 31.5%, and 19.62%, respectively. This finding informs marketers to focus on the required level. Moreover, increasing these variables above the required level does not lead to any incremental gain. Similarly, the highest required level of advertising value (75 %) and attitude toward advertising (66.3 %) are required for the highest level of purchase intention (>70 %), which means that above this level, marketers will receive no additional benefit.

6.2. Theoretical Implications

Our findings offer several theoretical implications. First, we combined the AVM with the S-O-R framework. In the digital advertising domain, AVM is widely used to investigate the effects of entertainment and informativeness on advertising value and attitude toward advertising. Several researchers expanded this model by including other relevant variables, such as credibility and message relevance. AVM establishes a link between stimulus (i.e., credibility, entertainment, informativeness, and message relevance) and emotional reactions (i.e., advertising value and attitude toward advertising) but not between emotional reaction and consumer responses (i.e., purchase intention). We used the S-O-R framework in conjunction with AVM to establish such a link, given the wide application of the former in investigating the relationships among inputs (stimulus), processes (organism), and outputs (response). Our study may be the first to combine these models to explain the links mentioned above in a digital advertising environment, hence expanding our understanding of how digital advertising affects consumer responses.

Second, our PLS-SEM results highlight informativeness as the most important predictor of advertising value. However, the NCA results show that entertainment has the largest effect size, emphasizing the importance of advertisements' entertainment component. Furthermore, both the PLS-SEM and NCA results for purchase intention emphasize the importance of advertising value over attitudes toward advertising. This finding contributes to a better understanding of how the informativeness and entertainment of an advertisement

determine its success and effectiveness, which develops advertising value and leads to purchase intention.

Third, this study contributes to the literature on digital advertising by introducing advertising irritation as a moderator of the relationship between advertising value, attitude toward advertising, and purchase intention. We found that high levels of advertising irritation can negatively affect advertising effectiveness and reduce the overall positive effect of advertisements. The overall negative effect of advertising irritation outweighs the positive effect of advertisements (Kang et al., 2022). This finding adds to the digital advertising literature by demonstrating the effect of irritation level and its negative effect on advertising effectiveness. Our findings also support the main postulations of psychological reactance theory and brand avoidance theory, which state that consumers will avoid advertisements that they perceive as annoying or irritating.

Fourth, we combined PLS-SEM and NCA as a multi-method approach to expand our understanding of the topic. Previous studies have mostly used the sufficiency logic based on net effects. In the sufficiency logic-based approach, the higher effect of one variable compensates for the lower effect of another variable (i.e., net effect). By contrast, NCA is based on the necessary logic, which states that each variable is binarily associated with the outcome variable and that the effect of one variable cannot compensate for the effect of another. As a result, the results of the NCA highlight the significance of the "must-have" variables. According to the "necessary-but-not-sufficient condition," the presence of the identified necessary conditions points to success factors but does not guarantee success. However, the absence of these necessary conditions ensures the absence of the success factors (guaranteed failure). In other words, if the necessary condition variables are not present, then an outcome variable also cannot be present.

6.3. Managerial Implications

We also offer several practical implications for advertising practitioners. First, our findings show unequivocally that consumers require more informative and entertaining advertising to add value to their decision-making journey. Advertising that is highly informative and meets the needs of consumers can capture their attention and shorten their decision-making journey, hence allowing for faster decision-making (Jebarajakirthy et al., 2021). Several studies have confirmed that when the advertising content meets the needs of

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consumers, advertising irritation is reduced (Kang et al., 2022, Loureiro, 2018; Niu et al., 2021). As a result, marketers should create and deliver finely tailored advertisements that capture consumers' attention and build advertising value, which leads to purchase intention and actual purchase behavior. They may consider using data-driven advertising, which allows them to deliver highly relevant and interactive advertising content to their consumers in a variety of digital formats that are location, time, and context-specific. A critical consideration here is that advertising should be factual and short to capture the attention of consumers. However, balancing the length of advertising with the full delivery of its message poses a challenge. While long advertisements are ignored, overly short advertisements fail to deliver the intended message to the target audience. Marketers may investigate what attracts YouTube users to view full advertisements in a "skippable ad" environment (Jeon et al., 2019). If these advertisements capture customers' attention and match their functional profiles within the first five seconds, they will be viewed in their entirety; otherwise, they will be ignored or skipped.

Second, both the PLS-SEM and NCA results highlight the importance of informativeness and entertainment in increasing advertising value and underscore the importance of advertising value over attitude toward advertising for purchase intention. This finding has far-reaching implications for managing digital advertising resources. Furthermore, marketers should only maintain the maximum required level of various predictors of advertising value and purchase intention from the NCA results. These marketers will not receive any incremental gain if they raise the level of multiple predictors above the required level.

Third, the results of the moderation analysis suggest that increased advertising irritation has a strong negative effect and reduces the overall effectiveness of advertisements. Therefore, marketers should initiate collaborative activities to engage their consumers in virtual brand communities (Arya et al.,2019) and in their communication process. The participation of these consumers may reduce their advertising annoyance. Furthermore, marketers must keep advertising exposure at a moderate level and provide their consumers with relevant, useful, and easily accessible information (Niu et al., 2021), which can be accomplished by delivering the desired information to consumers in an interesting manner (i.e., ad fit) that may meet their information needs. This ad fit positively impacts the attitudes and behavior of consumers (Kang et al., 2022). Several studies have confirmed that need-related advertising causes less annoyance (Kang et al., 2022; Loureiro, 2018; Niu et al., 2021).

Fourth, advertising clutter and irritation are common in a highly competitive environment. To reduce advertising annoyance, businesses should engage their customers through online interactive community engagement, which provides customers with an enjoyable and entertaining experience while learning about relevant products and brand-related information. Advertising practitioners should also provide the most desired information to their customers to trigger their positive emotional reactions, reduce their advertising irritation, and ultimately help them make fast and excellent purchasing decisions. One way to promote positive emotions is to incorporate artworks into an advertisement campaign. Artwork infusion is widely acknowledged as a means of connecting with customers and the larger community while also maintaining a meaningful engagement. If practitioners use these concepts when creating advertisements, then they can reduce that overall advertisement irritation, and businesses will benefit from increased advertisement effectiveness.

6.4. Limitations and Future Research Directions

Similar to many other studies, this work is not without its limitations. First, we used purposive sampling to select university students for our sample, which may have limited the reliability and validity of our results. Moreover, university students are considered homogeneous. Future studies may consider using a heterogeneous sample to obtain more reliable, robust, and valid results. Second, this study was performed only in one country (the UAE), which may impact the generalizability of its results. Previous studies suggest that consumers' advertising tolerance and behavioral responses are linked to their cultural dimensions, which were not considered in this study. Future studies may explore different cultural settings or dimensions and their effects on advertising effectiveness. Third, the data were collected within a fixed timeframe based on a cross-sectional design, which could not account for temporal changes in the acceptance of digital advertising. Future studies may use a longitudinal framework to identify temporal changes in consumers' acceptance and behavioral responses to avoid this problem. Fourth, we employed the survey method, self-reported data, and a correlational design with inherent limitations. Specifically, survey-based studies generally have measurement error issues, self-reported data may introduce social desirability bias, and a correlation design does not have a causal condition. Future studies may combine multiple research approaches to produce highly robust results. Fifth, although we considered most of the relevant variables in this study, other factors could have been considered to make our findings highly comprehensive and inclusive. For instance, future studies can use

advertising quality (i.e., informativeness) as a second moderator of advertising irritation to offer insights into the moderated-moderated mediation effect on attitude toward advertising mediated path between advertising value and purchase intention. This approach may reveal how a strong negative and a strong positive moderator interact with each other and affect the mediated relationship between advertising value and purchase intention.

7. Conclusion

By using the S-O-R framework and AVM, this study investigated the effect of credibility, entertainment, informativeness, and message relevance on advertising value and the direct and indirect effects of advertising value on purchase intention through attitude toward advertising. We also assessed the moderating effect of advertising irritation on the relationship between advertising value, attitude toward advertising, and purchase intention. We adopted a multi-analytic approach that combined PLS-SEM and NCA. Results of the PLS-SEM revealed that all predictors of advertising value are significant and that both advertising value and attitude towards advertising significantly predict purchase intention. Results of the moderated mediation analysis revealed that attitude toward advertising partially mediates the relationship between advertising value and purchase intention and that advertising irritation negatively moderates the relationship between advertising value, attitude toward advertising, and purchase intention. Our application of the sufficiency and necessity logics provided a more in-depth understanding of the roles of the predictor variables in terms of being both sufficient and necessary for an outcome variable to be present. Our findings highlight the importance of antecedents in the development of advertising value, which shapes consumers' attitudes toward advertising and their purchase intention. One important contribution of this study is its demonstration of the level of necessity of the various predictors of advertising value and purchase intention in the form of "necessary-but-not-sufficient-conditions." In addition, this study empirically validates the moderating effect of advertising irritation on the relationship between advertising value, attitude toward advertising, and purchase intention.

Appendix-A: Summary of relevant literature on digital advertising.

Authors	Context	Sample Size and Type	Method	Theory used	Variable involved								Major Finding
					CRE	ENT	INF	IRR	MR	ADV	ATT	PI	
Arora and Agarwal (2019)	Social media advertising	General, 478-India	Survey, CB-SEM	Advertising Value Model	☑	☑	☑	☑		☑	☑		ADV predictors significantly predict ADV that leads to ATT.
Bakr et al. (2019)	SMS advertising	General, 218-Egypt	Survey, CB-SEM	Grounded Theory Approach			☑		☑	☑	☑		INF and MR both predict ADV, which leads to ATT.
Brackett and Carr (2001)	Web-advertising	College Student, 421-USA	Survey, Mean, and Rank	Advertising Value Model	☑	☑	☑	☑		☑	☑		CRE, ENT, and INF are all significant predictors of ADV, which leads to ATT.
Ducoffe (1996)	Web-advertising	General, 318-USA	Survey, CB-SEM	Uses and Gratification Theory		☑	☑	☑		☑	☑		ENT and INF are important predictors of ADV, which leads to ATT.
Falcao and Isaias (2020)	Social media advertising	General, 406-Portuguese	Survey, CB-SEM	Uses and Gratification Theory	☑	☑	☑	☑		☑	☑		CRE, ENT, and INF all predict ADV, which leads to ATT.
Gaber et al., (2019)	Instagram advertising	General, 412-Egypt	Survey, CB-SEM	Uses and Gratification Theory	☑	☑	☑	☑			☑		CRE, ENT, and INF all significantly predict ATT.
Herrando and Martin-De Hoyos (2022)	Instagram advertising	General, 602-Spanish	Survey, VB-SEM	Uses and Gratification Theory	☑	☑	☑	☑		☑	☑	☑	ADV is significantly predicted by infotainment and CRE, which leads to ATT and PI.
Khasawneh and Shuhaiber (2018)	SMS advertising	General, 321-Jordanian	Survey, VB-SEM	n.a	☑	☑	☑	☑	☑		☑		CRE, ENT, INF, and MR all predicted ATT significantly.
Kim (2020)	Mobile advertising	College Students, 295-South Korea	Survey, CB-SEM	Regulatory Focus Theory		☑	☑	☑		☑	☑		ADV that leads to ATT is significantly predicted by ENT and INF.
Kim and Han (2014)	Smartphone advertising	University Students, 256-South Korea	Survey, CB-SEM	Advertising Value Model & Flow Experience Theory	☑	☑	☑	☑		☑		☑	CRE, ENT, and INF are significant predictors of ADV, and ADV is a significant predictor of PI.
Lin and Bautista (2018)	Location-based advertising	General, 605-Singapore	Survey, VB-SEM	Uses and Gratification Theory	☑	☑		☑	☑	☑			CRE, ENT, and MR all predict ADV significantly, whereas IRR has a negative effect on ADV.

Liu et al., (2012)	Mobile advertising	General, 164-Austra, 107-Japan	Survey, CB-SEM	Uses and Gratification Theory	☑	☑	☑	☑		☑	☑		CRE, ENT, and INF all significantly predict ADV, which in turn predicts ATT.
Martins et al., (2019)	Smartphone advertising	General, 303-Portuguese	Survey, VB-SEM	Advertising Value Model & Flow Experience Theory	☑	☑	☑	☑		☑		☑	CRE, ENT, and INF all predict ATT, which leads to PI.
Pintado et al., (2017)	Digital media advertising	General, 1012, -Spanish	Survey, CB-SEM	Theory of Reasoned Action		☑	☑	☑		☑		☑	INF and ENT are significant predictors of ADV, which leads to intention.
Shareef et al., (2019)	Social media advertising	General, 238-Bangladesh	Experiment, CB-SEM	Advertising Value Model		☑	☑	☑		☑	☑		ENT and INF significantly predict ADV, which in turn predicts ATT.
Sharma et al., (2021)	SMS advertising	General, 483-UAE	Survey, VB-SEM, and ANN	Advertising Value Model and SOR framework	☑	☑	☑	☑	☑	☑	☑	☑	CRE, ENT, INF, IRR, and MR relevance form advertising perception, which leads to ADV and ATT, which leads to PI.
Sigurdsson et al., (2018)	In-App mobile advertising	General, 251-India, and the UK	Survey, VB-SEM	Uses and Gratification Theory	☑	☑	☑	☑			☑	☑	ENT, CRE, and INF all significantly predict ATT that leads to intention.
Tseng and Teng (2016)	SMS advertising	General, 611-Taiwan	Survey, CB-SEM	n.a.		☑	☑		☑		☑	☑	INF, MR, and ENT all significantly predict ATT that leads to PI.
Wang and Genç (2019)	Mobile advertising	General, 388-China and 287-South Korea	Survey, CB-SEM	Technology Acceptance Model	☑	☑	☑	☑			☑	☑	INF, ENT, and CRE are all significant predictors of ATT, which leads to intention and behavior.
Wang and Sun (2010)	Online advertising	Students, 196 (USA) 381 (Romania)	Survey, CB-SEM	Hierarchy of Effect Theory	☑	☑	☑			☑	☑	☑	INF, ENT, and CRE are all strong predictors of ATT, which leads to favorable behavior.

Note- ADV-advertising value; ATT-attitude toward advertising; CRE-credibility; ENT-entertainment; INF-informativeness; IRR-irritation; MR-message relevance; PI-purchase intention.

Appendix-B: Demographic Characteristics of Respondent (n=272)

Demographic	Category	Frequency	Percentage
Age	Below 20	50	18.4
	21-25	176	64.7
	Above 25	46	16.9
Gender	Female	117	43
	Male	155	57
Education	Bachelor and below	192	70.6
	Master and above	80	29.4

Appendix-C; Measurement Items Data Description

Construct	Item	Wording	Mean	S.D.	Excess Kurtosis	Skewness
Credibility (Liu et al., 2012)	CRE1	Convincing	3.654	0.958	0.458	-0.800
	CRE2	Believable	3.717	0.987	0.181	-0.697
	CRE3	Credible	3.691	1.000	-0.195	-0.591
	CRE4	Truthful	3.632	0.980	-0.057	-0.598
Entertainment (Ducoffe,1996)	ENT1	Pleasant	4.022	0.970	1.095	-1.114
	ENT2	Exciting	3.882	0.916	0.636	-0.890
	ENT3	Entertaining	3.603	0.991	-0.208	-0.504
Informativeness (Ducoffe,1996)	INF1	Good source	3.353	1.033	-0.665	-0.125
	INF2	Timely information	3.511	1.040	-0.773	-0.237
	INF3	Convenient source	3.621	1.050	-0.331	-0.534
Message relevance (Tsang and Teng, 2016)	MR1	Interesting	3.544	1.146	-0.736	-0.469
	MR2	Useful	3.607	1.066	-0.238	-0.666
	MR3	Relevant	3.721	1.180	-0.596	-0.658
Advertising value (Ducoffe, 1996);	ADV1	Useful	3.713	1.134	-0.265	-0.682
	ADV2	Valuable	3.574	1.008	-0.585	-0.278
	ADV3	Important	3.592	1.104	-0.408	-0.490
Attitude towards Advertising (Wang and Sun, 2010)	ATT1	Like	3.195	1.192	-0.969	-0.172
	ATT2	Favorable	3.239	1.162	-1.026	-0.095
	ATT3	Satisfied	3.210	1.241	-1.171	-0.102
	ATT4	Impresses	3.276	1.170	-1.006	-0.177
	ATT5	Reliable	3.522	1.124	-0.728	-0.414
Irritation (Ducoffe,1996)	IRR1	Offensive	2.529	1.230	-1.010	0.349
	IRR2	Annoying	2.489	1.191	-0.973	0.413
	IRR3	Irritating	2.526	1.218	-0.883	0.430
Purchase intention (Martins et al., 2019)	PI1	Consider	3.574	0.948	-0.324	-0.512
	PI2	Intend	3.632	0.885	0.175	-0.614
	PI3	Probably	3.621	0.895	0.401	-0.663

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