

Public Responses Towards Camera-Embedded Digital Signage Advertising

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Abstract— This study proposes a measurable scale to gauge advertising effectiveness of digital signage. Gender study was performed on the constructs to supplement the findings. “Engagement” and “Involvement”, two well-known constructs were used to find out the advertising effectiveness using digital signage. A real-time experiment was conducted and the survey data (N = 221) were analyzed, presenting descriptive analysis and T-test analysis across all items among the constructs. The findings reveal that both “Engagement” and “Involvement” are significant contributors to advertising effectiveness in the context of digital signage. Findings also suggest that females tend to enjoy the advertisements more with a higher degree of advertisement related experiences.

Keywords— Digital Signage, Engagement, Involvement, Advertising Effectiveness.

I. INTRODUCTION

Advertising has become one of the most popular means for many companies to promote the product and service information to their potential customers. Hence, it is paramount to measure the advertising effectiveness so that the advertisers will not invest heavily for diminishing rewards. To gauge advertising effectiveness, some academics have proposed theoretical constructs which include advertising relevance, advertising engagement and advertising involvement [1]–[3]. However, this has given birth to the issue of no consensus is reached on how to differentiate these constructs with one another [4], [5]. This is because these constructs are always utilized and used interchangeably by many academics.

In fact, these constructs are theoretically similar, but they are independently operable. Different academics have conducted their studies on these constructs by measuring the constructs separately. Also, empirical studies have also been carried out on these constructs rather than mere conceptualizations [1], [4]. These efforts are used to provide evidence that advertising effectiveness can be measured from the audience perspective through their behavioral responses and feedbacks.

In the advertising discipline, digital signage has gained tremendous popularity and has been implemented across the globe for advertising purposes. However, in the context of digital signage, academic research has been scarce, causing its lack of academic foundation [6]. Just like other types of advertising mediums, gauging the advertising effectiveness

of digital signage is equally important to help provide useful statistical data to the advertisers to come out with more strategic plans on how to advertise more effectively via digital signage.

This study examines the different constructs used to measure advertising effectiveness in the context of digital signage. These constructs include engagement and involvement in advertising. This is because advertising is context-specific and the audience will experience things differently depending on what they are dealing with [7]. As alluded earlier, the limited academic work on digital signage has prompted this study to shed light on how these constructs will affect advertising effectiveness via digital signage.

Literature Review

A. Digital Signage

Digital signage is a type of digital advertising. It can now be connected to the Internet or online content to display the information through text and video [8]. Digital signage at a fixed location is integrated with a big TV and networked computer to deliver the information to the audience. Moreover, a study shows that today’s digital signage has different types of media elements that can be used to present the content via online updates and real-time program scheduling [9]. As such, digital signage has become a viable advertising option for advertisers in today’s world that relies heavily on online advertising because of its various benefits [10].

Despite the vast implementations of digital signages, researchers have pointed out that there is very little academic research conducted in the area of advertising within the

context of digital signage [11]. The authors have conducted thorough and detailed research in understanding the mediating effects of the perception and emotions of the audience to digital signage through the positive perceptions aroused towards the mall environment. Some researchers [12] suggest that digital signage should receive more attention from the practitioners and researchers as it is a new but potential platform to provide effective targeted advertisements with the use of technology.

Digital signage outperforms traditional signage in terms of implementation costs and flexibility [13]. The content of digital signage can be changed easily regardless of time and location. This eases the advertisers in making the necessary changes to their advertising strategies. Not only that, today's digital signage delivers content in various forms to suit different groups of people at different places [13]. As technology advances, the cost of the hardware to produce digital signage has significantly reduced [14]. This is also another reason for the wide adoption of digital signage in today's lives.

B. Defining Engagement

Over the past decades, both researchers and practitioners have been harnessing the term *engagement* to conduct their studies [15], [16]. Particularly in advertising, this term is also conceptualized differently due to its various contexts of use and understandings. Scholars and advertisers always desire to come out with a solution to measure advertising effectiveness. As a result, the term *engagement* has captured the attention of the people to use it to measure advertising effectiveness. By doing so, they believe that they can determine if it is worth splurging their money in advertisements. The audience diagnostic analysis of a company in America (i.e. ComScore) even concluded that *engagement* is a powerful construct to measure advertising effectiveness [17].

As this term gains popularity, a few different definitions have been proposed by scholars across the globe. Advertising Research Foundation (ARF) defines *engagement* as "turning on a prospect to a brand idea enhanced by the surrounding context". This definition has been adopted by many as the foundation for defining the term in their respective work [3]. On the flip side, the Interactive Advertising Bureau (IAB) believes that advertising engagement works in a continuum that comprises three main interconnected dynamics of cognitive, emotional and behavioral elements [18]. As such, it defines engagement as "a spectrum of consumer advertising activities and experiences – cognitive, emotional and physical – that will have a positive impact on a brand". Furthermore, engagement is also defined as "a measure of the *contextual relevance* in which a brand's messages are framed and presented based on its surrounding context" [3]. The author argues that the definition complies with the working definition of ARF in that it is about the concept of putting relevant content and information for the audience in order to initiate engagement.

For some industries, engagement could mean the time spent with brand experience and clickthrough rates. The time spent and clickthrough rates are considered as good indicators for online advertising engagement as this data can be gleaned easily from the weblogs [2]. Moreover, certain

user behaviors like leaving comments and sharing a post are deemed as engagement. This is the norm of how social networking websites measure the engagement of online users from engaging posts they encounter [2].

On the other hand, researchers also argue that the abovementioned actions like commenting, sharing and clickthrough rates are essentially the implications of engagement but not how what engagement itself defines [5]. These actions are contributed by the first-order construct called the experience which evokes in the users before they make decisions to perform any behavioral actions. It is said that only if the users choose to make the initiation to establish a connection with the advertisement, the brand experience will be formed [19]. Also, brand experience is believed to be produced with personal thoughts and beliefs in the individuals that will create personal goals in ones' lives [7].

C. Experiences Evoked Through Different Advertising Mediums

The advertising practice today has evolved tremendously. People can see advertisements almost anywhere and anytime. Research has been conducted to measure the engagement of various forms of advertising mediums including TV advertising, online advertising and mobile advertising [4], [5], [20]. Obviously, these advertising platforms show different types of content and operate in different environments. This results in different evoked experiences for the different advertising medium [7], so does digital signage.

To measure engagement in the context of TV advertising, researchers have applied the theories of immersion and presence [4]. It is proposed that *immersion* refers to when the audience feels themselves being in another reality due to the interlocking experiences dealing with the advertisement. The theories also prove that advertising engagement is something that does not simply appear and disappear but working in a continuum involving several stages instead. On the other hand, [5] study of engagement in online advertising proposes two types of engagement namely *personal* and *social-interactive* engagement. The experiences are grouped into several categories including "stimulation and inspiration", "social facilitation" and "temporal", just to name a few. Clearly, the experiences evoked are different when advertising is implemented in the different context of use.

Digital signage delivers content in various ways with the use of different media elements. As a result, research shows that experiences evoked from digital signage can be grouped into both cognitive and emotional experiences [21], [22]. In their findings, they state that cognitive content that stimulates the intellectual experience usually involves text messages while affective content that engenders emotions is presented in the video format. Advertisement viewers could have either positive or negative emotional responses that direct to their behavioral responses towards the brand [23]. [11] also declare that the behavioral responses are the outcomes from both the cognitive and emotional experiences evoked in the consumers. These behavioral actions may include potential purchase, reaction to the advertisements and product usage. Hence, the selection of advertising content is crucial to determine the success of advertising.

D. Differentiating Engagement and Involvement

Involvement is a construct that is always widely but confusedly used by many academics in their work. It is always conflated with the concept of engagement. It is proposed that there are three main distinctions between the concepts of engagement and involvement [24]. The first distinction is that the consumption object is needed in involvement. In this study, for example, the consumption object is the advertisements of digital signage. Moreover, the authors claim that having an *active* relationship with the brand also differentiates between engagement and involvement. The authors state that engagement is a process that goes beyond involvement, surrounded by the brand relationship which very often requires more active cognition while involvement construct tends to allocate the mental resources more passively. Thirdly, the authors state that engagement requires more cognitive processes than involvement, creating experiential values in both cognitive and emotional aspects.

It is stated that involvement affects the advertisement comprehension when higher message involvement will improve the attention and cognitive effort of the audience [3]. It is also proposed that involvement is treated as a variable that possesses arousal, interests and drives levels from the advertisements. It could serve as the moderator that is composed of attention and personal relevance [4]. Advertising relevance contributes to engagement whereas engagement is able to cause the message involvement in the audience through the attention to process information. As such, attention is an important factor to gauge in this study.

II. METHODOLOGY

E. Study Design

A real-time experiment was conducted to collect the data from the audience spending time with digital signage. The digital signage was implemented in a skyscraper with many working adults passing by. As such, it was able to capture the interest of those people to come and watch the digital signage. The experiment was conducted without the awareness of the audience to obtain the most natural response from the audience. The experiment was run for 20 days in the convention building from 8 am to 6 pm each day. We tried to keep the experiment time constant to avoid any biased observations and results obtained.

F. Stimuli

This study opted video content as the main stimulus as video content is proven to be more effective as an advertising medium [17]. The videos used in the experiment were selected based on a few human attributes in order to achieve successful targeted advertising and different types of engagement. As such, these videos were categorized following humans' genders, estimated age groups, the presence of beard and spectacles. These attributes were chosen as they represented the significant information for targeted advertising from human faces to identify the distinct groups of people via computer vision technology. By doing so, the advertisements presented to the audience would generate more significant relevant contact points to the audience as discussed in the literature review above. There were 13 advertisements chosen and edited to fit the length of

15 seconds for each advertisement. All the contents were about advertised products or services and promotional information.

G. Questionnaire Generation

A set of 7-point Likert scale questionnaire (1 = Strongly disagree; 7 = Strongly agree) was prepared for the participants to convey their engagement towards the content they watched from the digital signage. The questionnaire was prepared in three different languages including English, Malay, and Chinese as it was to help participants understand the questions better with their preferred language. In the survey, there were 5 constructs measured including "Relevance", "Engagement", "Involvement", "Effectiveness" of advertising and "Digital Signage Experiences".

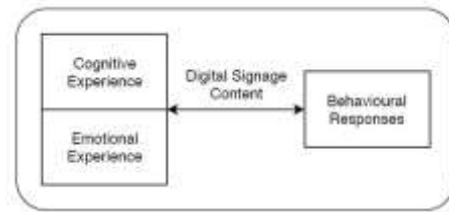


Fig. 1 Engagement Model for Digital Signage

In gauging the "Engagement" construct, an engagement framework for digital signage (Fig. 2) is adopted [25]. This model describes the evoked experiences in the audience that will affect the behavioral responses of the audience after encountering an advertisement. The authors also claim that this entire continuous process initiates engagement in the audience with the advertisements. In this framework, digital signage content acts as the mediating factor which will hugely influence the experiences evoked and also the potential responses of the advertisement viewers.

Since digital signage was meant to deliver advertising information to the audience, so it is important to understand how advertisements can affect the audience. This paper adopted the validated items from previous research in measuring TV advertising engagement [4]. This is because advertising with digital signage is similar to TV advertising in terms of the technology used with a widescreen which makes digital signage as compelling as TV advertising [13]. Thus, the experience evoked from TV advertising should be similar to digital signage except that the digital signage was in a public area.

Considering digital signage is located in public places, "social facilitation" aspect developed by [5] was included. This construct measures the likelihood that one would share the experience with their friends and others after encountering an advertisement in a public area. Not only that, an item was adopted regarding one's curiosity towards the digital signage content [26]. Initially, the item was used to define the sense of curiosity when dealing with online shopping experience. In this study, it was adopted to measure one's curiosity towards the content of the digital signage when it was displayed publicly. In the questionnaire, we also adopted two items to measure the cognitive and emotional experiences of the participants. Based on the discussion in the literature review, the content of the digital signage may evoke cognitive and emotional experiences. In

this study, we chose to use video content integrated with text messages to test their relationship.

The third construct measured the digital signage experiences of the audience. These experiences were chosen as they represented the specific experiences evoked from digital signage [21]. In this construct, it measured the experiences in both the cognitive and affective aspects that would influence the overall experience or even the purchase intention of the audience of an advertising campaign. The cognitive experiences explain how the audience comprehends the messages from the advertisement while the affective aspect was to engender their feelings towards the advertisement.

In the involvement construct, the items adopted were from the work by [1]. This is because involvement is always conflated with engagement and in this study, it was included to compare how engagement would affect involvement or vice versa. The other items were taken from [27] work, measuring the overall attention of the audience watching the digital signage. This was to gauge if the message involvement was able to increase the attention of the audience throughout the advertisement experience.

The last construct gauged the advertising effectiveness impacted by the previous constructs like engagement and digital signage experiences. It is said that engagement can be a good indicator to measure advertising effectiveness and this could apply to digital signage in a similar way [17]. The items were adopted from the work that was aimed to generate a measurement scale to measure advertising effectiveness [28]. The items were validated and used to apply in the context of digital signage.

The five constructs and their respective items are displayed in TABLE I. The Cronbach's Alpha values of all constructs are greater than 0.70, indicating high internal consistency among the items of each construct.

TABLE II
MEASUREMENT ITEMS

Construct	Items
Relevance	A1. The content of the advertisement is relevant to me.
Engagement ($\alpha = .91$)	B1. While watching the advertisement, I felt as if I was part of the action. B2. The advertisement made me feel connected to the product. B3. After I experienced the advertisement, I still felt as if I was experiencing the advertisement. B4. I bring up things that I have seen on this advertisement in conversations with many other people B5. I continued to watch on this advertisement out of curiosity. B6. The advertisement I just watched was informative. B7. Watching to this advertisement improves my mood, makes me happier.
Digital Signage Experience ($\alpha = .90$)	C1. If I were planning to buy a product, the advertisement would help me to make a better decision. C2. Viewing the advertisement provides information that would be helpful in buying a product.

	C3. I engage a lot of thinking when I encounter an advertisement like this one. C4. Viewing the advertisement provides entertainment. C5. Viewing the advertisement is pleasurable. C6. The advertisement induces feelings and sentiments. C7. This is an affective advertisement.
Involvement ($\alpha = .87$)	D1. I was really drawn into my advertisement watching experience. D2. I paid a lot of attention to the advertisement I just watched. D3. When I was watching the advertisement, my thoughts were only with the advertisement. D4. During watching the advertisement, I was hardly aware of the space around me.
Advertising Effectiveness ($\alpha = .93$)	E1. The advertisement I just watched results in exposure about the product. E2. The advertisement I just watched arouses the curiosity about the product. E3. The advertisement I just watched creates the interest in the product. E4. The advertisement I just watched helps me in knowing a new product. E5. The advertisement I just watched motivates me to buy the product. E6. The advertisement I just watched leads to the repurchase of the product.

H. Participants

The participants in this study were aimed to be working adults and the elderly as the experiment was conducted in a convention building with lots of office workers. The participants who naturally approached the digital signage were then invited before they left to conduct a survey. They were instructed to fill the survey regarding the advertisements they encountered during the watching session.

I. Measures and Procedures

A 42-inch vertical display was used for the digital signage to play the content to the audience. Throughout the day, the content was changed two times according to the schedule, with the balance of hours for each type of content. Each type of content was used from 8 am to 1 pm followed by the other type of content from 1 pm to 6 pm.

The audience was approached and invited by the research assistants to help conduct a survey regarding their engagement towards the content. The survey session was conducted in three different ways which the participants could choose to fill in the survey forms or do it online using a laptop provided or scan the QR code attached on the top-right corner of the screen. The participants were invited from a voluntary-based manner to ensure the data collected was not biased or affected.

After completing the survey, some participants were asked about their message recall from the advertisement they encountered. The questions mainly contained their intellectual experiences such as the brand or product message delivered in the advertisement. This was to validate

one of the items in the questionnaire that sought if they found the advertisement informative.

The experiment was also recorded with a hidden camera without the realization of the participants to keep the naturalness of the field test. The purpose of recording the entire experiment was to provide footage for video analysis. Take note that the privacy of the participants was fully protected and not ever revealed to others.

III. RESULTS

A. Descriptive Analysis

TABLE III
DESCRIPTIVE ANALYSIS RESULTS

Construct	Items	Mean	Mode	Median	Standard Deviation
Relevance	A1	5.20	6	5.00	1.285
Engagement	B1	4.87	5	5.00	1.316
	B2	5.03	5	5.00	1.221
	B3	4.77	5	5.00	1.185
	B4	4.93	5	5.00	1.358
	B5	5.43	6	6.00	1.221
	B6	5.26	6	5.00	1.137
	B7	5.10	6	5.00	1.235
Digital Signage Experience	C1	5.17	5	5.00	1.234
	C2	5.29	5	5.00	1.130
	C3	4.85	5	5.00	1.300
	C4	5.48	6	6.00	1.102
	C5	5.42	6	6.00	1.116
	C6	5.05	5	5.00	1.186
	C7	5.37	6	5.00	1.178
Involvement	D1	5.28	6	5.00	1.125
	D2	5.33	5	5.00	1.106
	D3	5.03	5	5.00	1.144
	D4	5.00	6	5.00	1.353
Advertising Effectiveness	E1	5.38	6	5.00	1.045
	E2	5.35	6	5.00	1.036
	E3	5.14	5	5.00	1.124
	E4	5.42	6	6.00	1.132
	E5	4.90	6	5.00	1.189
	E6	4.77	5	5.00	1.271

The results are presented in TABLE IV. There was a total of 272 participants who agreed to take part in the survey. Among the participants, 117 were male and 155 were female. Up to 54% (N = 154) of them were adults aged between 31 to 40 years old. The second highest population age group was adults from 21 to 30 years old, having 29.4% (N = 80) among the participants.

51 data entries were removed in the data cleaning procedure. The data showed erratic patterns as a result of the respondents who completed the survey in a hurry. These responses were noted during the survey data collection process and pruned off from the original data pool for more accurate analysis. The remaining data entries consisted of 102 male and 119 female respondents respectively. In the age groups, 53.8% (N = 119) participants were aged between 31 to 40 years old while the second highest population had 29% (N = 64), aged from 21 to 30 years old.

The “Relevance” construct consists of only one item. The mean score of A1 for 221 participants was 5.20 (M = 5.20, SD = 1.285). The “Engagement” construct consists of 7 items. B5 gleaned the highest mean (M = 5.43, SD = 1.221) while B3 had the lowest mean (M = 4.77, SD = 1.185). The third construct, “Digital Signage Experiences”, was also measured with 7 items. Results showed that C4 obtained the highest mean (M = 5.48, SD = 1.102) among the 7 items measured while C3 scored the lowest mean (M = 4.85, SD = 1.300). Among the 4 items measured in the “Involvement” construct, the items obtained a narrow range of mean values, ranging from 5.00 to 5.33. D2 scored the highest mean (M = 5.33, SD = 1.106) while D4 gleaned the lowest mean (M = 5.00, SD = 1.353). This construct demonstrated a minimal difference among the items to one another. In measuring the “Effectiveness” construct, there were 6 items used in the questionnaire. E4 achieved the highest mean (M = 5.42, SD = 1.132) while E6 gleaned the lowest mean (M = 4.77, SD = 1.271).

To compare across the constructs, C4 in the Digital Signage Experience construct obtained the highest mean (M = 5.48, SD = 1.102) while two items shared the lowest mean (M = 4.77, SD = 1.185); (M = 4.77, SD = 1.271) which were B3 from Engagement construct and E6 from Advertising Effectiveness construct respectively.

For all the measured items, the median was equivalent to 5 and this indicated that at least 50% of the respondents rated the items more than 5 points in the 7-point Likert scale. Additionally, the results showed no outliers after running the descriptive analysis.

B. T-test Analysis

An independent samples T-test was conducted to compare the measured constructs based on the genders.

In the “Engagement” construct, particularly in B4, there was a significant difference in the scores rated by males (M=4.73, SD=1.42) and females (M=5.11, SD=1.28); $t(219) = -2.11, p=0.036$. These results suggest that females are slightly more likely to bring up things they have seen on an advertisement in the conversations with many other people compared to males. Specifically, our results suggest that females tend to share the information they come across with others. B7 was also found to have a significant difference in the scores rated by males (M=4.87, SD=1.28) and females (M=5.29, SD=1.17); $t(219) = -2.56, p=0.011$. These results suggest that females are slightly more likely to agree that watching the advertisement played via digital signage improves their mood and makes them happier compared to males.

C2 in the “Digital Signage Experience” construct was found to have a significant difference in the scores rated by males (M=5.05, SD=1.18) and females (M=5.49, SD=1.05); $t(219) = -2.92, p=0.004$. These results suggest that females are more likely to find information about the advertisement more helpful than males to help them in buying a product.

In the construct of measuring “Advertising Effectiveness”, E6 was found to have a significant difference in the scores rated by males (M=4.55, SD=1.31) and females (M=4.96, SD=1.21); $t(219) = -2.41, p=0.017$. These results suggest that females are more likely to repurchase the product

advertised from the digital signage compared to males after experiencing the advertisement through the digital signage.

IV. DISCUSSION

The findings in the descriptive analysis show that the “Relevance” construct is a strong indicator of the “Engagement” construct. Most of the respondents found the advertisement to be related to them and initiated engagement with the advertisement. Hence, the connection established as a result of high relevance between the advertisement and the respondents ensures the high level of engagement achieved [4]. These results are also consistent with the findings by [3], denoting that advertising relevance is important to drive engagement among advertisement audience.

Cognitive experiences and emotional experiences contribute to the engagement of the audience by having potential behavioral actions. This was measured from both Items 6 and 7 in the “Engagement” construct. The mean values for both B6 and B7 are ($M = 5.26$, $SD = 1.137$) and ($M = 5.10$, $SD = 1.235$) respectively. This suggests that both cognitive and emotional experiences are great contributors to initiate engagement in the audience towards the advertisement. This is also heavily depending on the advertising content. It should be one that the respondents found highly related to them, leading them to their interest to continue watching the advertisement. This explains the mediating effect of the content of the digital signage between the experiences evoked and the behavioral responses in the proposed framework.

The results also demonstrated that curiosity serves as a good indicator affecting the engagement towards the advertisements of the digital signage. Digital signage that plays advertisements based on feature selections can be eye-catching to the public. The features were identified from human faces with certain attributes that could differentiate the demographics of the audience based on attributes such as genders and age groups. Also, audio element-integrated digital signage is an added advantage to capture audience curiosity and attention a lot easier compared to digital signages that merely use static images to display information. The “Novelty” construct as discussed by [26] shows that curiosity aroused in the shopping process can lead to unexpected surprises and new information to the shoppers. Therefore, the present findings confirmed that digital signage with novel implementations leads to increased chances of the interested audience, engaging with the advertisements.

[4] propose a 4-item construct and claim that these items are invariant across different conditions including the type of people, viewing conditions and product types. However, the work focuses on the context of TV advertising and has yet to be tested with another context of use. The adoption of the items on digital signage in this study produces different results. The 4 items adopted were categorized as B1 to B4 in the “Engagement” construct. It is found that people tend to have lesser carry-over effect of the advertising experience after watching the advertisement. This could be due to the difference between the setup of TV advertising and digital signage advertising. Very often, digital signage is put in public places where people tend to pass by and leave the digital signage after watching the advertisement, carrying on

with their original business before they are being interrupted by the advertisement. As a result, the carry-over of the experience in these people may be weaker due to the immediate change of focus for these passers-by towards their errands after the interruption.

The results of the “Involvement” construct hint that digital signage serves as a good advertising platform to catch audience attention. When the respondents were paying attention and were highly focused during the advertisement, this resulted in message involvement with the advertisement. Advertising involvement is said to be the communications with the advertisements [1]. The similarity in the score patterns of the items in this construct reveals that successful communications of the advertisement viewers can lead to their high level of attention, resulting in better message involvement.

The findings on the “Digital Signage Experiences” tie well with the previous study conducted by [21]. The public tends to possess higher emotional experiences than cognitive experiences. By adopting 7 items from previous work, the results hint that the public find the advertisement content to be able to provide them pleasure and utilitarian values. Hence, they tend to assess the digital signage message more emotionally as proven from the findings.

The “Advertising Effectiveness” construct serves as a validation construct to measure the effectiveness of the other constructs mentioned earlier. Curiosity aroused from the digital signage content that evokes both cognitive and emotional experiences is able to help the public know about a new product through the product exposure they come across from the digital signage. If the public is engaged to the advertisement, the experiences elicited will engender their interests in the product and eventually stimulate the purchase intention, or maybe product repurchase. This also implies the success of advertisers to spread their product information to their potential customers via digital signage. From the findings of all constructs, the mean values are at least more than half of the average. This confirms that digital signage is an exceptional platform to provide advertising services.

Across the constructs, the lowest mean value for B3 suggests that the carry-over experience decreases over time while the highest mean value for item C4 reveals that advertisement viewers tend to enjoy the advertisements as they find advertising via digital signage provides them enjoyment. When experiencing the advertisements, the viewers are able to enjoy the advertisements. However, right after the advertisements, they felt that they would start losing the advertising experience carried over from watching the advertisement. However, it should be noted that the lowest mean value is still greater than the average of the specific rating. This may demonstrate that the emotional experiences elicited from digital signage serve as a strong element to sustain the positive experience of the audience even after the advertisement has finished.

The findings from the T-test analysis evidently show that females are better-targeted shoppers when it comes to advertising via digital signage. Prior research shows that females tend to process message order or message emotionality more distinctly than males [29]. The findings suggest that females tend to get happier more easily

compared to males during or after they experience the advertisements. This could be due to the nature of females being natural shoppers than males as watching an advertisement or shopping is an activity that females perform more than males [29]. This nature may also justify the results in which females are found to be able to process advertisement information better than males. Also, from the results, it is posited that advertising via digital signage can instill loyalty in females better than males as the intent of product repurchase is higher for females.

V. CONCLUSION AND IMPLICATIONS

Overall, this study provides empirical support for the use of camera-embedded digital signage for more effective advertising. This study responds to the measurement of advertising engagement through two constructs namely engagement and involvement. These two constructs play a significant role in advertising as discussed by previous academics. The findings of this empirical study concluded that advertising practice with digital signage can be enhanced with better strategies.

The main contribution of the study is the testing and analysis of a measurement scale used to gauge how distinct constructs affect advertising effectiveness via digital signage. The results entail that engagement of the advertisement audience serves as an important factor in successful advertising practice, especially in the cognitive and emotional aspects. There is a need for advertisers to go the extra mile in producing advertisements with more solid intellectual and affective elements. On the other hand, the positive result of involvement indicates that digital signage may be an excellent medium for advertising practices that demand high audience attention such as workplace safety awareness campaigns. Hence, this will benefit advertisers by providing them with a more effective option to advertise that comes with more efficient communication capability.

The study also examines the differences among the constructs between the genders. The results reveal that digital signage may be a more effective advertising medium for females than males. Therefore, advertisers wishing to target females should consider using more of this medium to advertise particularly on female activity areas. On the other hand, the advertising agencies should also devise strategies on how an advertisement can attract attention and improve the way it performs with males. This may be feasible future work on finding ways for digital signage to be better utilized to target male advertising practices.

This study works in a niche context of use on digital signage since advertising is context-specific. Therefore, suggested next steps for academics include the comparative study of the effectiveness of these constructs in other advertising mediums, particularly those that relate to digital advertising. Other important demographics data such as age groups and monthly income may be included to explore their effects towards the constructs, providing more accurate and useful data for advertisers.

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