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Research on Factors Influencing User Experience in H5 Interactive Advertising Based on Flow Theory

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Abstract. With the advancement of HTML5 technology, mobile web interactive advertisements based on HTML5 have offered users a superior experience. Drawing from Flow Theory, we constructed a research framework to elucidate how 'flow' influences user acceptance and sharing intentions towards H5 interactive advertisements. Furthermore, we aimed to identify factors influencing the flow experience of users. Given the Person-Artifact-Task (PAT) model, which frames the precursors to flow around three dimensions: person, tool, and task, this paper employs a model centered around the person, tool, and task. We categorized factors impacting flow experience into user factors and ad design factors. Adopting a quantitative research approach, we surveyed users of H5 interactive ads in China. Regression analysis was conducted using SPSS (version 26.0). Findings indicate: (1) Within user factors, Entertainment and Perceived Control, and within design factors, Interface Design Quality and Interactive Narrative, have a positive influence on flow. (2) Flow positively affects the acceptance and sharing willingness of users towards H5 interactive advertisements.

Keywords. H5 Interactive Advertising, Flow Theory, User Experience, PAT Model

1. Introduction

In an era where internet information technology and digital media are flourishing, the rise of the mobile internet industry has paved the way for a new trend in media convergence. As mobile social interaction becomes increasingly dominant in China, investments in digital and mobile technologies for online advertising channels have steadily risen year by year. HTML5, being accessible on mobile devices, harnesses various social platforms to enhance interaction and dissemination. Although there's been an increase in interactive modalities within H5 interactive advertisements, there's still a depth lacking in research on interactive effectiveness and the emotional experiences users encounter during interaction. Flow theory is among the most applied concepts within experience theories. It offers fresh insights into understanding mental perceptions and unlocking human potential. Currently, it stands as a critical guiding thought increasingly applied across multiple design disciplines.

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Hence, this study aims to explore the influence and role of flow theory in H5 interactive advertising. Building on flow theory, we establish a research framework elucidating how flow impacts user acceptance and sharing intentions towards H5 interactive ads. We also analyze the factors influencing the flow experience within H5 interactive advertising, and integrating the PAT model, categorize these factors into user-related and ad design-related components.

2. Literature Review

2.1. H5 Interactive Advertising

HTML, an acronym for Hyper Text Markup Language, was born in 1990. It consists of descriptive text formed by HTML commands, which can denote text, graphics, animations, sounds, tables, links, and more. HTML5 operates seamlessly on both web and mobile platforms. Users can also access and view content anytime, without restrictions based on device or location[1]. In the context of this study, H5 interactive advertising refers to ads presented using HTML5 technology as a medium, wherein users are either permitted or autonomously interact with the content[2]. These advertisements are created by product designers using instantly participatory and modifiable digital interactive mediums that include transaction and payment functionalities, allowing user feedback on conveyed product information, user services, or viewpoints. Given the measurability, precision, customization, personalization, and easy localization of H5 interactive advertising[3], interactive digital marketing can arguably be considered one of the most potent tools available to advertisers.

2.2. Flow Theory

Numerous researchers have delved into the study of the flow experience, exploring various aspects of flow, such as its antecedent variables, dimensions, and outcomes. Csikszentmihalyi[4] defined flow as the holistic sensation people feel when they are completely immersed in an activity. Hoffman & Novak[5] posited that flow is a cognitive state experienced during an activity. This cognitive state is described as an intrinsically pleasurable optimal experience. While there are significant individual variations based on factors such as gender, age, cultural background, and social class, when individuals describe their experienced state of flow, they often allude to commonalities.

Over the subsequent decades, researchers have further discussed and refined the characteristics of flow, progressively categorizing them into stages of antecedents to flow, the flow experience itself, and outcomes from flow. The PAT model (Person-Artifact-Task Model) constructed by Finneran & Zhang[6] posits that factors influencing the flow experience primarily arise from three dimensions: the person (P), the tool or artifact (A), and the task (T). The "person" refers to the user, who, as the main operator of mobile networks, can achieve goals through the "artifact" or medium. Flow experience can emerge when there is alignment between the goal and the medium itself. Research indicates that, within the model of advertising research, flow is a crucial predictor in user acceptance and purchase intention in interactive advertisements.

3. Research Model and Hypotheses

3.1. Selection and Definition of Research Variables

Drawing from the theory of flow, the PAT model, characteristics of H5 interactive advertisements, and user experience, we constructed a research model in two stages. First, we categorized factors influencing the flow experience into user factors and advertisement design factors. We then investigated how elements in the user factors of H5 interactive advertisements, namely Entertainment, Informativeness, and Perceived Control, and elements in the design factors, namely Interface Design Quality, Aesthetics, and Interactive Narrative, influence the users' perception of flow. In the second stage, we positioned flow as a mediating variable to explore its influence on advertisement acceptance and the willingness to share within the user experience.

3.1.1. User Factors

Given that the PAT model delineates the precursors to the flow experience into three dimensions: person, tool, and task, this study adopts a model framework centered on the individual (user), the tool (H5 interactive advertisement design), and the task. Within this structure, and considering the characteristics of interactive advertisements, the factors influencing the flow experience are divided into user factors and advertisement design factors. The individual, or user, is the primary entity experiencing flow. Moreover, the concept of the user has always been pivotal in marketing. Thus, within the context of H5 interactive advertisements, user factors are analyzed in terms of user needs and the appeal to the user. Informativeness refers to the breadth and depth of details conveyed in the advertisement about a product or service, facilitating more informed decision-making by the user in online advertisements[7].

At the same time, Ducoffe[8] identified informativeness and entertainment as antecedents to users' attitudes towards advertisements. The entertainment value of an ad can fulfill a user's desire for escapism, aesthetic appreciation, and emotional expression. This enhances the flow experience, thereby fostering a positive attitude towards the advertisement[9]. In line with this, the present study references the dimensions of informativeness and entertainment from Ducoffe's[8] model of online ad value and posits the following hypotheses:

H1: Entertainment has a positive influence on Flow.

H2: Informativeness has a positive influence on Flow.

Within flow theory, perceived control is defined as one's sense of mastery over their environment and actions[10]. In the digital landscape, the abundance of information and products leads to a growing demand among consumers for greater control, reduced effort, and higher efficiency when viewing ads. Thus, in the context of H5 interactive advertising, whether a user can effortlessly and swiftly access information becomes a critical determinant of user experience. Drawing on the research of Ghani et al.[11] and Taylor & Todd[12], this study incorporates three measurement items to gauge perceived control, leading to the hypothesis:

H3: Perceived Control positively influences Flow.

3.1.2. Ad Design Factors

Within the PAT model, tools (or artifacts) serve as essential conduits for facilitating the flow experience and also act as mediums for users to gather information. In H5 interactive advertising, the quality of interface design is linked with factors like the ad's duration, size, color scheme, musical effects, animations, and the smoothness of its loading − all of which influence an ad's efficacy[13]. Superior interface design fosters an enhanced user experience, immersing users more deeply[14]. Some scholars have observed that a user's evaluation of an ad's interface design quality can impact their sense of immersion, satisfaction, and purchase intent[15]. Guided by the research on mobile interactive ad video quality assessment by GuChao et al.[16], we propose the following hypothesis:

H4: The quality of Interface design has a positive effect on Flow.

Aesthetic design aids designers in maintaining a consistent artistic style for the ad, offering inherent aesthetic value, which can shape a user's ad experience and, to an extent, satiate their aesthetic demands in H5 interactive advertising. Salen & Zimmerman[17] explored the impact of aesthetic design on flow and game experience. We aim to investigate whether the aesthetic design in ads influences users' sharing and forwarding experiences and propose:

H5: Aesthetic design positively influences Flow.

Interactive narratives offer a storytelling approach where the audience can influence, choose, and alter the plot[18][19]. Such interactivity can foster a connection between the audience and the ad's story, heightening their sense of engagement. The more users are satisfied with an ad's interactive narrative, the greater resonance they feel with the ad's designers. Past research indicates that interactive narratives in ad design exert a discernible influence on user experience. Hence, we suggest:

H6: Interactive Narrative exerts a positive impact on Flow.

3.1.3. The Impact of Flow on Ad Acceptance and Willingness to Share

Concentration is a crucial component of the flow experience. Users in a state of flow are wholly engrossed in their present activity[20][21]. If users are juggling multiple tasks at once, their ability to achieve this state of flow is compromised. Thus, if users focus their attention solely on the H5 interactive advertisement, they are more likely to enter this flow state. This, in turn, may influence their acceptance of the advertisement and their inclination to share it. Consequently, we posit the following hypotheses:

H7: Flow has a positive impact on Ad acceptance.

H8: Flow positively influences the Willingness to share.

Drawing upon the analyses presented, this study proposes a theoretical model for how H5 interactive advertisements influence user experience, as depicted in Figure 1.

4. Research Methods

This study utilized a survey method to test the hypotheses previously outlined, and used the QuestionnaireStar platform to create the electronic survey. The questionnaire was then divided into two main sections to evaluate our theoretical model. The first part pertained to demographic questions concerning the respondents and their engagement

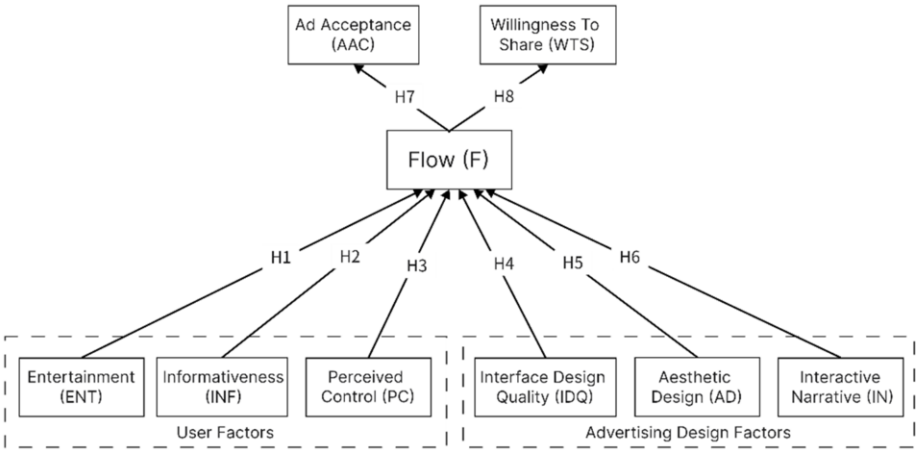

Figure 1. Theoretical model

with H5 interactive advertisements. The second part revolved around descriptive statistics and internal consistency analysis. Responses for each item corresponding to a construct were gauged using a 5-point Likert scale, with 1 signifying "strongly disagree" and 5 indicating "strongly agree." After filtering out duplicate or patterned responses, we successfully collected 556 valid responses. The data from these questionnaires were then analyzed using SPSS software (Version 26.0).

5. Data Analysis

5.1. Demographic Analysis of the Sample

Based on the data from the returned questionnaires, it's evident that among those who have either browsed or expressed interest in browsing H5 interactive advertisements, females are more prevalent, accounting for 65.3% of the sample. In terms of age, the 18-25 age bracket is the most represented, making up 46.4%. Within the sample, 79.5% have watched an H5 interactive advertisement. Regarding the platforms on which they viewed these ads, WeChat leads with 61.3%, followed by Douyin (TikTok) at 41.7%, and then Xiaohongshu and Weibo at 39.4% and 31.3%, respectively.

5.2. Descriptive Statistics and Internal Consistency Analysis

5.2.1. Descriptive Statistics

Descriptive statistics are utilized to characterize the features of data. In our study, we employed four standard measures for evaluation: mean, standard deviation, skewness, and kurtosis. From the questionnaire data, we can observe that the means and standard deviations for each item are within reasonable ranges. Additionally, all means are above 2.5, suggesting that respondents generally hold positive attitudes toward the statements or behaviors in the items. In terms of skewness and kurtosis, all items have absolute skewness values of less than 1 and absolute kurtosis values of less than 7, which indicates they conform to univariate normality.

5.2.2. Internal Consistency Analysis

Cronbach's alpha is widely used in academia to assess the reliability of scales. For a scale to be considered reliable, its Cronbach's alpha value should exceed 0.70. In this study, the Cronbach's alpha values for all items ranged from 0.806 to 0.903, surpassing the recommended threshold. This indicates that each item on the scale possesses a high degree of reliability.

5.3. Correlation Analysis

The correlation coefficient is a statistical measure used to reflect the degree of relationship between variables. For this study, we employed the Pearson coefficient. According to Table 1, the association among the nine variables in the study all demonstrate a moderate to strong correlation. Specifically, the correlation coefficients between the variables 'Flow' and 'Ad acceptance' with the other seven variables (excluding 'Aesthetic design') are greater than 0.70, indicating a strong correlation.

Table 1. Item Correlation Matrix

Constructs	ENT	INF	PC	IDQ	AD	IN	F	AAC	WTS
ENT	1								
INF	0.807**	1							
PC	0.702**	0.688**	1						
IDQ	0.776**	0.787**	0.681**	1					
AD	0.452**	0.471**	0.492**	0.467**	1				
IN	0.744**	0.776**	0.662**	0.813**	0.516**	1			
F	0.737**	0.720**	0.711**	0.733**	0.485**	0.749**	1		
AAC	0.759**	0.733**	0.725**	0.748**	0.525**	0.756**	0.825**	1	
WTS	0.683**	0.672**	0.647**	0.677**	0.428**	0.660**	0.730**	0.805**	1

5.4. Path Analysis

In this study, the Durbin-Watson values for the three regression sets are around 2, and R^2 is greater than 0.50. This indicates that the data has an established independence, and the independent variables have a relatively high explanatory power over the dependent variables. The influence of the independent variables (ENT, PC, IDQ, IN) on the dependent variable (F) is significant, and the impact of the independent variable (F) on the dependent variables (AAC, WTS) is also significant, supporting the hypotheses. However, the influence of the independent variables (INF, AD) on the dependent variable (F) is not significant, meaning those hypotheses are not supported.

5.5. Hypothesis Testing

From the path analysis, we can deduce that there are effective paths from the independent variables (ENT, PC, IDQ, IN) to the mediator variable (F). The significance levels of each path are below 0.05. This suggests that within the user factors of H5 interactive ads, ENT and PC, and design factors of IDQ and IN have a positive correlation with Flow. An effective path exists between the mediator variable (F) and dependent variables (AAC, WTS), with each path having a significance level below 0.001. This indicates that Flow also has a positive correlation with user experience factors such as Ad acceptance and Willingness to share. Results of the hypothesis testing for path coefficients and their significance can be found in Table 2, and the diagram of the path analysis model is illustrated in Figure 2. In conclusion, out of the eight hypotheses presented, six are supported by the data.

Table 2. Results of Hypothesis Testing

Hypothesis	Path coefficient	P value	Result
H1 ENT->F	0.209	P<0.001***	YES
H2 INF->F	0.080	P>0.05	NO
H3 PC->F	0.243	P<0.001***	YES
H4 IDQ->F	0.134	P<0.05*	YES
H5 AD->F	0.045	P>0.05	NO
H6 IN->F	0.281	P<0.001***	YES
H7 F->AAC	0.768	P<0.001***	YES
H8 F->WTS	0.773	P<0.001***	YES

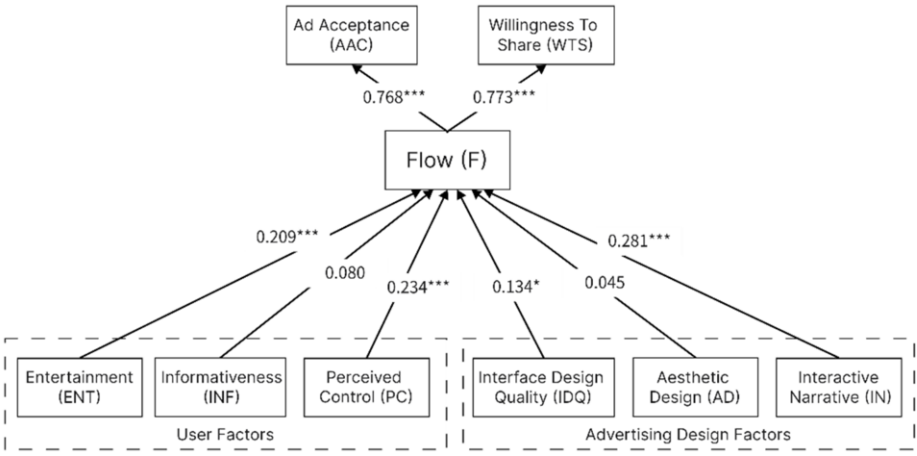

Figure 2. Path analysis model.

6. Discussion

In this study, we utilized the Flow Theory to discuss the factors influencing user experience in H5 interactive advertisements. Through data analysis, we verified our hypotheses, illuminating the relationships between variables. Among the eight hypotheses, H1-H6 aimed to elucidate the relationships between user factors, design

elements, and Flow in H5 interactive ads. All hypotheses, with the exception of H2 and H5, were supported by the data. The most significant influencing factor was Interactive Narrative (β =0.281, p<0.001), followed by Perceived Control (β =0.243, p<0.001), Entertainment (β =0.209, p<0.001), and Interface Design Quality (β =0.134, p<0.05). Each of these factors positively affected Flow, consistent with the findings of Ducoffe[8], Katifori et al.[10], and Shin[14].

However, H2's hypothesis regarding the impact of Informativeness on Flow did not meet expectations, contrasting with Ducoffe's[8] conclusions. This discrepancy might be attributed to the greater emphasis on entertainment and interactivity in H5 ads, which possibly overshadowed the visibility or quantity of product or service information. For example, popular forms of H5 interactive ads, such as video, game-based, composite, data-driven, and tech-focused ads, prioritize user engagement over presenting product or service details.

In H5, the effect of Aesthetic Design on Flow also didn't align with expectations, conflicting with the findings of Salen & Zimmerman[17]. Two potential reasons can explain this result. Firstly, the survey might not have adequately differentiated between the measurement items of aesthetic design and those of interface design quality. Secondly, users may prioritize the overall quality of H5 interactive ads over mere aesthetic requirements.

Lastly, H7-H8 highlighted the relationship between Flow and the user experience of H5 interactive ads. The study indicates that Flow (β =0.768, p<0.001) positively impacts User Ad Acceptance, and similarly, Flow (β =0.773, p<0.001) has a positive influence on the User's Willingness to Share. These findings are in line with the research of Koufaris[20] and Novak et al.[21].

7. Conclusion

This research, leveraging the Flow Theory, successfully constructed a specialized framework focused on examining how Flow influences the user experience in H5 interactive advertisements. This innovative framework not only presents a fresh perspective on the application of Flow Theory in advertising research but also serves as a potential reference for other fields of study. Importantly, for the first time, we integrated the PAT Model explicitly categorizing the factors influencing the Flow experience into "User Factors" and "Ad Design Factors." This clear categorization undoubtedly paves a lucid path for future research endeavors. Delving deeper, our understanding of the relationship between Informativeness, Entertainment, and Perceived Control with the Flow experience has been significantly clarified under the "User Factors" section. Meanwhile, in terms of ad design, we affirmed the pivotal roles of Interface Design Quality, Aesthetic Design, and Interactive Narrative in shaping the core of the Flow experience. These profound findings considerably deepen our understanding of the application of the Flow Theory within the advertising domain.

From a practical standpoint, by optimizing these core elements of advertisements, one can not only enhance the user's Flow experience but also amplify the ad's acceptance and intent to share. For advertising platforms and brands, gaining a profound understanding of these Flow-influencing factors and applying them in practice can undoubtedly boost the overall efficacy of advertisements and enhance the return on investment.

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