

The Impact of Interactivity on Users' Acceptance of Online Streaming Video from the Perspective of Flow Theory

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Abstract

With the recent popularity and technological development of online streaming video, interactive digital narrative (IDN hereafter) videos became one of the main formats for users. The current study proposed that the level of interactivity of IDN videos influences users' evaluation of the video. The concept of flow was introduced as a mediating variable between interactivity and the users' evaluation. Further, the type of IDN videos, users' familiarity with IDN videos and trust toward platforms were employed as moderating variables. Data from a survey verified the mediating role of flow, moderating role of users' familiarity and trust toward platforms. the type of IDN videos, users' familiarity with IDN videos and trust toward platforms. We have observed a significant moderating effect of users' trust toward the platform on users' evaluation resulting from flow experience. It is evident that the higher the level of users' trust towards the platform, the less pronounced the impact of flow experience on users' evaluation. Theoretical and managerial implications are discussed.

Keywords: *Interactivity, Flow, Online streaming video*

1. INTRODUCTION

Interactivity is extensively defined and investigated in a variety of settings. Interactivity can be defined as the extent to which users can participate in modifying the format and content of a mediated environment in real time [49]. Interactivity transforms audiences from passive consumers to active producers. With the recent popularity and technological development of online streaming video, interactive digital narrative (IDN) videos became one of the main formats for users [55]. IDN video refers to video with two features: user control over the video and the provision of choices to the user based on feedback [27] [45]. IDN videos provide users with multiple branches by setting multiple storylines and unfold in a nonlinear narrative mode. Secondly, what sets IDN videos apart from traditional forms is their emphasis on user participation, allowing them to trigger and determine story directions independently. Interactive elements of IDN videos include screen interactivity,

Manuscript Received: July. 5. 2024 / Revised: July. 11. 2024 / Accepted: July. 17. 2024

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perspective switching story selection and social features such as bullet screens [30].

Since IDN video provides a great deal of options and information, richness and expressiveness of the material are increased and users are presented with lively experience as a result. In other words, the current study contends that the level of interactivity exhibited by IDN videos will influence users' evaluation of the video. In doing so, the concept of flow is introduced as a mediating variable between interactivity and the users' evaluation. Thus, the current study argues that the level of interactivity of IDN videos will impact the users' flow experience, subsequently influencing users' evaluation.

Further, the type of IDN videos, users' familiarity with IDN videos and trust toward platforms would play moderating roles. This study examines the moderating variables, exploring their impact on users' interactivity, flow experience and its users' evaluation. In sum, the purpose of this study is to determine the flow experience caused by the interactivity of IDN video and its impact on users' evaluation, and verify whether moderating variables are established, which will help further expand the theoretical research on IDN video, and propose targeted strategies for the content production of IDN video.

1.1 Interactivity

An interaction occurs when the behavior of at least two participants is observed to be interdependent and both parties are aware of it [10]. Based on this perspective, "interactivity" has been inherent in mediated communication. However, it should be noted that the interpretation of interactivity varies depending on specific contexts. With the ongoing advancements in media technology, the concept of interactivity is continuously evolving and expanding its connotations and boundaries. The concept "interactivity" can be defined from three perspectives: (1) technology, (2) process and (3) user perception [1] [36]. In sum, the interactivity is a multi-dimensional construct [55]. Interactivity can be categorized into six dimensions: (1) complexity of choice available; (2) effort that users must exert; (3) responsiveness to the user; (4) monitoring of information user; (5) ease of adding information, and (6) facilitation of interpersonal communication [21].

The popularization of the Internet has led to a significant increase in the level of interactivity. As a result, research on interactivity has expanded into various fields [41]. An important line of research is the outcome of interactivity. The positive impact of interactivity on consumer behavior and perception has been reported in the context of online advertising [43]. Interactivity is directly related to engagement and, in turn, influences satisfaction and trust [43]. Similarly, websites with higher interactivity improved user engagement including user perception and behaviour [25]. Applying to IDN videos, with the higher level of interactivity, users concentrate more on the contents, but detachment from the real world, accompanied by a sense of enjoyment. Therefore, higher levels of interactivity in a virtual environment are more likely to induce user immersion and facilitate the pleasurable experience of flow.

1.2 Flow

Through extensive observation and investigation across various domains, when individuals immerse themselves in their work tasks, they tend to lose awareness of their surroundings to a certain extent, disregard the passage of time, and enter a state akin to oblivion [7]. Simultaneously accompanied by an emotional experience reminiscent of fluidity and ease like that of water flow, this ultimately leads to a state of psychological well-being [7]. Flow is an immersive experience elicited when individuals engage in activities that align with their personal abilities [32]. Within this state, individuals become fully absorbed in their actions and derive enjoyment generated by the activity [32]. The two fundamental attributes of flow encompass complete immersion and enjoyment, which is very closely related to features of IDN videos [15]. Various

studies showed that the interactivity is positively correlated with users' flow experience [42]. This line of studies revealed that flow experience can effectively enhance users' responses to platforms [54]. Therefore, it is of significance to examine the influences of IDN videos from the perspective of flow.

1.3 Hypothesis Development

Flow experience in a network environment is a cognitive state contingent upon interactivity among others [22]. Users become engrossed in the process of interactivity, leading to a loss of self-awareness and temporal perception while achieving an enjoyable state of flow [3][32]. Studies have demonstrated that interactivity in online environments fosters emotional responses and enhances user's immersion experiences, thereby suggesting that heightened interactivity may amplify the flow experience [18] [52].

Flow experience is an immersive phenomenon characterized by a sense of pleasure, which directly influences users' responses such as attitude, positive emotions, and exploratory behavior [22][40]. Based on these studies, the current study argues that the influence of interactivity in IDN videos on users' evaluation of IDN videos (attitude) would be mediated by users' flow experience.

H1: The IDN video will trigger users' flow experience, which will lead to positive attitude towards IDN videos.

In addition to interactivity, IDN video comprises another element, narrative. The narrative experience serves as the foundation for users' engagement, leading to a state of flow [2]. IDN video can be categorized into narrative and non-narrative types based on the coherence of their story structure [53]. Narrative types primarily features a well-developed storyline [17]. The inherent narrative structure is more likely to evoke intense emotional experiences in users such as immersion [17]. This immersion may manifest as a desire to achieve a goal or curiosity about the ending of story or even an immersive experience with the story itself. The process of viewing IDN video is an experiential journey that necessitates users' immersion into virtual environment. As the users imagine themselves within a virtual world, they naturally become engrossed in it.

However, IDN video also exhibits non-linear characteristics. These non-narrative IDN videos do not have obvious narrative elements and most of them appear in the form of simple quizzes and questions about daily life and science. These features disrupt the visual continuity which can momentarily disengage the user from immersive experience [53]. Even though users are also able to explore different storylines by revisiting and selecting new options, users view the video from the perspective of God rather than the perspective of the characters in the story. Thus, it is difficult to produce an immersive experience. That is, users are less likely to experience flow experiences.

Further, in terms of the motivation of interactivity, non-narrative IDN videos primarily rely on exploratory motivation. This kind of IDN videos do not establish clear objectives but instead emphasize the exploration of various interactive operations and the acquisition of new knowledge during the process of exploration [26]. Taking a quiz in IDN video as an example, users are required to make choices based on their existing knowledge and logical reasoning according to the information provided in the video. This necessitates that such IDN videos present appropriate challenge levels so that users can experience immersion to facilitate a flow experience. To sum up, this study believes that the type of IDN video would directly affect users' narrative experience and in turn, moderate the effect of interactivity on the flow experience.

H2: The effect of interactivity on flow experience would be dependent on the type of IDN (narrative vs. non-narrative).

H2a: Flow experience is less likely to occur when users are watching non-narrative IDN videos.

H2b: Flow experience is more likely to occur when users are watching narrative IDN videos.

The current study employs familiarity with IDN video as another important construct, which can influence the effect of types of IDN video. Audiences' use of media may vary based on their prior experiences and knowledge [19]. In the context of internet-based media, various studies demonstrated the effect of prior experience on users' perception of their media usage [48]. Individuals who are familiar with media have demonstrated an increased likelihood of experiencing flow experience because familiarity pertains to users' overall experience with using the technology and their comprehension of the technology [34][35]. In this study familiarity refers specifically to users' prior experience with IDN videos, encompassing their proficiency in understanding IDN video formats, contents, interactivity modes, and other related aspects. Familiarity has a positive impact on users' skill levels and enhances their cognitive structure and efficiency in analyzing and comprehending information [31]. Additionally, it fosters users' confidence in their own abilities, thereby generating positive expectations about the usage process that ultimately influence the integrity of the interactivity process [11].

When users have low familiarity, it may take a longer time to explore the correct mode and path of operation, resulting in a certain degree of delay and psychological frustration. This delay can lead to interruptions in the experience process and reduced interactivity, thereby impacting the formation process of flow experience. It was hypothesized that when users watch non-narrative IDN videos, it is difficult to generate flow experience because the integrity of the narrative is interrupted. However, if the user has more viewing experience and is more familiar with the process, the user's prior memory will subconsciously help users follow the viewing process smoothly. Therefore, even when users watch non-narrative IDN video, the possibility of users' flow experience become higher. Based on this, the following hypothesis is constructed.

H3: Users' familiarity with IDN video will influence the interaction effect between the interactivity and the type of IDN video (narrative and non-narrative).

H3a: For users' with the low familiarity, the flow experience when watching narrative IDN video would be reinforced.

H3b: For users with the high familiarity, the effect of type of IDN video on flow experience would disappear.

With the continuous advancement of technology, people are confronted with an increasingly diverse array of media choices. In such a context, trust towards media plays a significant role in shaping people's decisions and their willingness to persist in using a media [50]. Trust is a critical factor influencing users' attitude, especially in the virtual realm of Internet. Trust is defined as "when one party has confidence in an exchange partner's reliability and integrity" [38]. Some argued that it is essential to cultivate users' positive attitude towards the platform by enhancing their trust [28]. This implies that users (trusters) identify with and have faith in the information and services provided by the platform (trusted parties), believing that it shares their values, norms, and principles, which directly impacts users' attitudes and participation behaviors towards the platform. The level of trust influences the user's recognition of the platform, higher engagement with other users, lower perceived risk and low perceived uncertainty, thus leading to increased participation in the platform [47]. Taking social media as an example, users' trust significantly influences their intention to use it and their willingness to engage in word-of-mouth [6][47]. Therefore, trust can be considered a fundamental factor affecting users' attitudes and decisions [16].

Trust can serves as a moderator between variables by strengthening or weakening the relationship [5]. For

example, in the domain of online shopping, high levels of trust towards the platform significantly reduce decision-making time when purchasing products, indicating that high trust increases users' likelihood of developing positive attitude and subsequently leads to purchase intention [5]. Therefore, this study postulates that users' trust towards platform has a moderating role in influencing the relationship between flow experience and users' attitude.

H4: Users' trust towards platform influences the effect of flow experience on users' attitude.

H4a: For users with high trust, the impact of flow experience on attitude will be reinforced.

H4b: For users with low trust, the impact of flow experience on attitude will be attenuated.

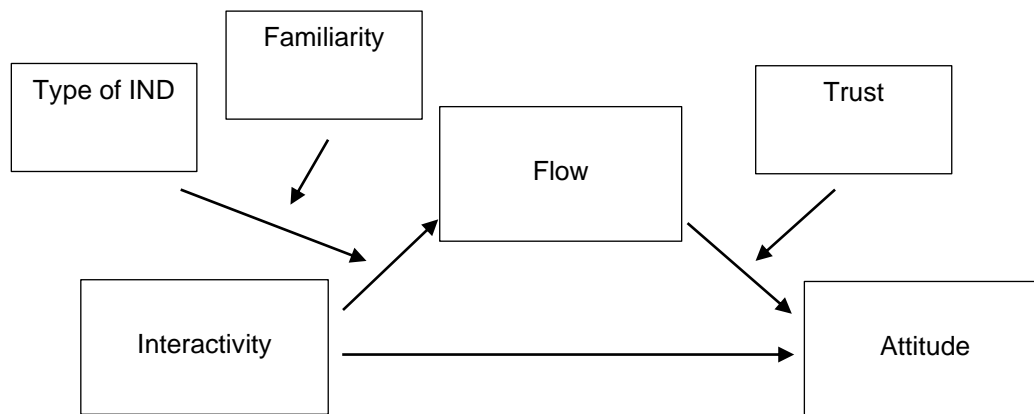


Figure 1. Proposed Model of Study

2. EXPERIMENTS

The purpose of this study is to determine the flow experience caused by the interactivity and its impact on users' attitude, and verify whether moderating roles of familiarity and trust are established. The paper uses online survey to address the hypotheses proposed, aiming to collect relevant data and conduct empirical analysis. Chinese participants were recruited due to the wide dispersion and popularity of IDN videos in China. Especially, the streaming platform, Bilibili is the primary research subject in this study because it is highly representative in terms of quantity and popularity of IDN videos, possessing significant research value. Bilibili has established a strong connection with users through its distinctive and high interactivity. Because of the interactivity, the platform has received significant recognition, leading to the greater popularity compared to other platforms.

Participants were recruited using the professional online survey agency, WJX (www.wjx.cn). Based on the screening item, "Have you ever watched IDN videos on Bilibili?," individuals who have not used IDN videos were excluded. A total of 406 responses were collected. Out of the 406 respondents, 163 were male (40.1%) and 243 were female (59.9%), The age group of 31-35 years constituted the largest proportion at 20.8%.

2.1 Construct Measurement

This research builds upon the measurements of existing research and made adjustments based on the specific characteristics of the current research context. The main variables were as follows: (1) perceived interactivity, (2) types of IDN video, (3) flow experience, (4) users' familiarity with IDN video, (5) users' trust towards the platform, (6) users' attitude towards the IDN video. The measurements were described as below.

Interactivity Eight items were employed [12]. Items were measured on a 7-point scale ranging from 1= Strongly Disagree to 7= Strongly Agree. Items measure the level of interactivity from three aspects: active control, two-way communication, and synchronicity, as follows: (1) I felt that I had a lot of control over my IDN videos viewing experiences, (2) I felt that I can choose freely what I want to see, (3) I think my actions decided the kind of experiences I get when viewing IDN videos, (4) IDN videos provide me an opportunity to give my feedback, (5) IDN videos can create a conversation between the platform and the user, (6) IDN videos give me the opportunity to respond in more than one way (e.g. click through to have detailed information, participate an ongoing campaign), (7) IDN videos can give my response without any delay, and (8) IDN videos can get desired answer fast when I request for further information (Cronbach's Alpha = .88).

Type of IDN video The questionnaire included a single-choice question, "What type of IDN video do you usually watch on Bilibili?" The choices were drama, game, test, daily life and science [53]. The second hypothesis in this study categorized IDN videos into narrative and non-narrative types. Drama and game were coded into narrative, while test, daily life and science were coded into non-narrative type for data analysis.

Flow experience Six items measured users' flow experience with IDN videos based on three dimensions of flow experience: immersion, pleasure, and perceived control [8]. The items were ranked on a 7-point Likert-type scale. Specifically, the six were: (1) In the process of watching IDN videos, I can concentrate fully on the video itself, (2) In the process of watching IDN videos, I often forget the passage of time, (3) In the process of watching IDN videos, I feel that the process is pleasant, (4) In the process of watching IDN videos, I feel that the process is pleasant, (5) In the process of watching IDN videos, I know exactly what I want to do, and (6) In the process of watching IDN videos, I feel everything in my control [22] McMillan, Hwang & Lee, 2003) (Cronbach's Alpha = .94).

Users' familiarity with IDN videos Four items measured users' familiarity with IDN videos which were ranged from 1 = Strongly Disagree to 7= Strongly Agree [24][33]. Participants were asked to describe how much experience they had with IDN videos and how well they mastered the relevant operations using items such as (1) I have acquired the necessary skills to watch IDN videos, (2) I am confident that I have the ability to participate in the viewing and interactivity of IDN videos, (3) As I often watch IDN videos, I have no obstacles when operating IDN videos, and (4) As I am quite familiar with IDN videos, I can maximize the use of videos or platform functions to watch (Cronbach's Alpha = .93).

Users' trust towards the platform Eight 7-point Likert-type items measured users' trust towards the platform. The items asked the participants to answer their cognitive trust and emotional trust towards the platform such as (1) I think the information in this platform is accurate and reliable, (2) I think videos load smoothly on this platform and the platform runs steadily, (3) I think the interface design of this platform is aesthetically appealing and the functions are easy to use, (4) I think the platform provides me with a comprehensive and professional service, (5) I think the platform is good at keeping my personal information safe, (6) I think the functions of this platform are easy to use, (7) I think this platform is more reliable than any other video platforms and (8) I feel comfortable and happy when using this platform. The eight items were combined to form the scale for users' trust towards the platform [56]. Scores were added for data analysis (Cronbach's Alpha = .96).

Users' attitude towards IDN video Four items were combined and modified [4][44]. The items were as follows: (1) I think IDN videos are interesting, (2) IDN videos can bring me emotional experiences that I don't have in reality, (3) I think IDN video is meaningful to me, (4) I am quite satisfied with all aspects of IDN videos. (Cronbach's Alpha = .96).

3. RESULTS

In this study, SPSS was utilized for basic statistics, followed by PROCESS for mediation and moderation analysis. Specifically, H1 was tested as mediation analysis using Model 4. H2 was tested as moderation analysis using Model 1. H3 was tested as moderation analysis using Model 3. H4 was tested as moderation analysis using Model 1. Finally, combining H1, H2, H3 and H4, moderated-moderated mediation analysis was conducted by using Model 25.

Test for mediation of flow experience H1 proposed the mediating role of flow experience between interactivity and users' attitude. The mediating role of flow experience was analyzed using PROCESS, a bootstrapping method with 5,000 resamples (Model 4) [20]. Overall, the mediation analysis was significant ($\beta = .15$, $SE = .03$, 95% $CI = .10$ to $.20$). Specifically, interactivity led to flow experience ($\beta = .48$, $t(404) = 13.54$, $p = .00$); in turn, flow experience also led to users' attitude ($\beta = .32$, $t(403) = 9.67$, $p = .00$). Thus, the mediating role of flow experience received the support.

Test for moderation of type of IDN video H2 proposed the moderating role of the type of IDN video between interactivity and flow experience. The moderating role of the type of IDN video was analyzed using PROCESS, a bootstrapping method with 5,000 resamples (Model 1) [20]. Overall, the moderation analysis was not significant ($\beta = .12$, $SE = .81$, 95% $CI = -.04$ to $.28$). Thus, the moderating role of the type of IDN video was not supported.

Test for moderation of users' familiarity with IDN video H3 proposed moderation of users' familiarity with IDN video on the interaction effect of interactivity and the type of IDN video (three-way interaction). The moderating role of users' familiarity with IDN video was analyzed using PROCESS, a bootstrapping method with 5,000 resamples (Model 3) [20]. Overall, the moderation analysis was not significant ($\beta = -.02$, $SE = .05$, 95% $CI = -.12$ to $.07$). Thus, the moderating role of users' familiarity with the type of IDN video was not supported. This was expected because the moderating role of the type of IDN video (H2) was not supported in the previous analysis.

However, to further examine the moderating role of users' familiarity with IDN video between interactivity and flow experience, an additional analysis was performed using Model 1 (simple moderation) and the result was significant ($\beta = -.15$, $SE = .02$, 95% $CI = -.19$ to $-.10$). Thus, users' familiarity with IDN video significantly influences the relationship between interactivity and flow experience. However, the moderation direction was not expected, meaning that, as the familiarity increases, the flow decreases. This finding is discussed in the conclusion section.

Test for moderation of users' trust towards platform H4 proposed the moderating role of users' trust towards platform between flow experience and users' attitude. The moderating role of users' trust towards platform was analyzed using PROCESS, a bootstrapping method with 5,000 resamples (Model 1) [20]. Overall, the moderation analysis was significant ($\beta = -.12$, $SE = .03$, 95% $CI = -.18$ to $-.08$). This means that the effect of

flow experience on users' attitude is contingent upon the trust. Thus, the moderating role of the users' trust towards platform was supported.

Considering the hypotheses of this study, it was needed to utilize moderated-moderated mediation analysis (Model 25) for testing the proposed model in Figure 1. However, H2 and H3 were not substantiated, confirming a simple moderating effect of users' familiarity with IDN video between interactivity and flow experience. As a result, Model 21 was utilized to assess the overall model. Overall, the moderated-moderated mediation analysis was significant ($\beta = .02$, $SE = .01$, 95% CI = .01 to .03). Specifically, the moderation analysis of users' familiarity with IDN video was significant ($\beta = -.15$, $SE = .03$, 95% CI = -.20 to -.10) and the moderation analysis of users' trust towards platform was significant ($\beta = -.10$, $SE = .03$, 95% CI = -.16 to -.05). Thus, the moderated-moderated mediation model in Figure 2 received the support.

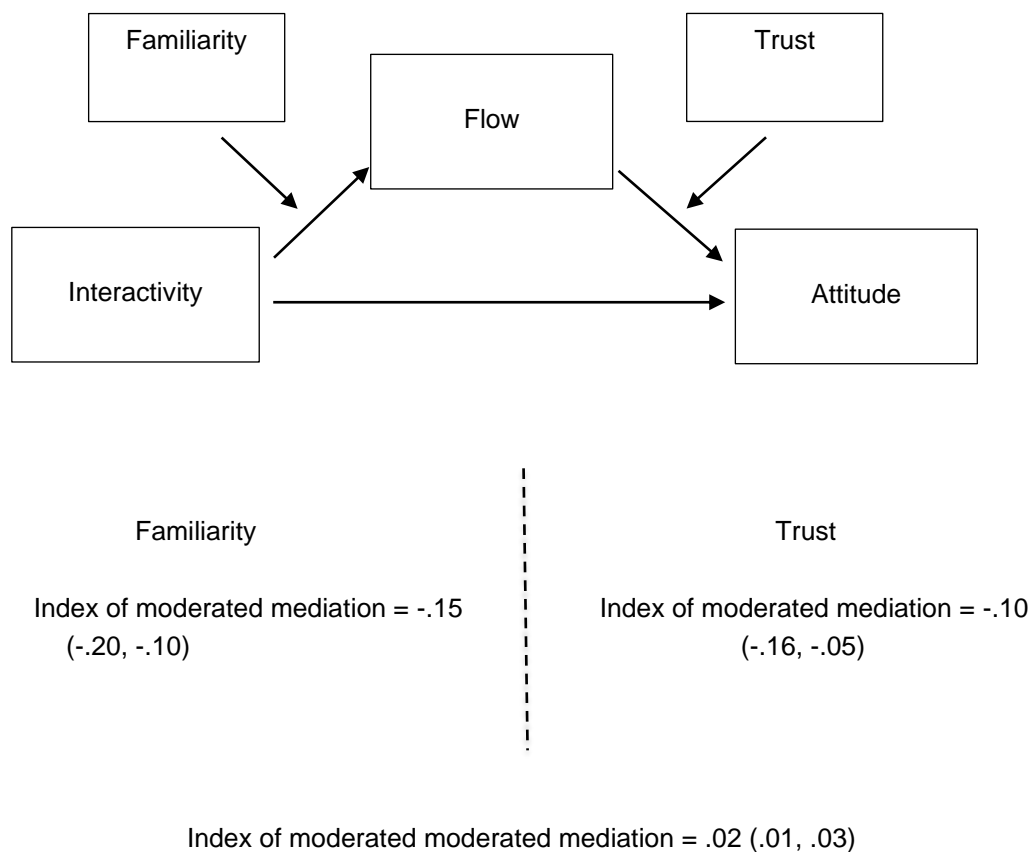


Figure 2. Moderated Moderated Mediation Model based on the Data Analysis

4. DISCUSSION

The current study aimed to enhance the theoretical perspective and scope of IDN video. A review of previous literature reveals that IDN video primarily focuses on its types, characteristics, creation methods, and users' participation. However, limited attention has been given to the process and effect of interactivity from users' perspective. Drawing from the concept of flow, this paper constructs a theoretical model to examine the influence of the interactivity on users' evaluation (attitude) and proposes moderating factors for enhancing users' evaluation through empirical validation.

The interactivity of IDN video positively influences users' attitude through flow experience, serving as a mediating factor. This is consistent with previous studies because previous research had also shown that flow experience plays a positive role in human-computer interaction environments [14][15][23]. In fact, it is not surprising because, in the process of watching IDN videos, users repeat the input-output interaction following the development of the story, which is as easy to generate a sense of flow. It is this flow experience that prompts users to associate the IDN video with positive evaluations [39]. This finding adds to the current research in that flow experience plays a significant role for users' positive evaluation.

The type of IDN video does not appear to moderate the interaction between interactivity and flow experience. This suggests that users' flow experience remains consistent across different types of IDN videos. Users might feel flow nevertheless because IND video provides users with the control, resulting in more immersed with the video. It seems, with the current technology, IDN videos produce a relatively uniform perception of flow experiences for users.

Importantly, this study confirms the impact of users' familiarity with IDN video and their trust towards the platform on the proposed mediation model. The findings indicate a negative correlation between users' familiarity with IDN videos and the occurrence of flow experience due to interactivity. Specifically, higher users' familiarity with IDN video is associated with a reduced likelihood of experiencing flow. This result contrasts with previous studies which suggested that higher familiarity would lead to a more immersive experience and an increased likelihood of flow experience [46]. However, the flow is more likely to occur when users are confronted with activities that present a certain level of challenge [8]. Given that IDN videos only offer interactivity through simple choices and the mode is relatively limited, resulting in the adequate level of challenge for flow experience. Conversely, multiple or repeated viewings may lead to aesthetic fatigue among users due to an imbalance between challenge and skill, making it more difficult for the flow experience to occur [7].

For H4, a significant moderating effect of users' trust between the flow experience and users' evaluation was observed. According to other previous research, trust has been found to have a significant positive impact on the users' evaluation about media usage such as willingness to use SNS or willingness to engage in eWOM [29][51]. However, in this study, it is evident that the higher the level of users' trust towards the platform, the less pronounced the impact of flow experience on users' evaluation. In the domain of IND video, this might mean the users' evaluation would be predominantly influenced by their individuals' trust. When users' trust towards the platform is low, their evaluation is primarily influenced by the flow experience.

5. CONCLUSION

On a practical level, the finding helps practitioners to understand users' acceptance of IND. From the perspective of flow experience, IND platforms can attempt to optimize the level of challenge to foster users' immersive experiences. Platforms might be able to enhance users' flow experience by providing more diverse challenge levels. Currently, there are limitations, matching user capabilities and challenges. Research has indicated that recent digital technology development can contribute to matching a balance between users' familiarity and challenges [9]. In order to achieve the balance, they should increase the functionality incorporating features that reflect users' interests, continuously providing new and challenging IDN videos to promote an immersive experience.

The current study has some limitations that necessitate further research and investigation. This study employed survey as its research method. A survey is based on self-report, that relies on an individual's

perception of his/her experience. In other words, the interactivity of IDN was based on participants' perception, which might be different from the actual level of interactivity. Also, a survey is limited to demonstrate the causal relationship between variables. Even though this paper specifically focused on the effect of interactivity on users' evaluation, the results can not demonstrate causal impact of interactivity.

Further, the participants from Bilibili were recruited as its research subjects, which may restrict its generalizability due to specific characteristics of the platform. The findings of this study may not necessarily apply to IDN videos on other platforms. Therefore, it is hoped to further investigate various types of IDN videos across multiple platforms in the future.

Acknowledgement

'This work was supported by Hankuk University of Foreign Studies Research Fund of 2024.'

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