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The Impact of Gratifications on the Adoption of Immersive Journalism: A Meta-analysis

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ABSTRACT

This paper investigates the role of gratifications in the adoption of immersive journalism and examines how various factors influence audience engagement. This study adhered to the PRISMA guidelines for meta-analysis, analyzing 20 quantitative studies (N = 1,598) retrieved from Web of Science and Scopus between 2017 and 2024. The research quantifies the relationship between uses and gratifications theory and user adoption of immersive journalism, as well as the moderating factors at play. ATLAS.ti 9 facilitated literature screening and coding, while Stata MP 17 computed effect sizes. The findings reveal that gratifications such as emotional involvement, interactivity, and a heightened sense of presence significantly enhance the adoption of immersive journalism. However, these effects are moderate (d = 0.69). The analysis also highlights that audience age, particularly Generation Z, strongly moderates adoption behavior, as younger audiences are more likely to embrace new technology and engage with immersive experiences. However, the complex nature of immersive media poses challenges in information processing, potentially hindering its adoption. This study underscores the need for future research on the evolving role of immersive journalism in media development and its broader implications for communication and storytelling in the digital age.

Keywords: Immersive Journalism, Uses and Gratifications, Adoption Behavior, Generation Z, Meta-analysis.

INTRODUCTION

Immersive journalism allows viewers to experience news events and scenarios from a first-person perspective, enabling them to assume the role of a digital avatar in a virtual recreation of a news article (de La Peña et al., 2010). This approach provides audiences with a more intimate engagement, allowing them to not only observe events but also experience the emotions of the involved parties. Therefore, some media organizations have experimented with immersive journalism by using 3D models to recreate historical events or simulate future scenarios, making the story more interactive.

The news industry worked on immersive journalism projects, experimenting with narrative forms of immersive journalism and releasing numerous immersive journalism products (Nielsen & Sheets, 2021). For instance, 3D models can recreate historical events or simulate future scenarios, allowing audiences to engage with the story in a more immersive way. Moreover, some organizations facilitate interactive storytelling experiences in immersive journalism (Eskiadi & Panagiotou, 2024). These experiments generate dynamic storylines or responses based on user input, allowing audiences to actively shape the narrative and explore different story paths.

However, despite the initial boom in experimentation, immersive journalism faces significant challenges (Herrera Damas & Benítez de Gracia, 2022). Issues such as low VR headset penetration, reliance on technology companies, and limited audience reach have caused some media outlets to lose interest in its production. In this setting, immersive journalism research has become a pressing problem for professionals and academics. To address this, this article merges the uses and gratifications theory to examine the impact of gratifications on

adoption of immersive journalism.

It is evident that the evolution of technology has achieved major shifts in the media landscape (Alzub, 2023). As media development is experiencing a critical era characterized by an emphasis on audience-centered approaches, understanding the motivations is critical for improving the adoption of new technologies. The uses and gratifications theory investigates the psychological and behavioral effects of mass communication on individuals by evaluating their motivations for media consumption. Besides, understanding how gratifications influence immersive journalism adoption is critical for both practitioners and scholars. Therefore, this study addresses the following research questions:

RQ1: How do gratifications influence the adoption of immersive journalism, and what is the extent of this relationship?

RQ2: How does immersive journalism affect the public, and how can these effects inform the future development of immersive storytelling in media?

RQ3: What moderating factors influence the adoption of immersive journalism, and how do these factors shape audience engagement with immersive journalistic content?

The purpose of this paper is twofold. First, it synthesizes existing empirical studies to examine the relationship between UGT and user adoption in immersive journalism. Second, it investigates the potential moderating effects of various factors on this relationship. To achieve these goals, the study employs meta-analysis, a way of quantifying effect sizes based on prior research (Cumming, 2013; Rosenthal & DiMatteo, 2001). Through analyzing published studies and quantifying outcomes using a standardized measure (effect size), this paper aims to uncover the role of gratifications in immersive journalism adoption and pinpoint potential avenues for future investigation.

LITERATURE REVIEW

Immersive Journalism: An Overview

de la Peña et al. (2010) are pioneers in the research of immersive journalism. They define it as the generation of news that allows viewers to experience an event or scenario firsthand. Depending on the technology used, immersive journalism can be classified as 360-degree video news, VR news, or AR news (Mabrook & Singer, 2019).

Because of its capacity to provide engaging experiences in different modalities, scholars have hailed immersive journalism as a revolution (Bujic & Hamari, 2020). A type of deep news emerges because immersive storytelling increases the audience's emotional engagement with current events. The current state of study on the use of immersive technology in journalism is still in its early stages, with a focus on production and user experience (Greber, Aaldering, & Lecheler, 2023). The former comprises investigations into the reasons and motives for employing immersive technology in news production, as well as technological concerns, challenges, content, and ethics. The latter is concerned with different user responses and media consequences, such as news recall, perceived trustworthiness, and cognition. Existing evaluations of immersive journalism focus on: 1) immersion and empathy from a user experience standpoint; 2) audience accuracy, credibility, and emotional attitudes from a media effect standpoint; and 3) the characteristics of production and narrative.

Sundar, Kang, and Oprean (2017), for example, studied the impact of immersive journalism on cognition and psychology. They compared the audience's mental states before and after viewing VR news, 360-degree video news, and traditional text news. Researchers discovered that viewers of VR and 360-degree videos experience a higher sense of presence, interaction, and reality. They also have a stronger desire to spread the news. While establishing a connection between audiences and a news story can increase audience engagement, some academics believe there may be a conflict between users' satisfaction with the experience and their involvement in the story (Oliveira et al., 2023), as viewers may become so engrossed in the story that they miss out on important information.

According to Bujić, Salminen, and Hamari (2023), utilizing virtual reality and 360-degree video to create stories can improve empathy and create a better connection to distant persons or realities. They discovered that VR produces a stronger emotional response than photo/text processing, making viewers more likely to take political or social action after viewing it. Despite increased levels of place hallucinations and enjoyment, Van Damme, All, De Marez, and Van Leuven (2019) conducted an experimental study and found no significant evidence of greater engagement with distant persons in 360-degree movies.

New research on immersive journalism has included some empirical studies on user experience in recent

years. They demonstrate the impact of new media on knowledge recall and comprehension, empathy and emotional reaction, and trust and trustworthiness, providing insight into the effects of media in VR while also presenting numerous new issues. As a result, the most significant unknowns continue to be relevant to audiences' demands and interests (Eskiadi & Panagiotou, 2024).

Uses and Gratifications Theory: Immersive Media

The uses and gratifications theory originated from the study of how media and its content fulfill the social and psychological needs of the audience. Katz, Blumler, and Gurevitch (1973) suggested that these demands would motivate individuals to engage in contact behavior with information sources, with the end consequence being fulfillment of their needs. Audiences were assumed to be picky, motivated by a logical self-awareness of their demands, and expecting specific sorts of media and content to be supplied to them.

According to Isa, Mahmud, and Sulaiman (2020), consumers generally classify media satisfaction into two sorts. The first is satisfaction with media content. People are satisfied with certain knowledge transmitted by the media, which creates enjoyment. The second aspect is the satisfaction derived from media exposure and engagement in media activities. People may become happy from media exposure (rather than specific content) or from experiencing high-tech. The initial features of U&G continue to dominate the study of media gratification to this day, where the concept of an engaged audience has achieved new heights with the Internet and shifted from assumption to reality (Gao, 2023). Y. Kim and Lee (2022) concentrated their research on 360-degree video and used the U&G approach to assess user motives, which included the desire for entertainment information, social consistency, and usefulness. Nielsen and Sheets (2021) participated in a survey to observe how users perceive virtual reality technologies in the news. Participants in the focus groups were exposed to recent immersive journalism works and discussed their reactions within the context of use and gratification. Six categories of satisfaction were identified by the researchers: immersion, transportation, emotion, empathy, information, and control. These satisfactions are separately reflected in studies on immersive media studies or U&G research on traditional and new media. However, it is distinct as a collection of gratifications, particularly associated with IJ.

U&G is regarded as a useful tool for studying the usage and influence of media in the 21st century (Ruggiero, 2000). This perspective focuses on voluntary attitudes that guide people to choose and consume specific media based on their desires and motives, as well as how media may be utilized to satisfy the demands of different users with diverse goals. Furthermore, one study holds that the U & G technique is a solid place to start when determining why consumers use smartphone apps and new media devices such as AR or VR (J. Kim & Lee, 2018). Media consumption is primarily motivated by enjoyment, according to the uses and gratifications theory (Sherry, 2004). As a result, the U&G approach provides a robust theoretical foundation for researching user adoption of immersive journalism.

However, there have been few evaluations on this subject, particularly quantitative meta-analytical reviews. Sanchez-Acedo, Carbonell-Alcocer, Gertrudix, and Rubio-Tamayo (2023) released a thorough literature review of the metaverse and extended realities in immersive journalism. They came to the conclusion that research in this field is still in its exploratory and generalist stages. Moreover, Canet and Pérez-Escolar (2023) conducted a systematic literature review on the effects of immersive media. They provided an overview of immersive media trends and presented a DSSM model. Although these literature reviews are admirable, they have several drawbacks. They did not explain or examine how some research produced inconsistent results in terms of statistical significance, direction, and size of hypothesized connections. We address this gap by reporting the effect size as well as moderating variables. Given the quantity of research that has been undertaken on this topic over the past ten years, it is intriguing that only systematic reviews have been conducted. To our knowledge, no one has utilized meta-analysis to investigate the effects of gratifications on immersive journalism adoption. The current study addresses the limitations and applies the findings to the current state of the literature.

Moderators for Immersive Journalism Adoption Effects

Moderating variables refer to the study characteristics that are associated with the study results. The search for moderating factors includes validating the results of various subgroup analyses. Previous research found that socio-demographic information was the most common moderating variable. Based on this, we consider these variables to be beginning points. The moderating variables utilized in the subgroup analysis are then described as follows:

When it comes to the sample characteristics, ten probabilistic studies used well-educated respondents in this meta-analysis. At the same time, ten non-probabilistic investigations utilized general population participants. We can anticipate cognitive disparities among college students. According to research, younger people are more likely to embrace immersive technology than older users when developing a mental model in an immersive environment (Suh, Wang, Gu, & Wagner, 2018). College students, for example, may be more inclined to experiment with

immersive journalism than others.

In addition, gender is generally regarded as a crucial moderating aspect in immersive settings. According to prior research, women are more likely than men to have negative experiences (e.g., motion sickness) when using head-mounted displays in an immersive environment (Grassini & Laumann, 2020; Grassini, Laumann, & Luzi, 2021). Men are more inclined than women to accept augmented reality technologies (Bartosik-Purgat & Rakowska, 2024).

Another variable is age. Previous research has discovered that age influences audience adoption (Su, 2023; Machfud, Laksmi, & Hong, 2024). Goutier, De Haan, De Bruin, Lecheler, and Kruikemeier (2021) agree that immersive journalism is primarily intended to attract younger people to news consumption.

The sample size is also crucial. The larger the sample size, the more information it contains and the less error occurs. A significant sample size may ensure that the study results are accurate and reliable. As a result, there may be discrepancies in the conclusions drawn from large and small sample studies in the research on audience adoption of immersive journalism.

In summary, although gratification is effective in terms of adoption behavior, the extent to which it influences adoption outcomes has not been thoroughly investigated. This analysis sought to investigate the degree to which gratifications affected attitudes, behavioral intentions, and actual adoption in prior research. Ultimately, our goal is to investigate the potential impact of sample characteristics, sample size, audience gender, and age on adoption behavior.

METHODOLOGY

Meta-analysis was initially proposed by Gene V. Glass in 1976. Glass defined meta-analysis as "the statistical analysis of a large collection of results from individual studies to integrate findings" (Glass, 1976, p. 3). It is a statistical technique for measuring and methodically combining previous research findings. Because of the influence of research objectives, circumstances, and researchers, there will frequently be conflicting conclusions for the same research topic. The meta-analysis method compensates for the shortcomings of a conventional descriptive literature review, which primarily describes but does not comment on. It conducts a quantitative and thorough examination of various studies on the same research issue. One advantage of taking findings from meta-analyses is that they use a larger sample size than individual studies. As a result, they are less likely to be muddled by simple sampling errors (Picchio, 2023). Therefore, Rosenthal and DiMatteo (2001) conclude that meta-analysis performs better than alternative ways of collecting literature.

ATLAS.ti 9 is a powerful qualitative data analysis software that facilitates the organization, coding, and analysis of textual data (Adelowotan, 2021). In the context of this meta-analysis, the ATLAS.ti 9 program was employed as a literature screening and coding tool. This software allows for the efficient extraction and coding of relevant text from multiple research articles, helping to organize key insights related to the adoption of immersive journalism and the gratifications theory. As a result, this process ensures that all pertinent data is reviewed and compared within a coherent framework, providing a deeper understanding of the qualitative dimensions of the meta-analysis.

Stata MP17 is a statistical software package renowned for its advanced data management and analysis capabilities (Mehmetoglu & Jakobsen, 2022). In the context of this meta-analysis, Stata MP17 is instrumental in quantifying the effect sizes and statistical relationships between the variables. The Stata MP 17 software was used to generate statistics such as Cohen's d, an effect size to characterize the impact of gratifications on immersive journalism adoption. Stata MP17 is particularly beneficial for performing meta-analytic procedures such as random-effects models and fixed-effects models, which help to provide a more generalized understanding of the overall effect. Furthermore, Stata's meta-analysis command allows for the assessment of heterogeneity and publication bias, which are crucial for validating the robustness and reliability of the results.

Literature Search

This paper adhered to the guidelines of the PRISMA statement (Sarkis-Onofre, Catalá-López, Aromataris, & Lockwood, 2021) to ensure the process's efficacy and accuracy (as illustrated in **Figure 1**). We chose the range of articles from 2017 to 2024 to ensure their relevance and emergence. Prior to 2017, immersive journalism was still in its nascent stages, with fewer published studies and experiments (Aitamurto et al., 2022). By starting the analysis in 2017, we capture a period when immersive journalism began to gain attention and saw increased experimentation and adoption. By including articles up to 2024, we account for recent developments and advancements in the field, providing a comprehensive overview of the state of immersive journalism research

during the specified period. The years between 2017 and 2024 witnessed rapid advancements in immersive technologies such as VR and AR, as well as increased accessibility and affordability of these technologies (Hazarika & Rahmati, 2023). Analyzing literature from this period allows us to explore how these technological advancements have influenced the practice and impact of immersive journalism. Furthermore, limiting the analysis to recent years ensures that the findings are relevant to the contemporary landscape of journalism and media studies. This is particularly important given the rapid pace of technological innovation and its impact on journalism practices.

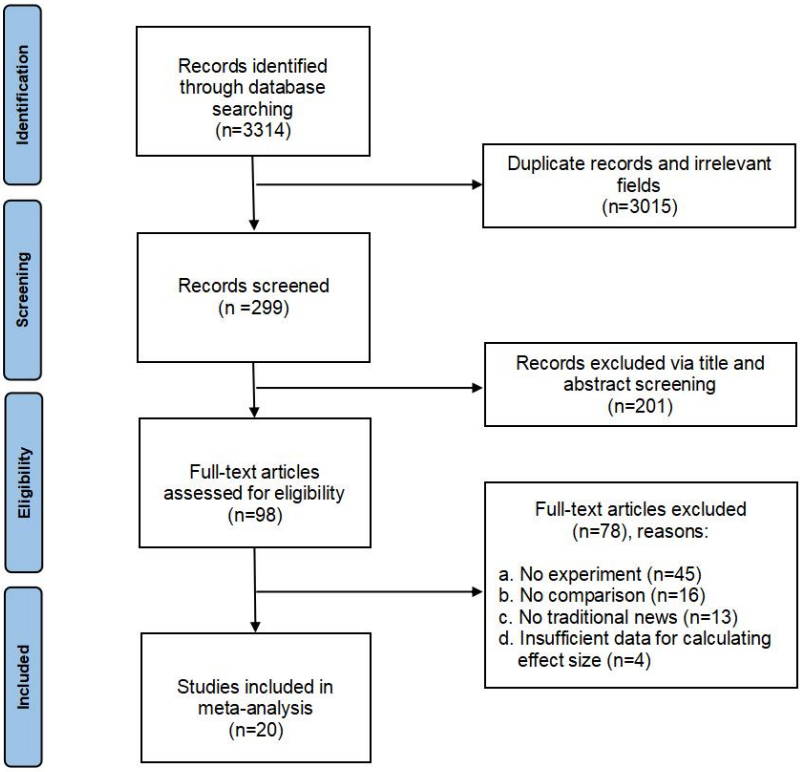

Figure 1. PRISMA Flow Diagram of Study Selection Process (Note: PRISMA=Preferred Reporting Items for Systematic Review and Meta-analyses)

We conducted the literature search using the Web of Science and Scopus databases. Moreover, in order to retrieve English articles published from 2017 to 2024 from the databases, we enter a combination of the following keywords into the search term:

(**immersive journalism**) AND (**experiment**) AND (**uses and gratifications**) AND (**user experience**) OR (**360-degree video**) OR (**AR journalism**) OR (**VR journalism**)

The inclusion and exclusion criteria are then used to narrow down the results.

1. The research topic is related to the audience adoption of immersive journalism.

2. The research is quantitative empirical research, and the method is an experiment.

3. The quantitative study set the experimental group (immersive journalism) and the control group (traditional journalism), or set the pre-test and post-test of each group (the pre-test is the perception of traditional news, and the post-test is the perception of immersive news).

4. Detailed and specific statistical information about experimental data is reported (for example, sample size, mean, standard deviation, or standard error for the experimental and control groups), and the corresponding effect size can be calculated.

5. Exclude study findings that have been republished in various forms.

Table 1 demonstrates the final sample of the current meta-analysis, which contains 20 papers that met all inclusion and exclusion criteria.

Table 1. Overview of Included Studies in Meta-analysis

Author	Year	Sample Size
Pjesivac, Ahn, Briscoe, and Kim	2022	100
Van Damme et al.	2019	74
Wu, Cai, Luo, Liu, and Zhang	2021	87
Fraustino, J. Y. Lee, Lee, and Ahn	2018	81
Bujić et al.	2023	58
Suh et al.	2018	60
Aitamurto et al.	2022	53
Vettehen, Wiltink, Huiskamp, Schaap, and Ketelaar	2019	83
Bujic and Hamari	2020	58
Pérez-Seijo, Vicente, and López-García	2022	104
Barnidge et al.	2022	87
Pimentel, Kalyanaraman, Lee, and Halan	2021	110
Kang, Dove, Ebright, Morales, and Kim	2021	44
Cummings, Tsay-Vogel, Cahill, and Zhang	2022	62
Narciso, Bessa, Melo, Coelho, and Vasconcelos-Raposo	2019	63
Nowak et al.	2020	87
Weber et al.	2022	32
Hernández-Rodríguez and García-Perdomo	2023	29
Sundar et al.	2017	86
Greber	2024	150

Data Coding

In this meta-analysis, the determination of the factors involved a systematic process that aimed to clearly define and categorize the key variables from the included studies. The primary factor under examination was gratification, defined as the increase in audience satisfaction after viewing immersive journalism content, compared to traditional journalism. This factor was operationalized based on the reported measures of satisfaction, engagement, and emotional response in the selected studies. Gratification was consistently measured through various constructs such as enjoyment, sense of presence, attitude, and engagement. However, since these constructs were assessed in different ways across studies, we standardized their interpretation by coding them according to their most common operational definitions. For instance, enjoyment and sense of presence were defined as emotional responses to the immersive experience, while engagement was conceptualized as the degree to which the audience interacted with or immersed themselves in the content.

All variables in each study were coded separately by two coders. For immersive journalism and traditional journalism, variables recorded included author, year, sample size, participants, numbers, mean value, and standard deviation. In six of the 20 investigations, enjoyment and sense of presence were measured the most frequently, followed by a favorable attitude in four, while engagement and satisfaction were only assessed in two studies. Although the tests evaluate the same underlying components, the exact operation of these five constructs varies from one study to another. Two writers coded the moderators separately using a predesigned coding scheme (as shown in **Table 2**). The inter-rater reliability (Cohen's Kappa) ranged from 0.95 to 1.00. We discussed and resolved minor disagreements through consensus.

Table 2. Coding Scheme of Moderate Variables

Moderate Variables	Coding Scheme
Sample size	N_1=1–50; N_2=51–100; N_3=above 100
Sample characteristic	E_1=university students; E_2=adults
Gender	M=male in the majority; F=female in the majority; S=Equal number of male and female
Age	A=mean age below 30; B=mean age above 30

Effect Size Calculation

As a dependent variable to measure the audience's attitude towards immersive journalism, gratification was defined as the increase in satisfaction between the beginning and end of the intervention by watching immersive journalism. This improvement was evaluated using Cohen's d effect size for quantitative studies. Researchers define effect size as a quantitative reflection of the size of a phenomenon used to address the benefit problem (Plonsky & Oswald, 2014). Effect sizes are frequently used to quantify the effectiveness of an intervention,

including the level of audience gratification with immersive technology in journalism. In our analysis, the reported effect size was the average difference between the control group (traditional news) and the experimental group (immersive news). This study calculated Cohen's d between the two groups for each experimental comparison of immersive and traditional news, as follows:

$$d = \frac{\bar{M}_I - \bar{M}_T}{SD_{pooled}}$$

The terms $\bar{M}_I$ and $\bar{M}_T$ represent the average rating for the gratifications of immersive and traditional journalism, respectively. Cohen's d is calculated this way for both within-subject and between-subject studies, as long as the relevant mean and standard deviation are reported in the paper or estimated from the graph. A positive d value implies that audiences prefer immersive journalism over traditional journalism. A negative d indicates that audiences prefer traditional news. The researchers determined the effect size of the meta-analysis by averaging and weighting the d values of the preexisting studies. We adopted the effect size criteria proposed by Cohen (2013), which include a small effect (d = 0.2), a medium effect (d = 0.5), and a large effect (d = 0.8).

RESULTS

Heterogeneity Test

According to the statistical principle of meta-analysis, only homogenous data can be combined. As a result, the heterogeneity of numerous research outcomes is required to be tested. The purpose of the heterogeneity test is to check whether there is heterogeneity among different effect sizes. If there is heterogeneity in the effect sizes, the main effect analysis should use the random effects model; otherwise, the fixed effects model should be employed (Borenstein et al., 2009).

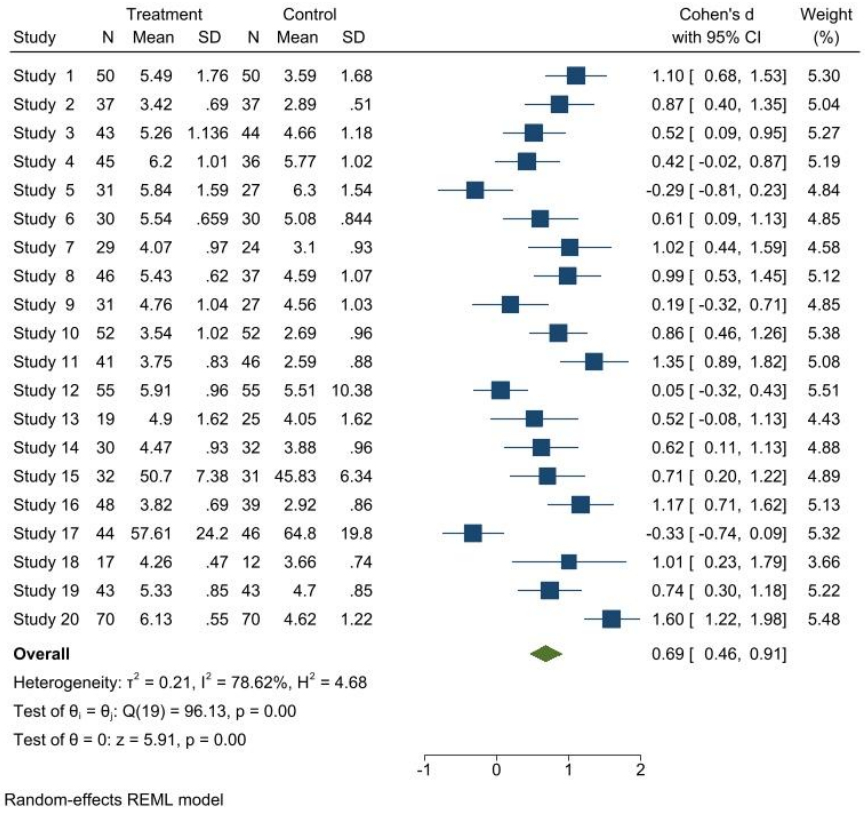

Figure 2. Forest Plot of the Effect Sizes (Cohen's d) for Studies Measuring the Gratifications Comparison between Immersive Journalism and Traditional Journalism

In this paper, the studies included in the meta-analysis differ regarding research methods, objects, contexts, and so on. As a result, the difference in effect size is caused by more than just sampling error. We used random

effects models to validate the heterogeneity tests Q and I^2. Cochran (1954) proposed the Q statistic to represent the degree of heterogeneity between studies. According to the criterion proposed by Hedges and Vevea (1998), when the Q statistic is significant, the random effects model should be utilized. Considering the significance of the Q statistic, we employed the random effects model in this meta-analysis.

However, the Q statistic does not indicate the degree of heterogeneity but rather reports its statistical significance. Higgins and Thompson (2002) suggested the I^2 index to address this Q-test limitation. **Figure 2** shows that I^2= 78.62%, showing high heterogeneity. The values in **Figure 2** above support the assumptions of the random effects model.

Publication Bias Test

Bias, also known as systematic error, is the difference between the results of a study and the actual value (Goulet & Smith, 2013). Reporting bias is pervasive in the field of social science research. We can lessen the effect on meta-analysis findings by precisely measuring the extent of report bias. To detect publication bias caused by the limited sample size, this study used a qualitative funnel plot and a quantitative Egger test. Researchers can determine whether there is bias in the results by visually evaluating the funnel plot. However, relying solely on visual inspection can lead to variations. The Egger test is also appropriate for small-sample studies. If $p < 0.05$, there is bias; if $p > 0.05$, there is no bias (Egger, Smith, Schneider, & Minder, 1997).

Figure 3 shows that the points on the funnel plot are spread out symmetrically; the majority of them are placed in the effective area, indicating that there is no publishing bias. The Egger test results demonstrate that $p = 0.94 > 0.05$, showing no publication bias. Hence, The study obtained a relatively robust total effect value.

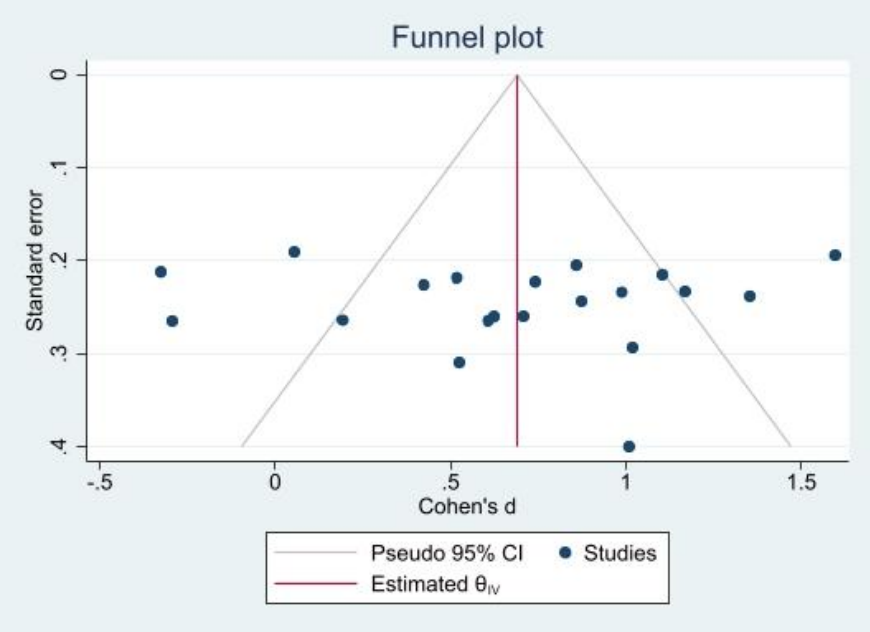

Figure 3. Funnel Plot

Main Effects Test

The random effects model of meta-analysis shows the impact of gratification on adopting immersive journalism in **Table 3**. The overall effect size d = 0.69, which meets the impact on immersive journalism adoption, is positive, with a 95% confidence interval [0.46, 0.91], and the confidence interval does not include 0. The combined effect size reaches statistical significance ($p < 0.05$). It is evident that audience gratification has a medium positive impact on the adoption of immersive journalism (d = 0.69). This result indicates that good user experiences, such as a sense of presence, enjoyment, and engagement, can improve the adoption of immersive journalism to some extent. In other words, immersive journalism is more conducive to audience gratification than traditional journalism.

Table 3. Results of Meta-analysis

Meta-analysis Model	Cohen's d	95% CI		Two-tailed test	
		LL	UL	Z	p
Random effects model	0.69	0.46	0.91	5.91	<0.01

Note: Cohen's d represents the standardized difference between the means of the experimental group (immersive journalism) and the control group (traditional journalism). 95% Confidence Interval (CI) indicates the lower limit (LL) and upper limit (UL) of the confidence interval for the Cohen's d value. Z-statistic was used to test the significance of the effect size. P-value for the two-tailed test, indicating the statistical significance of the effect.

Moderate Effects Test

The capacity to incorporate previous data and undertake moderating analysis in a single context is one of the primary benefits of meta-analysis. If the heterogeneity test is statistically significant, then a moderator analysis is warranted to identify the source of this variation. To assess whether the differences between the observed effect sizes were due to the moderators, a subgroup analysis was performed to examine the effects of gratification on the adoption of immersive journalism. This is also the third question this study needs to answer: What variables moderate the audience's adoption of immersive journalism? As indicated in **Table 4**, subgroup analysis examined the influence and differences in gratification on the adoption of immersive journalism under the influence of four different moderating variables: sample size, sample characteristics, gender, and age.

Table 4. Results of Moderating Effect Test (Subgroup Analysis)

Moderating variables	k	Cohen's d	95% CI	Q_b	df	p
Sample size						
N_1(1–50)	2	0.35	-0.43(LL)—1.13(UL)	0.92	2	0.63
N_2(51–100)	17	0.72	0.50(LL)—0.94(UL)			
N_3(Above 100)	3	0.84	-0.04(LL)—1.71(UL)			
Sample characteristics						
E_1 (University Students)	10	0.79	0.48(LL)—1.10(UL)	0.78	1	0.38
E_2 (Adults)	10	0.58	0.24(LL)—0.92(UL)			
Gender						
M (Male Majority)	15	0.72	0.47(LL)—0.97(UL)	1.17	2	0.56
F (Female Majority)	3	0.30	-0.45(LL)—1.04(UL)			
S (Equal Gender Distribution)	1	0.61	0.09(LL)—1.13(UL)			
Age						
A (Mean Age < 30)	13	0.98	0.73(LL)—1.24(UL)	5.20	1	0.02
B (Mean Age ≥ 30)	3	0.53	0.23(LL)—0.82(UL)			

Note: K indicates the number of studies in each subgroup. Heterogeneity Test (Q_b) is a test for between-group heterogeneity, indicating the variation in effect sizes across subgroups. Df indicates the degrees of freedom for the heterogeneity test. p-value for the heterogeneity test, indicating the statistical significance of the differences between subgroups.

Audience age (Q_b = 5.20, $p < 0.05$) significantly moderated the relationship between audience gratification and immersive journalism adoption. However, the effect values of gender, sample characteristics, and sample size were not significant ($p > 0.05$). The results of the moderating effect test reveal that the impact of audience gratification on immersive journalism adoption varies in accordance with the audience's age. The effect of immersive journalism adoption among audiences under 30 years old is significantly greater than that of those over 30. Furthermore, gender, sample characteristics, and sample size had no significant moderating effect on the adoption of immersive journalism. In other words, the outcomes of earlier studies with diverse gender groups, sample characteristics, and sample sizes were similar.

DISCUSSION AND CONCLUSION

This meta-analysis extracted data from 20 different studies to assess audience gratification when watching immersive and traditional news. The paper derives three important conclusions from these findings.

First, to answer how gratifications influence the adoption of immersive journalism. The results indicate that when audiences experience a sense of satisfaction or fulfillment from engaging with immersive journalistic

content, their likelihood of adopting this form of media increases. Gratifications such as emotional involvement, interactive participation, and a deeper sense of presence are key factors driving this adoption. The moderate effect size reflects a meaningful but not overwhelming influence, suggesting that while gratifications play an important role, other factors may also contribute to the overall adoption process. By altering the scene perspective, the spectator can not only obtain spatial autonomy but also break free from the shackles of linear narrative structure, resulting in arbitrary time. The audience's engagement is increased during this all-sensory immersion condition. In this regard, the feeling of enjoyment drives user motivation to watch immersive news, resulting in adoption behavior. The audience's perception of media forms may contribute to immersive news experiences. According to Van Damme et al. (2019), high system immersion boosted the satisfaction of watching videos. Furthermore, the presence of immersive journalism is pleasurable, allowing audiences to wander around, choose their own path and pace, and study certain visual parts of the story. The majority of immersive journalism includes disaster scenarios (Sánchez Laws, 2020). To evoke the impression of being at the scene, the audience has been referred to as presence. It is a critical approach for convincing users that what happens in the mediated world is just as true as what happens in the real world. Despite experiencing pain or pity while watching, the viewer is supposed to gain gratification. Gratification may emerge from the need to quench interior wants instead of the motivation to seek pleasure (Tamborini, Bowman, Eden, Grizzard, & Organ, 2010) or from appreciating a meaningful portrayal of the human condition (Oliver & Raney, 2011).

Second, to answer how immersive journalism influences the general public. Immersive journalism has the potential to significantly affect the public by creating a more engaging, participatory, and emotionally impactful experience of news. This form of journalism allows individuals to experience events from a first-person perspective, which can lead to stronger emotional connections with the content and a greater sense of empathy for the subjects of the story. If technology is not neutral, it might be regarded as a manifested symbolic form of a specific worldview (Heyndels, 2023). It is critical to investigate how technology is accepted and adopted in areas outside of its original domain. The increased use of immersive technology in journalism poses an intriguing professional challenge, not just in terms of its incorporation as a tool for news reporting but also in terms of its adaptation to journalistic language and ethics. Although initially appealing, the phenomenon of audience immersion preceding a momentous event has the risk of compromising objectivity. It is vital to remember that the primary goal of news reporting is to accurately depict the world (Van Dijk, 2013). As a result, there is no doubt that the general public will be concerned about the impact of this technology on their lives, news, and society. The results indicate that immersive journalism holds promise for enhancing audience engagement, which can be leveraged to inform the development of more interactive and emotionally resonant storytelling techniques in the future. Media developers should focus on creating content that maximizes these gratifications, particularly through emotional engagement and interactivity, to increase adoption and foster deeper audience connections.

Third, to answer what factors moderate the adoption of immersive journalism. According to the subgroup analysis, the link between gratifications and immersive journalism adoption is strongly moderated by audience age. These young audiences are Generation Z, people born after 1995 who are digital natives and quick decision-makers (Ajmain, 2020). As the first generation born in an internet-connected world, there is no doubt that they live and breathe technology. Technology is viewed as a useful tool by Generation Z (Szymkowiak, Melović, Dabić, Jeganathan, & Kundi, 2021). Experts emphasize that Generation Z can make a difference in both the physical and virtual worlds because they regard these two worlds as complementary and can readily transition between them (Hernandez-de-Menendez, Escobar Díaz, & Morales-Menendez, 2020). As a result of this condition, Gen Z can access and evaluate the information they require, as well as communicate knowledge with others quickly. Because they use numerous communication devices or social media, their communication is continuous. Generation Z not only consumes but also generates and controls Internet content. This article explains two reasons why Generation Z is embracing immersive journalism: 1) a curiosity about new technology and 2) a desire to temporarily escape the reality they encounter.

More than half of the respondents in the literature felt cognitively overwhelmed while watching immersive news, indicating that their information processing is hampered by the complex media environment. This suggests that the complex media environment is one of the causes of immersive journalism's medium effect value. Although these findings merely cover a short time span (2017–2024), we believe that further empirical research on the varied implications of immersive journalism will be conducted in the future. In addition to developing new concepts and theories for immersive journalism research, we must employ many current communication concepts and theories to describe and predict the rapid changes in artificial intelligence. Because immersive journalism offers exciting possibilities for pushing the boundaries of storytelling and audience engagement. By harnessing the power of technology, journalists can create more compelling and personalized narratives.

In conclusion, this meta-analysis highlights the significant role of audience gratifications—such as emotional involvement, interactivity, and presence—in the adoption of immersive journalism. It demonstrates that

immersive journalism has the potential to enhance public engagement by fostering stronger emotional connections and empathy. However, the study also identifies important moderating factors, particularly age, with younger audiences like Generation Z showing a greater propensity to adopt this form of media. These findings underscore the need for media developers to focus on creating emotionally resonant and interactive content, while also addressing ethical considerations in the use of immersive technologies. Overall, immersive journalism offers exciting opportunities for the future of storytelling, though further research is needed to explore its long-term impacts and potential integration with emerging technologies.

LIMITATIONS AND FUTURE DIRECTIONS

It is important to note that this meta-analysis also has significant limitations. To begin with, publication in English is one of the inclusion criteria. The underrepresentation of studies from countries where English language publications are not standardized can result in conclusions that are most applicable to English-speaking countries. In contrast, other countries may have more limited generalizations. Although we made every attempt to find all articles connected to our topic, it is likely that we missed some pertinent papers. Second, due to the small sample size of our study, we only tested a few moderating variables. Therefore, future meta-analysis reviews should broaden the variety of mediators and moderators to provide sufficient data to explain the underlying mechanisms of immersive journalism adoption as the number of empirical investigations grows. Third, it is imperative to acknowledge and address the inherent limitations associated with the articles chosen as a sample. Each individual study brings its own biases and methodological nuances, which are subsequently transferred and potentially magnified in the meta-analysis.

More research is required to fully investigate how the diffusion of technological innovation affects the adoption processes of immersive journalism. As a result, we advocate for deeper research into the diffusion of innovation in immersive journalism. Future research can investigate the specific characteristics of immersive technologies. To further investigate the problem, researchers are suggested to undertake a population study on different stages of innovation spread. The conclusions of this meta-analysis provide merely a snapshot of the current status of immersive journalism while audience perceptions may change over time. Therefore, we urge researchers and practitioners to continue exploring the evolution of immersive journalism. Only in this manner can we provide a better user experience to the audience.

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