

A Modelling Study on Visitor Usage Intentions with AR-Based Content for Sports Venues

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Abstract

This study examined the development of users' behavioural intentions to visit sports venues when using AR-based content using the stimulus-organism-response model. The study centred on individuals who had experienced the AR-based content at Gocheuk Sky Dome. This study presents a structural model that illustrates the connections between three attributes of Augmented Reality (AR)—interactivity, vividness, and novelty (stimulus)—and their influence on the flow experience. This, in turn, affects the intention to depend on AR-based content for visiting a sports venue. A survey was conducted to evaluate the model, targeting young visitors in their 20s and 30s who are knowledgeable about AR technology. The study's findings indicate that novelty had the greatest influence on flow, followed by vividness, while interactivity did not show any significant impact. Flow had a significant impact on all four experiences: education, entertainment, aesthetics, and escapism. The positive impact on the intention to visit AR-based sports venues was observed only in relation to entertainment and education experiences. The role of consumer cultural innovativeness was examined as a moderator in the proposed structure model for visiting AR-based sports venues. These insights offer valuable information for the development of AR-based content in countries with culturally significant tourist destinations for sports enthusiasts. They also guide destination marketers in promoting AR in the tourism industry.

Keywords: Tourism, AR, Sports Tourism, AR Attribute, Flow, Experience, Usage Intention, Customer Cultural Innovativeness, SPSS, AMOS.

1. Introduction

The incorporation of immersive technologies has led to significant changes in tourist consumption and visitor behaviour models, contributing to the growth of the tourism industry (UNWTO RW, 2020). Augmented Reality (AR) is often preferred over Virtual Reality (VR) in the tourism sector, particularly in places like exhibitions, museums, and historical sites (Coates, 2020). VR effectively eliminates the audience's physical environment and replaces it with a digitally mediated reality. However, augmented reality improves the audience's perspective by integrating revised and educational texts and images. In addition, virtual reality requires specific equipment such as HMDs (Head-Mounted Devices), controllers, and gloves. On the other hand, augmented reality experiences can be easily accessed using only a smartphone or tablet. AR has proven to be highly effective in the field of tourism, providing unique experiences and enhancing the educational setting by integrating multiple sensory layers (Chung et al., 2018). AR has become widely popular in a range of fields, including sports (da Silva, Gustavo, & de Medeiros, 2021). AR is anticipated to enhance the overall sporting experiences of individuals.

In addition, it has the potential to transform individuals' recreational pursuits, such as participating in a sporting event (Han, Tom Dieck, & Jung, 2019). The sports industry is considered a lucrative market for AR due to its potential applications in marketing campaigns to promote sports events and venues. In the wake of the COVID-19 pandemic, sports organisations have increasingly adopted AR technologies to provide sport tourists with a more immersive and enhanced sporting experience (Goebert, 2020). Sporting events have long been recognised as a significant platform for providing entertainment and a means of cultural expression. These events have the potential to attract tourists from different regions and bring them together. AR integration in sporting events has the potential to revolutionise the spectator experience (Javani, Ansari, & Abdavi, 2023). In recent decades, there has been a growing interest in integrating AR-based visualisations for sports spectators. "Immersiv.io" and "Nexus Studios" implemented on-site AR visualisations during basketball and soccer games (Lo, 2022). In a similar vein, South Korea has been integrating AR into its tourism industry. As an example, the Seoul Metropolitan Government improves the visitor

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experience at Gyeongbok Palace by digitally recreating royal court rituals. This is accomplished by integrating interactive activities and offering supplementary explanatory notes (Yim & Park, 2019).

Moreover, South Korea has also been making noteworthy efforts to incorporate augmented reality into its sports tourism. During the opening day of the "2019 Korea Baseball Organisation (KBO)" season at SK Happy Dream Park in Incheon, an AR image of a wyvern, a mythical dragon, greeted the spectators as they entered the stadium. The mythical creature provided a captivating performance that heightened the experience for the audience. Furthermore, observers had the option to use their smartphones to witness this augmented reality spectacle (Hwaya, 2019). The sports tourism market in South Korea is flourishing, successfully blending the thrill of sports with the cultural splendour of the country. Due to its rich sports heritage, the country has become a highly sought-after destination for sports enthusiasts (MWR, 2024). Furthermore, the collaboration between the Ministry of Culture, Sports and Tourism in South Korea has resulted in the construction of a smart stadium at Gocheok Sky Dome, home to the Kiwoom Heroes of the Korean Baseball Organisation, as well as the Jeju World Cup Stadium, where the Jeju United Football Club plays.

The Kiwoom Heroes team unveiled a mobile application that utilised augmented reality technology. This innovative app aims to provide a more immersive experience for spectators and facilitate athlete recognition. This mobile app enabled spectators to access athlete-related information, revolutionising their sports viewing experience (Haps Staff, 2023). In addition, the country has allocated a higher budget for culture, sports, and tourism in 2024, amounting to 6.9796 trillion KRW. This represents a 3.5% increase compared to the previous year. This suggests the country's commitment to promoting sports tourism in the region (K-ArtNow.Com, 2023). Therefore, South Korea is a suitable country to analyse the effects of AR technology content on tourists' intentions to visit an AR-based stadium or sports event.

Although AR has the potential to engage a wide range of people and enhance their participation in tourism, there is a dearth of comprehensive studies examining the direct impact of AR on tourist behaviour (Yung & Khoo-Lattimore, 2019). This technology in the tourism industry aims to integrate information by overlaying it onto relevant physical entities. AR can provide tourists with diverse and interactive experiences, fundamentally transforming their engagement with the environment. It smoothly incorporates with location-based settings such as

museums, exhibitions, and historical sites (Han, Yoon, & Kwon, 2021). AR combines digital and analogue components, merging aspects of reality and imagination. AR has been extensively studied for its potential impact on the tourism industry, covering a wide range of areas. Firstly, it leads to economic advantages, such as lowering marketing expenses, improving operational efficiency in tourism agencies, and being less affected by seasonal fluctuations (Cranmer, tom Dieck, & Fountoulaki, 2020). In addition, it enhances the aesthetic appeal of tourism destinations (Marto et al., 2020), thus influencing travellers' perceptions of their physical surroundings and improving the overall tourist experience. In addition, it offers a captivating tourist experience that combines entertainment and education, making it a key factor in attracting visitors (Cranmer et al., 2020; Cranmer, tom Dieck, & Jung, 2018). Therefore, it is necessary to conduct a study to investigate the impact of AR technology on tourists' intentions to visit an AR-based sports site.

This study was conducted with three specific objectives. At first, AR was effectively used in indoor tourist sites such as museums, galleries, and exhibitions. However, there is a lack of research on the impact of AR on outdoor tourism, leaving a gap in our understanding. The main objective of this study is to examine the impact of AR-based content on the intention to visit outdoor sports sites, such as stadiums and arenas. Additionally, previous studies have explored the relationship between AR attributes and user behaviour, as well as the impact of the overall AR experience on user behaviour (Han et al., 2021). This study aims to thoroughly examine the process through which a tourist's intention to visit AR-based sports stadiums and events is formed, to make a valuable contribution to the existing literature on AR in tourism.

Additionally, a visitor's level of interest in AR technology may influence their desire to explore a destination, particularly if they opt to visit AR-based sports venues. The objective of this study is to analyse how user innovativeness influences their intention to visit sports stadiums that utilise augmented reality technology. This study holds great importance due to its exclusive emphasis on sports venues. Prior research has predominantly concentrated on cultural heritage sites and museums when examining the utilisation of AR applications in the context of tourism (Grammatikopoulou & Grammalidis, 2023; Karagianni, 2023; Koo et al., 2019; Singh, Sharma, & Daim, 2024). Nevertheless, there is a notable lack of research dedicated to exploring the impact of AR applications on the promotion of sports tourism. This highlights the importance of the current study.

2. Literature Review

2.1. Theoretical Framework

This study utilises the S-O-R model, which includes the components of Stimulus, Organism, and Response (Belk, 1975; Jacoby, 2002). This model examines the cognitive, affective, and psychological processes that influence consumer decision-making, specifically in relation to stimuli like products, brands, advertisements, and websites. This study utilises the S-O-R model to examine the process by which a visitor's intention is formed to visit AR-based sports venues. The study seeks to examine the impact of AR content attributes (S) on tourists' intention (R) to visit sports venues in the future, based on their experiences (O). This study further investigated the influence of innovativeness on the emerging technology of augmented reality (AR) using cross-group analysis. Consumers follow a decision-making process when buying products or services, as well as when choosing brands or stores, after being influenced by various factors.

The decision-making process is influenced by two main categories of factors: personal and environmental (Engel, Blackwell, & Miniard, 1995). AR-based tourism behaviours can be influenced by personal factors, specifically "innovativeness" (Terblanche & Olivier, 2018). Consumer innovativeness has been defined in different ways, such as functional, hedonic, social, and cognitive innovativeness (Vandecasteele & Geuens, 2010). Other definitions include intrinsic innovativeness, domain-specific innovativeness, and innovative behaviour (Kaushik & Rahman, 2014). The study focused on examining the impact of "cultural innovativeness" on the proposed structure that outlines the process of visitors' intention to visit AR-based sports venues. Visitors were categorised into two distinct groups based on their varying levels of cultural innovativeness.

2.2. Flow

The study aimed to investigate the correlation between flow and consumer behavior. In their study, Ekdale et al. (2015) categorised innovations into three types: technical, relational, and cultural. Cultural innovation specifically refers to changes in thinking methods and attitudes towards products or consumption that are driven by the needs of target consumers (Ekdale et al., 2015; McLean & Wilson, 2019). Prior studies have examined the impact of flow on the AR experience. For instance, Barhorst et al. conducted a study that revealed how the three attributes of AR contribute to the state of flow. This, in turn, has a positive effect on customer satisfaction, as it enhances the usefulness of information, facilitates learning, and

increases enjoyment of the AR app (Barhorst et al., 2021). Flow is a state of mind that leads to higher consumer satisfaction (Lee, Ha, & Johnson, 2019). A study found that the interactivity of the tourism experience has a positive impact on consumer flow (Liu, Zhang, & Chen, 2022).

A recent study has highlighted the importance of interactivity in enhancing the flow experience of tourists (Ye, Zheng, & Li, 2022). Furthermore, the impact of vividness on tourist behaviour has been widely recognised (Zheng, Wu, & Liao, 2023). A study found that the level of interactivity and vividness in virtual reality had a notable and positive effect on the flow experience of sports tourists (Kim & Ko, 2019). Furthermore, the impact of novelty on the flow experience of tourists has been recognised as significant and positive (deMatos, Duarte, & Sá, 2023).

Therefore, the following hypotheses are proposed:

H1: Interactivity in AR has a positive effect on tourist flow.

H2: Vividness of AR has a positive effect on tourists' flow.

H3: The novelty of AR has a positive effect on tourist flow.

2.3. Experience

Pine and Gilmore introduced the concept of the Experience Economy to analyse different types of experiences, which can be classified into four realms: education, aesthetics, escapism, and entertainment (Pine & Gilmore, 1998). The different realms, referred to as the 4E constructs of the experience economy, can be distinguished by the level of user involvement and the nature of the action or environment. Engaging in an immersive environment fosters a valuable educational experience, whereas participating in an absorptive environment tends to encourage escapism.

An aesthetic experience occurs when the customer is fully engaged in an activity or environment that has minimal impact on their overall experience. Within a receptive and immersive setting, it becomes an engaging form of entertainment. The Interactive Media Effects model, as presented by Sundar et al., examines how the characteristics of the communication medium influence consumer engagement and interactions. These interactions can result in emotional, cognitive, and behavioural responses, which are observed through the concept of flow (Sundar, 2015). Research has shown that the flow experience has a notable influence on the augmented reality (AR) experiences of consumers (Barhorst et al., 2021). The study found that flow positively influenced consumers' perception of information usefulness, learning, and enjoyment, thereby enhancing their augmented reality experiences.

Therefore, the following hypotheses are proposed:

H4: Tourists' flow has a positive effect on the educational experience in AR.

H5: Tourists' flow has a positive impact on the entertainment experience in AR.

H6: Tourists' flow has a positive effect on the aesthetic experience in AR.

H7: Tourists' flow has a positive effect on the escapist experience in AR.

2.4. Usage Intention

The concept of usage intention pertains to the inclination to strategize and execute future actions, or the probability that this inclination will result in the acquisition of products or services (Engel & Blackwell, 1982). The Technology Acceptance Model (TAM) proposes that usage intention serves as an indicator of the extent to which a user is inclined to embrace a novel technology or system. Thus, the researchers have selected 'usage intention' as the dependent variable to better understand the AR experience. In a study conducted by J. Park and J. Yoon, the researchers examined user satisfaction with the AR mobile app for Changgyeonggung Royal Palace in South Korea. The results of the study indicated that factors such as education, aesthetics, entertainment, and escapism had a positive impact on user satisfaction and usage intentions (Park & Ji-Hwan, 2019).

A study conducted by E. Kim found that immersive cosmetics experiences through an AR mobile app resulted in greater consumer satisfaction and a higher likelihood of purchasing the products (Kim, 2020). Sung emphasised that advertising through AR mobile apps had a positive impact on user satisfaction, intention to purchase, and shared social experiences when compared to traditional marketing (Sung, 2021). A study conducted by Cranmer et al. (2020) examined the satisfaction levels of young tourists attending an AR science festival, considering the perspectives of the experience economy. The study revealed that aesthetics strongly influenced the educational, entertainment, and escapism aspects of the AR experience (Jung & Rauschnabel, 2018). Therefore, the following hypotheses are proposed:

H8: Educational experience in AR has a positive effect on usage intentions (regarding AR-based sports venues).

H9: Entertainment experience in AR has a positive effect

on usage intentions (regarding AR-based sports venues).

H10: Aesthetic experience in AR has a positive effect on usage intentions (regarding AR-based sports venues).

H11: Escapist experience in AR has a positive effect on usage intentions (regarding AR-based sports venues).

2.5. Consumer Cultural Innovativeness

Innovativeness is characterised as the "willingness of an individual to try out any new information technology" (Zarpou et al., 2012). As per Roger's Diffusion of Innovations theory, individuals who are early adopters actively pursue additional information regarding new ideas and technology. They also adeptly address any challenges that may arise during the acquisition of knowledge about new technology (Rogers, 1995). Past studies have consistently found a connection between innovativeness and consumer behaviours, specifically in relation to the adoption of new technologies (Holt & Cameron, 2010; Ravasi, Rindova, & Dalpiaz, 2012). Therefore, innovativeness plays a vital role in influencing the adoption of AR-based services in the field of sports tourism. Further definitions and sub-categories have been established for innovativeness.

In their study, Song et al. provided a definition of consumer cultural innovativeness as the extent to which consumers' thoughts and attitudes change when accepting new things. They also found that consumer cultural innovativeness can be used to predict consumer behaviour in the mobile environment (Song, Yoo, & Kim, 2020). Therefore, it is logical to suggest that consumer cultural innovativeness could potentially influence the key components of the research model illustrated in Figure 1. Therefore, the following hypotheses are posited:

H12: Consumer cultural innovativeness moderates the effect of AR attributes toward Flow.

H13: Consumer cultural innovativeness moderates the effect of Flow toward Experience.

H14: Consumer cultural innovativeness moderates the effect of Experience on Usage Intention.

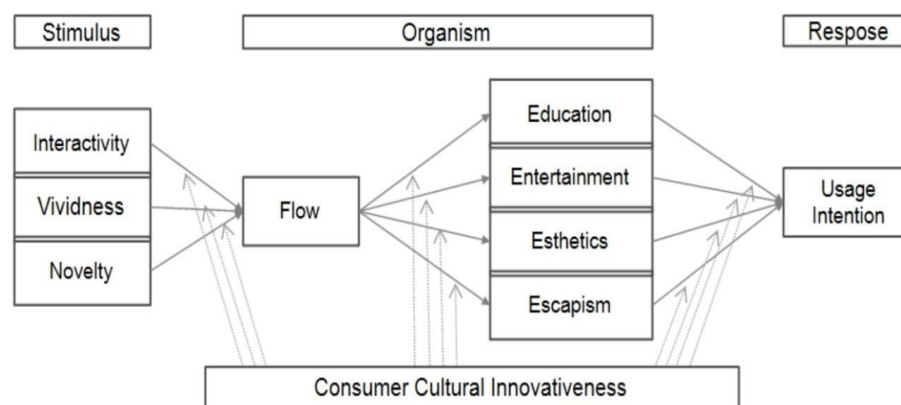


Figure 1: Proposed S-O-R Research Model, Including Important Parameters.

3. Methodology

The study centred around the Gocheck Sky Dome and aimed to analyse the effect of AR-based marketing content on tourists' inclination to visit the stadium and partake in various sporting events. The AR virtual tour offers an immersive experience, allowing visitors to get a glimpse of the sights and sounds and enhancing the spectator experience within the stadiums. The study utilised a quantitative approach to analyse the effects of AR technology on tourists' intentions to visit sports venues.

3.1. Data Collection and Respondents' Characteristics

Participants were given video and print materials that explained AR technology and its application in sports venues. They were then asked to complete a survey. The survey was conducted with 291 young visitors in their 20s and 30s who confirmed their awareness and knowledge of AR in order to maintain

accuracy and reliability. The demographic characteristics of the respondents are provided in Table 1, while additional details about the questionnaire can be found in Table 2. The participants were well-acquainted with the Kiwoom Heroes' augmented reality (AR) marketing campaign.

3.2. Analysis

The measurement and research model in this study were evaluated using SPSS (v. 27) and AMOS (v. 27) programmes. A frequency analysis was conducted to investigate the overall characteristics of the participants. The survey's validity and reliability were thoroughly examined using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), as well as reliability and correlation analyses. In addition, the study utilised structural equation analysis and performed cluster analysis and multi-group path analysis to enable cross-group comparisons based on innovativeness.

Table 1

Demographic Characteristics of the Respondents.

Demographics		Number	Percent (%)
Gender	Male	141	48.5
	Female	150	51.5
Age	20-29	138	47.4
	30-39	153	52.6
Monthly Income (Krw)	<1million	58	19.9
	1million-3millions	138	47.4
	3millions-5millions	70	24.1
	5millions-7millions	17	5.8
	>7millions	8	2.7
Education	Middle And High School	25	8.6
	University Students	44	15.1
	Bachelor	205	70.4
	Master/Phd	17	5.8

Table 2

Measurement Scales.

Construct	Definition	Measurement Items	Reference
Interactivity	Interaction by users manipulating augmented sensory information in combination with the real environment	I received a tour guide for the location that I like to visit through a virtual character of the AR content.	Barhorst et al. (2021)
		The AR content gave me new knowledge about the stadium.	McLean and Wilson (2019)
		I could engage in various activities with virtual characters in the AR-based content.	McLean and Wilson (2019)
Vividness (VIV)	The degree to which accurate and vivid images are realized in overlay onto the real world	The AR-based content offered a vivid visual display.	Barhorst et al. (2021)
		The AR-based content offered a detailed visual display.	McLean and Wilson (2019)
		The AR-based content offered a clear visual display.	McLean and Wilson (2019)
Novelty (NOV)	The degree to which users feel the combination of the real and virtual new and novel	The AR-based content offered new functions.	Barhorst et al. (2021)
		The AR-based content provided me with a new sense.	McLean and Wilson (2019)
		The AR-based content offered something different.	McLean and Wilson (2019)

Flow (FL)	The state of being interested in and attentive to tour guide applications utilizing AR	I lost track of time when using the AR-based content. I focused on the tour when using the AR-based content. I was absorbed with the tour when using the AR-based content.	Barhorst et al. (2021)
Education (EUD)	The degree of knowledge or ability enhancement through AR experiences	I obtained information on the stadium through the AR-based content. Using the AR-based content made me more knowledgeable.	Park and Ji-Hwan (2019) Sung (2021)
Entertainment (ENT)	The degree to which AR experience provides amusement and joy	I enjoyed the stadium with the AR-based content. I had fun touring the stadium through the AR-based content. It was enjoyable to learn about the stadium through the AR-based content.	Park and Ji-Hwan (2019) Sung (2021)
Esthetics (EST)	Esthetic experience that may be felt via AR	When I used AR-based content at the stadium, I felt a real sense of harmony. When I used AR-based content at the stadium, the overall atmosphere was pleasant.	Park and Ji-Hwan (2019) Sung (2021)
Escapism (ESC)	The degree to which one feels one has forgotten or deviated from reality when using AR	I momentarily forgot about my daily life when using the AR-based content. Experiencing the palace through AR-based content made me feel departed from reality. X made me feel like I was in a different universe.	Park and Ji-Hwan (2019) Sung (2021)
Usage Intention (UI)	Willingness to use tourist sites to which AR has been applied	I intend to visit a AR tourist site again after experiencing the AR-based content. I intend to visit a AR tourist site in the future. I will continue to visit an AR tourist site to enjoy the AR experiences.	McLean and Wilson (2019) Sung (2021)
Customization	The degree to which one prefers that which suits one's individuality or taste	1. Companies should be able to recommend products well-suited to its customers. 2. Companies should be able to provide services customized to its customers. 3. Companies should be able to provide events well-suited to its customers.	Song et al. (2020)
Prosumer	The degree to which participation is sought in a company's creation of a product	1. In order to produce goods and services that I desire, I am willing to provide my personal information. 2. In order to produce goods and services that I desire, I am willing to participate in tests. 3. In to produce goods and services that I desire, I am willing to participate in surveys.	Song et al. (2020)
Innovation	The degree to which one seeks to accept that which is new	1. When I know a new technology, I tend to use it. 2. I like to try new things. 3. I encounter new things more quickly than other people around me.	Song et al. (2020)
Speed	The degree to which quick responses and rewards are expected for an action	1. I want to receive quick responses to my messages. 2. I want quick access to necessary information.	Song et al. (2020)
Multitasking	The degree to which various actions may be performed simultaneously	1. I can communicate with other people through Internet messengers while working. 2. I can work while listening to music and using the Internet at the same time. 3. I can use two or more programs at the same time.	Song et al. (2020)
Graphics	The degree to which visual images are utilized to communicate	1. It is easier to obtain information from visual images than from text. 2. I prefer to sending pictures rather than writing when explaining something. 3. I use pictures or emoticons more often when sending messages.	Song et al. (2020)

4. Results

Structural Model Evaluation

Reliability and Validity Analysis

Prior to evaluating the structural model, the measurement model was assessed in this study. The factor loading values in Table 3 ranged from 0.565 to 0.892, surpassing the

recommended threshold of 0.5. Prior to testing the hypotheses, we ensured the reliability, convergent validity, and discriminant validity of the measures. The reliability of each construct was assessed using Cronbach's α , and all constructs demonstrated a reliability above the 0.7 threshold, as indicated in Table 3. The AVE values exceeded 0.5, while the CR values surpassed 0.7. As a result, the study confirmed the convergent validity.

Table 3

Reliability and Validity Analysis.

Construct Measurement Items		Factor loading	Cronbach's α	AVE	CR
Interactivity	INT1	.797	.734	.676	.860
	INT2	.841			
	INT3	.565			
Vividness	VIV1	.704	.812	.722	.886
	VIV2	.850			
	VIV3	.799			
Novelty	NOV1	.755	.818	.749	.899
	NOV2	.812			
	NOV3	.790			
Flow	FL1	.704	.825	.703	.877
	FL2	.815			
	FL3	.669			
Education	EDU1	.892	.794	.820	.901
	EDU2	.805			
Entertainment	ENT1	.726	.841	.768	.908
	ENT2	.713			
	ENT3	.797			
Esthetics	EST1	.784	.737	.731	.845
	EST2	.795			
Escapism	ESC1	.810	.865	.727	.888
	ESC2	.875			
	ESC3	.807			
Usage intention	UI1	.834	.891	.820	.932
	UI2	.824			
	UI3	.812			

The AVE scores in Table 4 were compared with the squared of all construct correlations to confirm discriminant validity. It

was observed that the AVE scores for each variable were greater than their squared correlation coefficients.

Table 4

Discriminant Validity.

	1	2	3	4	5	6	7	8	9
1.Interactivity	.676a								
2.Vividness	.462b	.722							
3.Novelty	.546	.533	.749						
4.Flow	.213	.370	.324	.703					
5.Education	.651	.350	.491	.165	.820				
6.Entertainment	.292	.425	.555	.517	.383	.768			
7.Esthetics	.236	.356	.482	.453	.218	.503	.731		
8.Escapism	.049	.215	.208	.430	.037	.246	.354	.727	
9.Usage intention	.218	.296	.326	.448	.303	.469	.255	.178	.820

Note: a: AVE, b: Squared correlation

Structural Model Evaluation and Hypotheses Testing

Upon conducting a structural equation analysis, it was determined that the overall model fit was appropriate at $\chi^2=392.944$ $df=247$ $p<.001$ $GFI=.901$ $NFI=.911$ $CFI=.964$ $RMSEA=.045$.

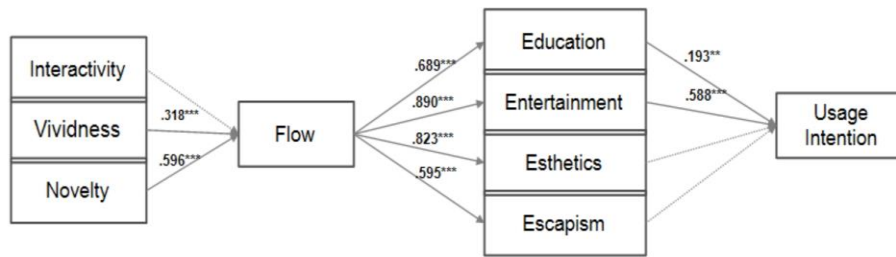


Figure 2: Results of Structural Model (Dash Line is Non-significant Path).

The lack of significance in determining flow was observed in the three AR attributes, as depicted in Figure 2 and Table 5, so H1 was not supported. H2 ($\beta=0.318$; $p<.001$) and H3 ($\beta=0.596$; $p<.001$) which

tested the effect of two AR attributes (vividness and novel) on flow were supported. The results indicated that the novelty effect on flow was the highest ($\beta=0.596$), followed by vividness ($\beta=0.318$).

Table 5

Results of Structural Model.

Hypotheses	Path	$\beta(p)$	S.E.	C.R.	Result
H1	Interactivity → Flow	0.009	.091	.091	Not supported
H2	Vividness → Flow	0.318***	.075	3.335	Supported
H3	Novelty → Flow	0.596***	.118	5.066	Supported
H4	Flow → Education	0.689***	.091	7.228	Supported
H5	Flow → Entertainment	0.890***	.123	8.751	Supported
H6	Flow → Esthetics	0.823***	.110	8.075	Supported
H7	Flow → Escapism	0.595***	.123	6.939	Supported
H8	Education → Usage intention	0.193**	.097	2.731	Supported
H9	Entertainment → Usage intention	0.588***	.114	5.582	Supported
H10	Esthetics → Usage intention	-0.049	.121	-.489	Not supported
H11	Escapism → Usage intention	0.092	.056	1.497	Not supported

Model Fit: $\chi^2=392.944$ $df=247$ $p<.001$ $GFI=0.901$ $NFI=0.911$ $CFI=0.964$ $RMSEA=0.045$

Note: * $p<.05$ ** $p<.01$ *** $p<.001$

There was strong evidence (H4) ($\beta=0.689$; $p<.001$) supporting the beneficial impact of flow on the educational experience. Additionally, flow was found to have a positive effect on the entertainment experience (H5) ($\beta=0.890$; $p<.001$); the positive effect of flow on esthetics experience (H6) ($\beta=0.823$; $p<.001$); the positive effect of flow on escapist experience (H7) ($\beta=0.595$; $p<.001$) were all supported. Entertainment experience ($\beta=0.890$) was affected the most positively, followed by esthetics experience ($\beta=0.823$), educational experience ($\beta=0.689$), and escapist experience ($\beta=0.595$).

The positive effect of educational experience (H8) ($\beta=0.193$; $p<.01$) and entertainment experience (H9) ($\beta=0.588$; $p<.001$) on usage intentions was supported while the effect of esthetics experience (H10) and escapist experience (H11) on usage intentions was not positively related so H10 and H11 was rejected. The highest was

entertainment experience ($\beta=0.588$), followed by educational experience ($\beta=0.193$).

Consumer Cultural Innovativeness as a Moderator in the Structure Model

Reliability and Validity Analysis

Prior to examining the moderating role of consumer cultural innovativeness in the proposed structure model, we assessed the measurement items, focusing on reliability, convergent validity, and discriminant validity. All factor loading was higher than 0.5, indicating that the determinant factors such as customization, prosumer, innovation, speed, multitasking, and graphics were distinguished. The reliability of each construct, as measured by Cronbach's α , exceeded 0.7, indicating strong internal consistency. The study confirmed the convergent validity by obtaining an Average Variance Extracted (AVE) value above 0.5 and a Composite Reliability (CR)

value of 0.7 or higher. The square root of AVE exceeded its correlation coefficient.

Hypothesis Testing

Following a cluster analysis using K-means after hierarchical clustering (as displayed in Table 6), the groups were categorised into two: the "digital proactive group (DPG)" and the "digital follower group (DFG)". In addition, intergroup differences were analysed using ANOVA, as presented in Table 7.

Table 6

Cluster Analysis.

	DPG (N=125, 43%)	DFG (N=166, 57%)	F
Customization	4.45	3.83	97.128***
Prosumer	4.34	3.70	107.851***
Innovation	4.21	3.35	155.203***
Speed	4.46	3.65	170.805***
Multitasking	4.50	3.82	137.338***
Graphic	4.37	3.52	142.230***

Note: *p<0.05 **p<0.01 ***p<0.001

DPG: Digital Proactive Group, DFG: Digital Follower Group

Table 7

ANOVA Results.

		DPG	DFG	χ^2
AR-based App	Very necessary	25%	4%	37.624***
	Necessary	48%	44%	
	Doesn't matter	23%	39%	
	Less necessary	4%	13%	
AR-based tourists	Not necessary at all	0%	0%	49.752***
	Very necessary	33%	6%	
	necessary	44%	37%	
	Doesn't matter	19%	46%	
	Less necessary	4%	11%	
	Not necessary at all	0%	1%	

Note: *p<0.05 **p<0.01 ***p<0.001

After being divided into two groups of DPG and DFG, the moderation effect of consumer cultural innovativeness on the proposed structural model for each group was tested as shown in Figure 3.

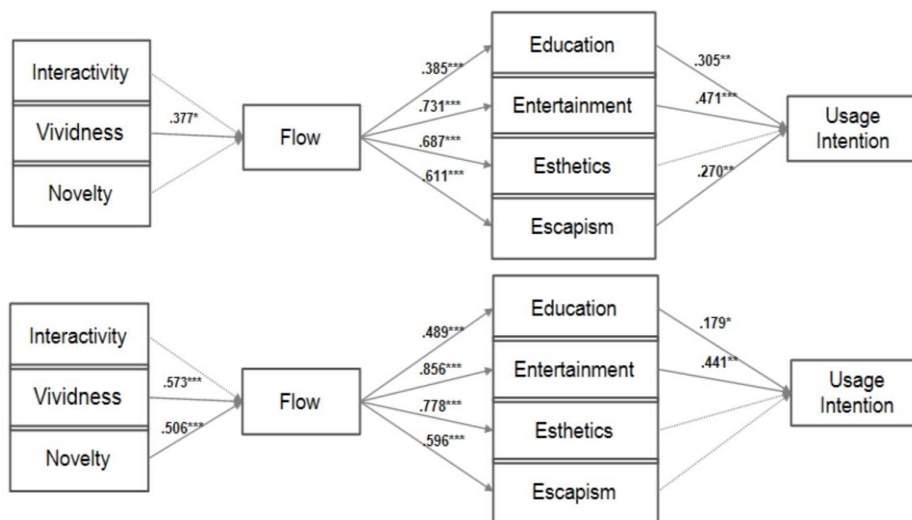


Figure 3: Results of Multigroup Analysis.

Note: *p<.05 **p<.01 ***p<.001 (The above for DPG, The below for DFG)

The study found support for the moderating effect of consumer cultural innovativeness on the AR attributes towards Flow (H12). This was evidenced by the observed difference between the two groups of Digital Progressive Group (vividness: $\beta=0.377$; $p<.05$) and Digital Follower Group (vividness: $\beta=0.573$; $p<.001$), (novelty: $\beta=0.506$; $p<.001$).

The rejection of H13 came up. The study did not find any difference between the two groups, thus failing to substantiate the moderating effects of consumer cultural innovativeness between Flow and Experience. For the DPG, the effect results were entertainment ($\beta=0.731$; $p<.001$), esthetics ($\beta=0.687$; $p<.001$), escapism ($\beta=0.611$;

$p<.001$), and education ($\beta=0.385$; $p<.001$); for the DFG, the effect results were entertainment ($\beta=0.856$; $p<.001$), esthetics ($\beta=0.778$; $p<.001$), escapism ($\beta=0.596$; $p<.001$), and education ($\beta=0.489$; $p<.001$).

The study found support for the moderating effect of consumer cultural innovativeness on Experience towards Usage Intention (H 14). For the DPG, entertainment ($\beta=0.471$; $p<.001$), education ($\beta=0.305$; $p<.01$), escapism ($\beta=0.270$; $p<.01$) had a positive effect on usage intentions but for the DFG, entertainment ($\beta=0.441$; $p<.01$) and education ($\beta=0.179$; $p<.05$) had a positive effect on usage intentions.

5. Discussions

This study investigated the impact of various attributes of AR on the intention to visit AR-based sports venues. Specifically, the study focused on the attributes of interactivity, vividness and novelty, flow, and the four realms of experience in the proposed model. A survey was conducted with visitors to Gocheok Sky Dome using AR-based content. The results are outlined as follow.

First, among the three AR attributes, novelty had the most significant impact on flow, with vividness following closely behind. This finding demonstrates that the addition of new features that altered the visitor's perception of the stadium's landscape and surroundings significantly improved the user experience with AR-based content. The outcome was strongly linked to the vividness of the AR attribute, specifically the quality of the images that the AR-based content can offer in terms of clarity, detail, and realism. The findings align closely with the research conducted by Barhorst et al. (2021). However, the limited user interactions in the AR-based content resulted in no significant findings for interactivity.

Therefore, it is necessary for sports venues to implement AR guides and applications for sports tourists. This will enhance the level of interactivity between the application and the tourists. The AR marketing campaigns employed by the stadiums in South Korea consist solely of pre-determined gestures and concise lines spoken by the characters. These campaigns are not designed to respond to spontaneous user reactions or inquiries. Although AR technology allows for interactive activities like taking pictures with virtual characters and flying creatures, these interactions do not appear to enhance the flow due to the limited presence of meaningful conversations or emotional exchanges, in contrast to interactions with real people. The findings suggest that incorporating virtual characters into AR technology for sports venue tour-guides can add novelty. However, it is important to not overlook the significance of human interaction for a seamless experience.

Second, the utilisation of AR-based content during a sports venue tour had a significant impact on all aspects of the experience, including entertainment, aesthetics, education, and escapism. The AR-based content enhances the entertainment experience by bringing to life events and mythical figures that are not visible. It also reveals hidden or restricted areas of sports venues. In addition, visitors could immerse themselves in the flow through visually enhanced effects that added to the overall aesthetic

experience of the surroundings. Visitors could acquire new information and knowledge by utilising on-screen audiovisual educational aids as they explored the spacious venues.

Third, the impact of AR experiences on visitors' usage intentions towards sports venues showed that entertainment and education had a positive effect, while aesthetics and escapist experiences were found to be insignificant. The study found that AR-based content effectively conveyed new information and knowledge about the culture of sports in South Korea to visitors. Additionally, visitors showed a willingness to learn and engage with the AR-based interactions. On the other hand, the sports venues in SK showcase the dynamic sports culture of the country, providing visitors with a satisfying aesthetic and escapist experience. Therefore, the augmented reality content for the sports venues did not offer substantial benefits to the tourists. In summary, AR in tourism for sports venues offers a distinct advantage in terms of both entertainment and education.

Fourth, the impact of consumer cultural innovativeness on usage intentions towards AR based sports venues was examined in the following manner. For the group characterised by higher innovativeness, vividness was found to have a positive impact on flow. In contrast, for the group with lower innovativeness, both vividness and novelty were found to have an effect. The findings can be attributed to the observation that individuals who are quick to adapt to new technology and are familiar with AR-based immersive experiences, known as DPG, were less influenced by novelty in AR-based content compared to the impact of vividness on their state of flow. Furthermore, the utilisation intentions in the DPG were positively influenced by experiences related to entertainment, education, and escapism.

Similarly, in the DFG, both entertainment and education experiences had a positive impact on usage intentions. The results demonstrated that AR-based material enhanced pleasure and enjoyment in sports tourist settings, irrespective of the customer's level of innovativeness. Additionally, its instructional function was shown to be secondary. However, the impact of escapism on intentions to use was only statistically significant in the DPG. The DPG, who possess proficient operational skills and are well-versed in digital technologies, can fully utilise AR-based content, resulting in a more immersive experience while navigating the site. On the other hand, the DFG, who lack familiarity with digital technologies, may encounter difficulties in using and manipulating AR-based content. DFG is more likely to favour non-digital options when visiting sporting venues.

Conclusion

This study utilised a survey-based approach to investigate the influence of AR-based content on the intentions of sports tourists to visit sports venues that provide AR-based immersive experiences. The study utilised the S-O-R model to investigate the impact of AR technology on outdoor tourism within the realm of sports venues. The study primarily centred around the Gocheok Sky Dome in South Korea and gathered data from participants who had firsthand experience with the AR-based content. The flow experience of sports tourists was found to be influenced by the factors of vividness and novelty. Furthermore, the influx of tourists greatly impacted various aspects such as education, entertainment, escapism, and aesthetics for the visitors. In addition, the influence of education and entertainment on tourists' motivations to visit sports venues showcasing AR-based content was noteworthy.

Theoretical Implications

Prior research on AR in tourism has primarily concentrated on indoor gallery spaces, hotels, and exhibition halls. 2) There is a need for a research model that encompasses the entire process and provides an explanation for customer behavioural intention to use AR-based content in tourism. Therefore, the study initially prioritised outdoor sports venues. Additionally, a comprehensive model was constructed to illustrate the impact of various attributes, flow, and experiences on a visitor's usage intentions towards AR-based sports venues. Furthermore, this study has made a notable contribution to the current body of research on sports tourism. It specifically focuses on investigating the effects of AR technology in promoting sports tourism. The study has emphasised the significant potential of AR technology in shaping individuals' intentions to visit sports venues and partake in an immersive sporting experience. Furthermore, the study has confirmed the use of the S-O-R framework to analyse the factors influencing the flow experience of tourists when visiting AR-based sports venues.

Practical Implications

This study offers valuable insights for companies or institutions interested in using AR technology to showcase their national sports venues. Sports venues play a crucial role as tourist destinations, embodying both a sense of national pride and universal significance. Therefore, it is crucial to carefully analyse the spatial aspects, tourism objectives, and tourist characteristics associated with it. This study highlights the potential of

AR in enhancing entertainment and educational experiences in sports venues. When developing AR-based content for sports venues, it is important to consider the findings regarding the moderating role of consumer cultural innovativeness. As time progresses, new technology is embraced by a small group of innovators and early adopters before gradually being adopted by a larger group consisting of the early majority and late majority (Rogers, 1995).

Therefore, the development of diverse AR applications and their corresponding content in the tourism sector is crucial, particularly for attracting forward-thinking visitors who are likely to embrace the widespread use of AR in the future. Visitors with higher innovativeness actively participate in AR-based immersive experiences at the sites, where vividness is greatly influenced. This suggests that when developing AR-based content, priority should be given to audio-visual effects and their improved quality. The findings of this study have important implications for sports tourism in SK.

The results of this study suggest the importance of implementing interactive and visually engaging augmented reality (AR) technology to assist tourists in navigating sports venues within the country. This can contribute to the country's efforts in boosting sports tourism and attracting international visitors to witness various sporting events. At present, sports organisations in SK have been exploring the use of AR technology to launch marketing campaigns for sports events. This study highlights the significant potential of augmented reality (AR) technology for marketing sports tourism in South Korea. For example, a mobile application utilising AR technology can assist tourists in navigating sports arenas and stadiums, providing them with a virtual experience.

In addition, this technology based on augmented reality has the potential to improve fan engagement by providing a virtual and interactive opportunity to meet athletes. AR technology enables individuals to engage with their preferred athletes. Therefore, it is imperative for sports organisations to heavily invest in AR technology to implement mobile applications that have the potential to transform the touring experiences of sports tourists. These applications can provide a unique and immersive experience for visitors at sports venues.

Limitations and Future Directions

The study involved surveying young visitors in their 20s and 30s who possess knowledge of AR technology and have prior experience with AR-based content. This approach ensured the collection of precise and reliable data. Additional research can be conducted to

investigate the disparity between individuals who are acquainted with or prefer AR in the tourism industry and those who do not. In addition, the model proposed in this study specifically targets the outdoor sports venue. The model can be applied to various destinations where AR technology is used. Ultimately, tourists' perceptions of AR can be influenced by the technological capabilities of a country and the cultural traits of its people. Further research can explore additional factors that influence visitors' decision-making process regarding sports venue visits.

Data Availability

The data provided in this study can be obtained upon request from the author responsible for correspondence.

Conflicts of Interest

The authors affirm that they have no conflicts of interest pertaining to the publication of this paper.

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