

Article

Cultural Differences in the Use of Augmented Reality Smart Glasses (ARSGs) Between the U.S. and South Korea: Privacy Concerns and the Technology Acceptance Model

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Abstract

Augmented Reality Smart Glasses (ARSGs) allow users to engage in picture-taking and video recording, as well as real-time storage and sharing of pictures and videos through cloud services. Unlike smartphones, newer ARSGs resemble ordinary sunglasses, allowing for unobtrusive recording. As these devices become available on an international market, it is important to understand how different cultural attitudes towards privacy and the recording and sharing of images of bystanders could impact the acceptance and adoption of ARSGs. South Korea and the United States have vastly different culturally based perceptions of photography and recording in public. S. Korea has cultural and legal restrictions in place, while the U.S.'s values of freedom of expression and individual rights are reflected in limited restrictions. Accordingly, drawing upon the Technology Acceptance Model (TAM), this paper explored the impact of privacy concerns on key constructs of the TAM for U.S. and S. Korean participants. This paper examined how Americans' (U.S. = 402) and S. Koreans' (S. Korea = 898) perceived usefulness, perceived ease of use, attitude toward using, and behavioral intention to use ARSGs were impacted by privacy concerns. The results of this study found that S. Korean respondents had significantly greater privacy concerns about using ARSGs than U.S. respondents. However, they also had significantly more positive attitudes and greater behavioral intentions to use ARSGs. Path analyses examining ARSGs' acceptance revealed that privacy concerns impacted attitudes towards ARSGs, but that these had a greater impact on U.S. participants than on Koreans. The results highlight the importance of considering nuanced cultural perspectives, specifically privacy concerns, in examining the development and adoption of new technologies. Raw data and scripts for this study are available to ensure reproducibility.

Keywords: augmented reality smart glasses; ARSGs; cross-cultural; privacy concern; technology acceptance model (TAM)



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1. Introduction

In recent years, there has been a marked increase in the adoption of smart wearable technologies. Among these are Augmented Reality Smart Glasses (ARSGs) that allow users to interact with the device, the Internet, a range of applications, and with virtual and augmented reality experiences. Earlier versions of ARSGs such as Google Glass had a distinctive appearance. However, one of the more recent versions resembles a simple

pair of sunglasses. People may not be aware that they are in the vicinity of someone wearing ARSGs. This has created concerns about bystanders' privacy. ARSGs have built-in cameras and sensors that can capture and record the users' movements, interactions, and surroundings in real time [1]. These recordings, often shared across digital platforms or stored in cloud servers, can contain sensitive information not only about individuals' behaviors, preferences, and identities [2], but about people in their vicinity who may be recorded without their knowledge. Consequently, the potential for misuse, exploitation, or unauthorized access to such data poses significant privacy risks [3]. Amidst the excitement surrounding the device's potential, concerns about privacy have emerged as a critical issue, raising questions about data privacy, surveillance, and consent [4,5], and sparking debates about the boundaries between personal space and public disclosure.

Understanding cultural differences in the adoption and perception of emerging technologies like ARSGs is essential, as cultural norms and values deeply shape individuals' privacy concerns and technology acceptance behaviors [6,7]. This study investigated privacy concerns about ARSGs between two countries, South Korea and the United States, where cultural perceptions of privacy diverge significantly. To illustrate, consider two hypothetical users. In the U.S., an individual may freely record street performances or take photos in public parks, viewing such activities as personal expression and protected under freedom of speech principles. This reflects Americans' general emphasis on individual rights and freedom of expression, resulting in higher tolerance for public photography and recording [8,9]. Conversely, in South Korea, a user may feel anxious when strangers take photos in public spaces where they could be unintentionally included. Many Koreans perceive being unknowingly photographed as an intrusion into personal boundaries and a source of social discomfort. A recent incident in Seoul exemplifies this: a resident was distressed upon discovering that a neighbor's CCTV was pointed directly at their front door and elevator, causing them to feel constantly surveilled without knowing the extent of recording or whether they could request its removal [10]. These cultural distinctions are particularly relevant when assessing the acceptance of ARSGs, which integrate real-time recording and sharing functions that may be interpreted either as beneficial or intrusive, depending on the cultural context. These contrasting views impact how ARSGs' features, such as real-time video recording and cloud-based sharing, are interpreted—either as convenient and useful or as intrusive and unsettling. By comparing these two cultures, this study provides insight into how privacy concerns, shaped by deeper societal values, influence the perceived ease of use, usefulness, and willingness to adopt ARSGs with surveillance-related functions.

The Technology Acceptance Model (TAM) provides a robust framework for analyzing how users adopt emerging technologies by focusing on perceived usefulness and perceived ease of use [11], and has been specifically applied to the adoption of ARSGs [4]. As ARSGs integrate immersive functions like real-time recording and cloud sharing, users' privacy concerns may directly influence their perceptions and acceptance [12,13]. Given that privacy norms differ significantly across cultures, applying the TAM allows for a systematic comparison of how cultural factors shape attitudes and behavioral intentions toward ARSGs [9,14–16]. By grounding a study in the TAM, researchers can isolate and measure the influence of cultural context on technology adoption while maintaining a validated theoretical structure. This model is especially suitable for comparing the U.S. and S. Korea, where differing social values and privacy expectations may yield distinct technology acceptance patterns. This cross-cultural study explored the specific relationships between privacy concerns and the key TAM components of perceived usefulness, perceived ease of use, attitude toward using ARSGs, and behavioral intention to use ARSGs.

The remainder of this paper is organized as follows. Section 2 reviews the literature on ARSGs, privacy concerns, and cultural differences in technology acceptance, and presents the study's hypotheses and research questions. Section 3 describes the research methods, including the sample, measurements, and analysis procedures. Section 4 presents the results of the data analysis. Section 5 discusses the findings and their implications. Finally, Section 6 concludes the paper with theoretical contributions, practical implications, and suggestions for future research.

2. Literature Review and Hypothesis Development

2.1. Augmented Reality Smart Glasses

ARSGs are wearable devices that integrate virtual elements into the physical environment, enhancing the users' perceptual experiences and interactions with real-world surroundings [17]. Unlike VR, which fully immerses the users in simulated environments, ARSGs overlay digital content onto the user's real-time view [18]. Since early prototypes like EyeTap [19], ARSGs have advanced into commercial products such as Google Glass and Microsoft HoloLens [8]. Their portable, glasses-like design allows for diverse applications across industries. In healthcare, ARSGs assist surgeons by displaying real-time patient data during operations [20]. In manufacturing, they provide hands-free access to instructions, reducing errors and increasing productivity [21]. In education, ARSGs enhance learning by overlaying educational content directly onto physical objects [22]. Recently, companies like Ray-Ban have introduced ARSGs that resemble ordinary sunglasses, allowing users to record and share content while maintaining a conventional appearance [23]. As ARSGs evolve, their widespread use raises significant societal and ethical questions related to privacy, data sharing, and human–computer interaction [18]. Understanding these implications is essential for responsibly guiding future ARSGs' development and adoption.

2.2. Privacy Concerns

Privacy concerns have become a focal point in contemporary discourse, particularly in the wake of technological advancements and globalization [24]. The advent of recording technologies, including VR devices, has introduced new complexities to the realm of privacy [25]. Privacy, a fundamental human right, has garnered heightened attention in the digital era characterized by extensive data collection, surveillance practices, and technological innovations [26]. However, perceptions and attitudes toward privacy vary significantly across different cultures and societies. Understanding how different societies perceive and value privacy is crucial for shaping policies and fostering informed discourse. Cultural values and norms exert a profound influence on individuals' attitudes toward privacy. Accordingly, understanding the differences in technology acceptance between Americans and Koreans regarding the use of ARSGs requires us to consider various socio-cultural factors and perceptions that influence individuals' attitudes and behaviors toward technology adoption.

2.3. Privacy Concerns About ARSGs

The recording and sharing functionalities of ARSGs raise serious privacy concerns, which can be categorized into five main areas: surveillance and consent, data security, ethical considerations, location tracking, and data retention. First, ARSGs allow users to capture audio, images, and video of people and surroundings, creating continuous surveillance risks [4]. Their discreet design often prevents individuals from realizing they are being recorded, limiting their ability to provide informed consent [4]. Second, recorded data is vulnerable to security breaches and unauthorized access [27]. Without strong encryption, personal information may be exploited for malicious purposes, such

as identity theft or unauthorized disclosure [5]. Robust security protocols are essential to safeguard sensitive data. Third, ARSGs allow users to share recorded content widely online, often without considering the privacy rights of those depicted [28]. This raises ethical issues involving consent, dignity, and potential social consequences like reputational harm or harassment [2]. The ease of content sharing amplifies these risks. Fourth, many ARSGs incorporate GPS and location tracking technologies to enhance functionality [5]. However, collecting and sharing location data without explicit consent heightens privacy and security risks, necessitating transparent data policies and user control over location information [4]. Finally, uncertainty about data ownership and storage further complicates privacy concerns. Content stored on manufacturer or third-party servers may limit users' control over their own data, increasing the risk of misuse or unauthorized access [2]. Clear data ownership guidelines and user rights are crucial for protecting individual privacy.

2.4. Cultural Differences in Privacy Concerns

Cultural values significantly shape individuals' privacy attitudes and technology acceptance behaviors, particularly through the lens of individualism and collectivism [29]. Individualism emphasizes personal freedom, autonomy, and achievement, where individuals prioritize personal goals over group interests. Decision-making is decentralized, and people value independence, self-expression, and personal responsibility [30]. Examples include the United States, Australia, and the United Kingdom. In contrast, collectivist cultures emphasize group harmony, loyalty, and interdependence. Individuals in these societies prioritize the welfare of their family, community, or organization, often placing group interests above personal desires. Social norms encourage conformity, and authority or group consensus heavily influences decisions. Countries like China, Japan, and South Korea exemplify high collectivism [29].

These cultural distinctions influence privacy sensitivity regarding ARSGs. In American culture, individual autonomy fosters lower sensitivity toward recording and sharing. Americans often view recording public experiences as a form of free expression protected by legal rights [29]. Conversely, Koreans are more sensitive to being unknowingly recorded, as collectivist values emphasize maintaining social harmony and protecting personal boundaries. Unauthorized recording may evoke shame or social embarrassment, reinforcing stricter social norms about privacy in public spaces [29].

This cultural divergence also manifests in legal frameworks. In the U.S., privacy is largely conceptualized as a passive right that limits government intrusion. Legally, individuals entering public spaces often forfeit certain privacy expectations, and courts recognize that publicly visible behavior can be recorded without explicit consent [31]. Freedom of expression generally overrides privacy concerns unless highly invasive circumstances exist. Moreover, privacy laws vary across jurisdictions and periods, creating inconsistencies in legal protections [32]. For instance, in public settings where behavior is observable by others, U.S. law typically offers limited privacy claims.

In South Korea, privacy protections focus on safeguarding personal dignity, self-determination, and personality rights [31]. The legal framework emphasizes protecting individuals from unauthorized exposure, even in public spaces. The Supreme Court of South Korea ruled that photographing someone wearing leggings in public can constitute an illegal camera offense, highlighting the country's stricter privacy protections [31]. Unlike the U.S., Korean law places greater weight on protecting individuals from unwanted exposure regardless of location, aligning with the cultural emphasis on face-saving and social harmony.

Social norms further shape attitudes toward recording practices. In the U.S., there is broad cultural acceptance of public recording, influenced by values of transparency and

accountability [32]. Americans often do not expect devices to issue alerts when recording occurs. In contrast, Koreans expect clear signals such as mosaics or alert sounds when photographs or recordings are made, reflecting heightened sensitivity to unauthorized capturing of personal images [33]. This cultural expectation reinforces caution toward ARSGs' use in South Korea, where users may be particularly vigilant about privacy boundaries in both personal and public contexts.

These legal, cultural, and normative differences underscore why privacy concerns regarding ARSGs diverge between the U.S. and South Korea. In the U.S., individuals may prioritize personal liberties to record public experiences without considering the privacy of others. In contrast, Koreans exhibit higher concern about being recorded without consent, as it is seen as an intrusion on dignity and social standing. Thus, ARSGs' ability to record and share content presents distinct challenges in each cultural context, affecting both user acceptance and public attitudes.

Based on these cultural differences in privacy perceptions, this study tested the following hypothesis:

H1: *South Koreans will report significantly greater privacy concerns about ARSGs with recording and sharing functions than Americans.*

2.5. Cultural Differences in the TAM and Privacy

The TAM has been widely applied to explain how individuals adopt and use technology across various contexts. The TAM posits that two primary factors—perceived usefulness and perceived ease of use—influence users' attitudes toward using a technology, which then shape their behavioral intentions to adopt the technology and ultimately predict actual usage behavior [34,35]. Perceived usefulness refers to the extent to which a person believes that using a technology will enhance their job performance or personal productivity, while perceived ease of use refers to how effortless and uncomplicated the technology is to operate [36]. These cognitive assessments form the basis for users' affective evaluations and behavioral decisions regarding technology use.

Although the TAM was originally developed in the U.S. and has been widely tested in Western contexts, it has also been applied in various cultural settings, including South Korea [34,37]. For example, Zin and colleagues [37] found that both perceived usefulness and perceived ease of use significantly influenced older South Korean adults' attitudes toward adopting smart healthcare wearables. These findings demonstrate the TAM's generalizability but also highlight the potential for cultural factors to shape the strength and nature of these relationships.

Cultural values and norms can profoundly influence individuals' perceptions of technology adoption. Different cultures prioritize distinct values, goals, and social expectations, which may affect how individuals assess both the benefits and ease of using emerging technologies [7,38,39]. Cultural orientations influence communication styles, cognitive processes, and evaluations of risk or social acceptance, all of which may modify how the TAM's core constructs function across different societies [40]. For example, in highly individualistic societies like the United States, individuals may prioritize autonomy, personal benefit, and innovation when adopting new technology. In contrast, collectivist cultures such as South Korea may place more weight on group norms, social harmony, and conformity when evaluating technology adoption decisions.

Lee et al. [40] systematically reviewed cultural dimensions—such as individualism–collectivism, power distance, and uncertainty avoidance—in shaping technology adoption across cultures. Their review demonstrated that cultural values directly affect how people perceive the usefulness and ease of use of new technologies. In individualistic cultures, people are likely to focus on personal advantages and convenience, whereas in collectivist

cultures, decisions may be influenced more strongly by group norms, social expectations, and authority figures. For example, social approval and conformity may serve as stronger predictors of technology adoption in collectivist cultures, potentially moderating the pathways proposed by the TAM.

Similarly, Venkatesh and Zhang [41] extended this line of research by applying the Unified Theory of Acceptance and Use of Technology (UTAUT) to compare technology acceptance between the U.S. and China. They found that while performance expectancy (similar to perceived usefulness) and effort expectancy (similar to perceived ease of use) were significant predictors in both countries, social influence and facilitating conditions played a larger role in China's more collectivist culture. Their findings support the view that technology acceptance is not culturally neutral and that sociocultural factors must be considered when applying models like the TAM across diverse cultural contexts.

McCoy et al. [42] provided further evidence by conducting a large-scale cross-cultural study across 20 countries, including the U.S. and South Korea. They argued that the TAM's universal validity may be overstated if cultural variations are not explicitly considered. Their study demonstrated that key TAM constructs—perceived usefulness and perceived ease of use—may carry different meanings and weight across cultures. In collectivist societies, social influence, conformity, and group-oriented motivations may override individual perceptions of utility when making technology decisions. Without accounting for such differences, cross-cultural applications of the TAM risk oversimplifying the complex interplay between technology adoption and culture.

Building on this foundation, the present study addresses a relatively underexplored issue: how privacy concerns intersect with cultural values to influence ARSGs' adoption. While prior research has often focused on how privacy concerns affect personal risk perceptions—such as concerns about personal data security or invasions of one's own privacy [34]—this study extended the inquiry to examine privacy concerns regarding others' privacy (i.e., bystanders or third parties unknowingly recorded by ARSGs). This distinction is particularly important in collectivist contexts, where the protection of group harmony and respect for others' dignity may elevate sensitivity to third-party privacy violations.

Privacy concerns may influence multiple pathways within the TAM. They may diminish perceptions of usefulness by making the technology seem socially problematic or ethically questionable. Privacy concerns may also undermine positive attitudes toward ARSGs' adoption by generating discomfort, fear of social disapproval, or ethical conflict. As a result, behavioral intention to adopt ARSGs may decrease even when individuals recognize the potential benefits. In collectivist cultures, concerns about violating others' privacy may amplify these effects.

Understanding how privacy concerns interact with cultural dimensions in shaping TAM pathways is critical for developing more culturally sensitive models and interventions that promote responsible technology adoption across global markets. Therefore, this study investigated the following research questions:

RQ1: How do privacy concerns impact U.S. and South Korean participants' perceptions of ease of use, perceived usefulness, attitudes, and intention to use ARSGs?

RQ2: To what extent do privacy concerns and perceptions of ease of use, perceived usefulness, and positive attitudes about ARSGs impact behavioral intentions to use ARSGs?

3. Method

3.1. Sample

Data collection for S. Korean respondents took place during July and August in 2022, and data collection for the U.S. respondents occurred during August in 2023. The U.S. samples were collected via the Prolific online survey platform. S. Korean samples

were collected via Embrain, an online research and survey agency in S. Korea. A total of 1300 respondents (U.S. = 402; S. Korea = 898) were collected. S. Korean data showed that the mean age of the respondents was 40.64 ($SD = 11.38$), and that 51.2% were male and 48.8% were female. The median education level was a completed college degree. The median annual income of individuals was USD 30,000–39,999. The mean age of the U.S. sample was 36.97 ($SD = 11.91$), 47.3% identified as male, 48% as female, 3.7% as non-binary/third gender, and 1% preferred not to answer. The median education level was a completed college degree. The median annual income of individuals was USD 40,000–49,000.

3.2. Measurement

This study employed validated scales adapted from prior research to measure privacy concerns and the key constructs of the TAM. To assess privacy concerns, measurement items were adapted from Harborth and Pape [43]. Items measuring perceived ease of use, perceived usefulness, attitude toward using, and behavioral intention to use were adapted and modified from Kim and Sundar [44]. All items were revised to reflect the context of Augmented Reality Smart Glasses (ARSGs) with recording and sharing capabilities. All items were measured using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) and were pre-tested for clarity and contextual relevance before formal data collection. Measures were originally developed in English and then translated into Korean by two native speakers. To enhance the transparency of the results and facilitate reproducibility of our findings, the analysis guidelines and scripts are provided in the Supplementary Materials. Specifically, Supplementary Table S1 lists every measurement item along with its corresponding Likert scale, while Supplementary Table S2 defines the variable abbreviations used in the scripts.

3.2.1. Privacy Concerns

In order to assess privacy concerns, respondents were asked to rate their agreement with the following statements: “If I were unobtrusively recorded using Smart Glasses or Headsets by a stranger in a public space,” (1) “I would be concerned,” (2) “I would feel that my privacy had been violated,” and (3) “I would be concerned about my safety.” “If I were unobtrusively recorded using Smart Glasses or Headsets in a public space and a stranger shared those pictures,” (4) “I would be concerned,” (5) “I would feel that my privacy had been violated,” and (6) “I would be concerned about my safety.” Responses were averaged to create a single-item measure for analysis ($M = 5.99$, $SD = 1.36$, Cronbach’s $\alpha = 0.97$).

3.2.2. Perceived Ease of Use

In line with the perception of the degree to which using a specific technology would be effortless [36,45], the respondents were asked to rate their agreement with the following statements: (1) “It would be easy for me to record pictures or video using Smart Glasses or Headsets” and (2) “It would be easy for me to share pictures or video using Smart Glasses or Headsets.” Responses were averaged to create a single-item measure for analysis ($M = 4.59$, $SD = 1.74$, Cronbach’s $\alpha = 0.94$).

3.2.3. Perceived Usefulness

Regarding the perception of the degree to which a given technology would enhance their performance or productivity [44,45], respondents were asked to rate their agreement with the following statements: (1) “Smart Glasses or Headsets would improve my ability to record content” and (2) “Smart Glasses or Headsets would improve my ability to share content.” Responses were averaged to create a single-item measure for analysis ($M = 4.46$, $SD = 1.62$, Cronbach’s $\alpha = 0.91$).

3.2.4. Attitude Toward Using

To assess the overall evaluation of utilizing ARSGs, the respondents were asked to answer two questions: (1) “I think that Smart Glasses or Headsets would be beneficial”, and (2) “I think that Smart Glasses or Headsets would have a positive impact”. The items were averaged to undertake path analysis ($M = 4.20$, $SD = 1.52$, Cronbach’s $\alpha = 0.87$).

3.2.5. Behavioral Intention to Use

Two questions were measured to evaluate the degree of intention to employ ARSGs with recording and sharing functions in the future [44,45]: (1) “I am likely to use Smart Glasses or Headsets to record content” and (2) “I am likely to use Smart Glasses or Headsets to share content.” The averaged item was used to conduct path analysis ($M = 3$, $SD = 1.91$, Cronbach’s $\alpha = 0.97$).

3.2.6. Control Variables

To control for the respondents’ personal characteristics that may affect the relationship between each variable, this study first introduced demographic characteristics (i.e., gender, age, education level, and annual income) as control variables. In addition, the level of social media use to share content ($M = 3.12$, $SD = 1.51$) was controlled by measuring “How often do you share pictures and video on social media?” from 1 (Never) to 7 (Always). The degree of immersive head-mounted display use ($M = 2.24$, $SD = 1.51$) was also controlled by asking, “How often do you use a virtual reality headset (Oculus Rift, etc.)?” from 1 (Never) to 7 (Always).

3.3. Analysis Procedure

This study analyzed descriptive statistics, tests of difference, and correlations among the study variables using SPSS 29.0. To further examine these differences, path analyses were conducted using Mplus 7.4. Control variables included gender, age, education, income, and frequency of immersive device use. Model fit was assessed using standard goodness-of-fit indices. Specifically, model fit was assessed using standard indices, namely χ^2 ($p > 0.05$), RMSEA (≤ 0.08), CFI (≥ 0.90), and SRMR (≤ 0.08), as per [46].

4. Results

4.1. Model Fit

Table 1 presents the model fit indices for both the U.S. and Korean samples. For both groups, the chi-square values are non-significant, indicating a good fit to the data. The RMSEA values are very low (0.000 for the U.S. and 0.019 for Korea), and both CFI values are perfect at 1.000, suggesting an excellent comparative fit. Additionally, the SRMR values are well below the recommended threshold (0.002 for both), further confirming the models’ strong fit across both cultural groups.

Table 1. The results of goodness of fit.

Model	χ^2	RMSEA	CFI	SRMR
U.S. ($N = 402$)	$\chi^2 (1) = 0.644, p = 0.422$	0.000	1	0.002
Korea ($N = 898$)	$\chi^2 (1) = 1.316, p = 0.251$	0.019	1	0.002

4.2. Descriptive Statistics and Correlation

Tables 2 and 3 present the means, standard deviations, and Pearson correlation coefficients for key variables in the U.S. and S. Korea. In both countries, perceived ease of use was positively correlated with perceived usefulness, and perceived usefulness was strongly

associated with behavioral intention to use ARSGs. However, the relationship between perceived usefulness and attitude, as well as that between attitude and intention, varied across cultural groups. In the U.S. data, privacy concerns showed significant negative associations with perceived usefulness ($r = -0.13$), attitude ($r = -0.29$), and continuance intention ($r = -0.25$). These coefficients were larger than those observed in South Korea. In the Korean sample, privacy concerns were likewise negatively related to attitude ($r = -0.10$) and intention ($r = -0.09$). Next, perceived ease of use was positively and significantly correlated with perceived usefulness ($r = 0.42$), attitude ($r = 0.27$), and intention ($r = 0.27$) in the US data. These relationships were uniformly stronger in South Korea (usefulness: $r = 0.53$; attitude: $r = 0.35$; intention: $r = 0.32$). Perceived usefulness exhibited robust positive links with attitude (U.S.: $r = 0.57$; Korea: $r = 0.63$) and with continuous use intention (U.S.: $r = 0.57$; Korea: $r = 0.50$) across both groups. Finally, attitude toward using the technology correlated positively with continuous use intention in each context, with the U.S. coefficient ($r = 0.69$) exceeding that of South Korea ($r = 0.61$).

Table 2. The descriptive analyses and correlations among the study variables of the U.S.

		<i>r</i>										
Variable	<i>M (SD)</i>	1	2	3	4	5	6	7	8	9	10	11
1. Gender	47.3%	-										
2. Age	36.97 (11.91)	−0.04	-									
3. Education	2 yr-college degree	0.07	0.23 **	-								
4. Income	USD 40,000–49,999	0.02	0.13 **	0.32 **	-							
5. SMU	2.98 (1.59)	0.09	−0.05	0.06	0.08	-						
6. HMD Use	1.71 (1.11)	−0.13 *	−0.13 **	−0.07	0.11 *	0.21 **	-					
7. Privacy Concerns	5.58 (1.42)	0.29 **	0.02	0.11 *	0.09	0.05	−0.17 **	-				
8. Ease of Use	5.75 (1.10)	−0.12 **	0.06	−0.01	−0.05	0.20 **	0.10 *	−0.10	-			
9. Usefulness	4.69 (1.66)	−0.18 **	0.06	0.06	−0.05	0.35 **	0.21 **	−0.13 **	0.42 **	-		
10. Attitude	4.05 (1.68)	−0.20 **	−0.04	−0.11 *	−0.13 *	0.04	0.24 **	−0.29 **	0.27 **	0.57 **	-	
11. Intention	2.99 (1.95)	−0.20 **	−0.02	−0.08	−0.06	0.19 **	0.34 **	−0.25 **	0.27 **	0.57 **	0.69 **	-

Note. $N = 402$. Gender coding, Male = 1, Female = 2, etc.; SMU, social media use to share content; HMD, immersive head-mounted device. * $p < 0.05$, ** $p < 0.01$.

Table 3. The descriptive analyses and correlations among study variables of S. Korea.

<i>r</i>												
Variable	<i>M (SD)</i>	1	2	3	4	5	6	7	8	9	10	11
1. Gender	51.2%	-										
2. Age	40.64 (11.38)	−0.24 **	-									
3. Education	4 yr-college degree	−0.13 **	0.04	-								
4. Income	USD 30,000–39,999	−0.10 **	0.07 *	0.29	-							
5. SMU	3.18 (1.74)	0.07 *	−0.06	−0.01	0.02	-						
6. HMD Use	2.47 (1.60)	−0.13 **	0.02	0.03	0.08 *	0.41 **	-					
7. Privacy Concerns	6.17 (1.28)	0.16 **	−0.17 **	0.04	0.04	−0.09 **	−0.17 **	-				
8. Ease of Use	4.07 (1.73)	−0.17 **	−0.02	0.03	0.03	0.18 **	0.06 **	−0.01	-			
9. Usefulness	4.36 (1.59)	−0.14 **	0.01	0.08 *	0.04	0.19 **	0.25 **	0.01	0.53 **	-		
10. Attitude	4.26 (1.44)	−0.25 **	0.04	−0.01	0.01	0.21 **	0.29 **	−0.10 **	0.35 **	0.63 **	-	
11. Intention	3.78 (1.84)	−0.21 **	0.05	0.03	0.03	0.27 **	0.33 **	−0.09 *	0.32 **	0.50 **	0.61 **	-

Note. $N = 898$. Gender coding, Male = 1, Female = 2, etc.; SMU, social media use to share content; HMD, immersive head-mounted device. * $p < 0.05$, ** $p < 0.01$.

4.3. Cultural Differences in Privacy Concerns

To examine H1, which predicted that Koreans would exhibit significantly higher privacy concerns than Americans regarding the use of ARSGs, an independent sample t -test was conducted. The results revealed a statistically significant difference between the two groups ($t = -7.35$, $p < 0.001$, with Korean respondents ($M = 6.17$, $SD = 1.28$) reporting higher privacy concerns than American respondents ($M = 5.58$, $SD = 1.42$). These findings confirm H1, indicating that S. Koreans are more sensitive to privacy issues related to ARSGs' usage (see Table 4).

Table 4. The results of the difference in key variables between the U.S. and S. Korea.

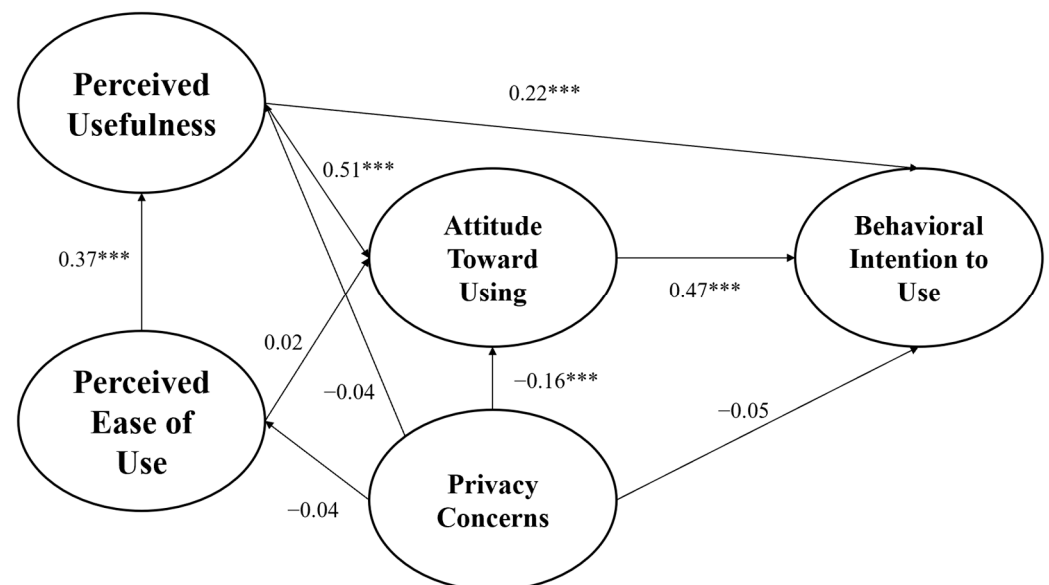
Variable	M (SD)		t (p)	Cohen's d
	US	Korea		
Gender	47.3%	51.2%	3.00 (<0.001) ***	0.18
Age	36.97 (11.91)	40.60 (11.38)	−5.30 (0.91)	−0.32
Education	2 yr-college degree	4 yr-college degree	−5.66 (<0.001) ***	−0.34
Income	USD 40,000–49,999	USD 30,000–39,999	5.74 (<0.001) ***	0.34
SMU	2.98 (1.59)	3.18 (1.74)	−1.97 (<0.001) ***	1.70
HMD Use	1.71 (1.11)	2.47 (1.60)	−8.61 (<0.001) ***	−0.52
Privacy Concerns	5.58 (1.42)	6.17 (1.28)	−7.35 (<0.001) ***	−0.44
Ease of Use	5.75 (1.10)	4.07 (1.73)	17.96 (<0.001) ***	1.08
Usefulness	4.69 (1.66)	4.36 (1.59)	3.35 (0.17)	0.20
Attitude	4.05 (1.68)	4.26 (1.44)	−2.30 (<0.001) ***	−0.14
Intention	2.99 (1.95)	3.78 (1.84)	−7.09 (0.03) *	−0.43

Note. Gender coding, Male = 1, Female = 2, etc.; SMU, social media use to share content; HMD, immersive head-mounted device. * $p < 0.05$, *** $p < 0.001$.

4.4. Privacy and Cultural Differences in the TAM

To further examine cultural differences in the role of privacy in the acceptance of ARSGs, path analyses based on the Technology Acceptance Model (TAM) were conducted. Demographic variables (gender, age, education, and income), social media use to share content, and immersive head-mounted device (HMD) use were included as control variables in all models, with 5000 bootstrapping samples applied for robust estimation.

The path analysis results offer clear insights into how privacy concerns and the TAM variables interact differently between U.S. and South Korean participants, answering both RQ1 and RQ2. (Figures 1 and 2, and Tables 5 and 6).

**Figure 1.** The results of path analysis for the U.S. group. Note. *** $p < 0.001$.

In both cultural groups, perceived ease of use significantly predicted perceived usefulness ($\beta = 0.37$, $p < 0.001$ for the U.S.; $\beta = 0.47$, $p < 0.001$ for South Korea). This supports a core assumption of the TAM that when users find a technology easy to use, they are more likely to view it as useful. However, perceived ease of use did not significantly predict attitudes toward using ARSGs in either group, suggesting that ease alone does not directly shape users' affective evaluations. This may reflect users' limited familiarity or comfort with ARSGs as a novel technology, where social and ethical implications take precedence over operational simplicity.

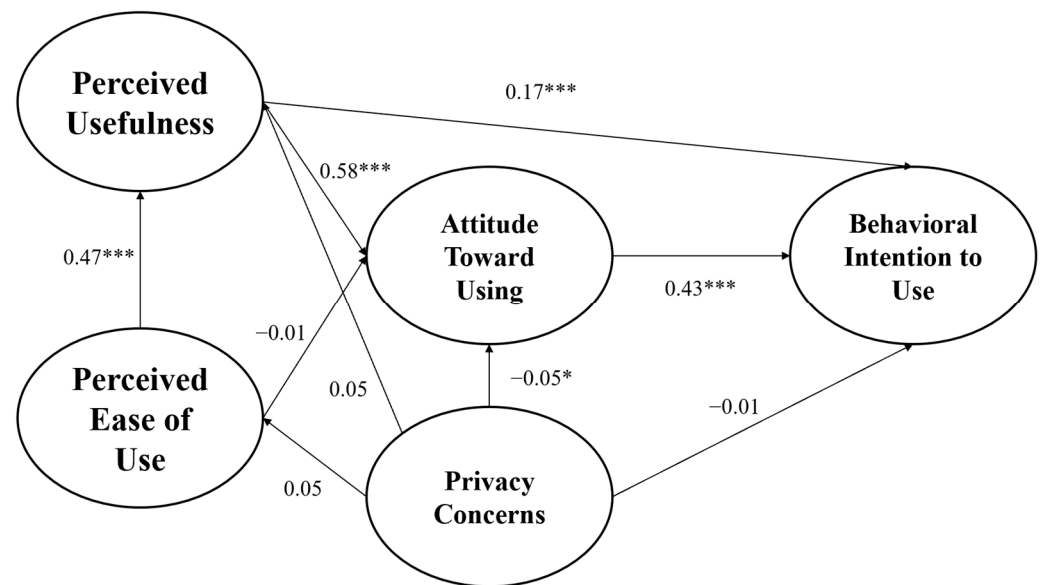


Figure 2. The results of path analysis for the S. Korean group. * $p < 0.05$, *** $p < 0.001$.

Table 5. The results of path analysis for the U.S. group.

Predictor	Outcome	β	p	Significance
Privacy Concerns	Perceived Ease of Use	−0.04	0.441	Not Significant
Privacy Concerns	Perceived Usefulness	−0.04	0.441	Not Significant
Privacy Concerns	Attitude Toward Using	−0.16	0.000	Significant
Privacy Concerns	Behavioral Intention to Use	−0.05	0.226	Not Significant
Perceived Ease of Use	Perceived Usefulness	0.37	0.000	Significant
Perceived Ease of Use	Attitude Toward Using	0.02	0.632	Not Significant
Perceived Usefulness	Attitude Toward Using	0.51	0.000	Significant
Perceived Usefulness	Behavioral Intention to Use	0.22	0.000	Significant
Attitude Toward Using	Behavioral Intention to Use	0.47	0.000	Significant

Table 6. The results of path analysis for the S. Korean group.

Predictor	Outcome	β	p	Significance
Privacy Concerns	Perceived Ease of Use	0.05	0.094	Not Significant
Privacy Concerns	Perceived Usefulness	0.05	0.108	Not Significant
Privacy Concerns	Attitude Toward Using	−0.05	0.041	Significant
Privacy Concerns	Behavioral Intention to Use	−0.01	0.806	Not Significant
Perceived Ease of Use	Perceived Usefulness	0.47	0.000	Significant
Perceived Ease of Use	Attitude Toward Using	−0.01	0.720	Not Significant
Perceived Usefulness	Attitude Toward Using	0.58	0.000	Significant
Perceived Usefulness	Behavioral Intention to Use	0.17	0.001	Significant
Attitude Toward Using	Behavioral Intention to Use	0.43	0.001	Significant

Perceived usefulness emerged as a robust and consistent predictor of both attitudes and behavioral intention across both countries. For U.S. participants, perceived usefulness strongly influenced attitudes ($\beta = 0.51$, $p < 0.001$) and behavioral intention ($\beta = 0.22$, $p < 0.001$). Similarly, for Korean participants, perceived usefulness significantly impacted attitudes ($\beta = 0.58$, $p < 0.001$) and behavioral intention ($\beta = 0.17$, $p < 0.001$). These findings reinforce that perceived utility plays a central role in driving both positive evaluations and intentions to adopt ARSGs, regardless of cultural background.

The effect of privacy concerns, however, demonstrates notable cultural differences, directly addressing RQ1. Among U.S. participants, privacy concerns significantly and negatively influenced attitudes ($\beta = -0.16$, $p < 0.001$), suggesting that privacy apprehensions directly erode users' affective acceptance of ARSGs. In contrast, privacy concerns had a smaller and significant negative effect on attitudes among Korean participants ($\beta = -0.05$, $p = 0.041$). Privacy concerns did not significantly affect perceived usefulness, perceived

ease of use, or behavioral intention in either country, indicating that privacy concerns primarily act as an indirect barrier, influencing adoption via attitudes.

Finally, attitudes toward using ARSGs significantly predicted behavioral intention in both groups ($\beta = 0.47$, $p < 0.001$ for the U.S.; $\beta = 0.43$, $p = 0.001$ for South Korea), underscoring the importance of fostering positive attitudes to promote adoption across cultural contexts. These results demonstrate that while the TAM holds broadly across both cultures, privacy concerns exert stronger suppressive effects on American users' acceptance compared with Koreans.

5. Discussion

This study investigated how cultural differences shape the acceptance of ARSGs, focusing on how privacy concerns interact with the TAM variables across the U.S. and South Korea. The central and most intriguing finding was that despite higher levels of privacy concerns, South Korean participants showed stronger intentions to adopt ARSGs than their American counterparts.

In both countries, privacy concerns were high, consistent with prior research that emphasizes public discomfort with surveillance technologies [47,48]. However, privacy concerns had a stronger negative influence on American users' attitudes toward ARSGs. This suggests that privacy apprehensions in the U.S. may act as a psychological barrier, dampening positive attitudes and lowering behavioral intentions. Americans' concerns may reflect deep-rooted cultural fears of surveillance and data misuse, where privacy violations are seen as significant threats to individual autonomy [15].

Conversely, the South Korean sample revealed a surprising paradox. While Koreans reported higher privacy concerns than Americans, these concerns had only a marginal negative effect on their attitudes and no direct influence on their behavioral intentions. This finding aligns with cultural frameworks emphasizing collectivism and social harmony in East Asian societies [15]. In collectivist cultures like South Korea, technology adoption may be strongly influenced by social expectations, group conformity, and perceived societal benefits. Koreans may be willing to tolerate privacy trade-offs if the technology provides functional, social, or economic benefits that serve collective goals. Thus, privacy concerns do not automatically translate into technology rejection but are instead weighed against perceived usefulness and societal value.

This phenomenon can be explained through the distinction between the "innovation effect" and the "imitation effect" described by Lee et al. [40]. In individualistic cultures like the U.S., technology adoption is often driven by individual assessments of usefulness and ease of use—the innovation effect. In contrast, collectivist cultures like South Korea often rely on social norms and collective endorsements—the imitation effect. For Korean users, witnessing peers adopt ARSGs or perceiving these technologies as socially acceptable may override personal privacy concerns.

Another factor is Korea's strong technological optimism. South Korea is one of the most digitally connected societies globally, with widespread acceptance of emerging technologies. This environment fosters a mindset where technology is seen as essential for social participation, productivity, and national competitiveness. As such, even technologies that present potential privacy threats, such as ARSGs, are more easily integrated into daily life when framed as advancing societal progress [42].

Legal and regulatory differences may also contribute to the divergent patterns. In South Korea, strict legal frameworks regulate recording and data collection, providing individuals with greater confidence that their privacy will be protected even when adopting potentially invasive technologies [31,33]. In contrast, the U.S. has fewer restrictions on public recording, placing a heavier burden on individuals to protect their privacy. This

difference may explain why privacy concerns play a more significant role in undermining U.S. users' attitudes toward ARSGs.

Interestingly, perceived usefulness consistently emerged as a powerful predictor of both attitudes and behavioral intention across both cultures, confirming the TAM's foundational assumption [35]. Even when privacy concerns existed, functional benefits helped to sustain adoption intentions, especially in South Korea. This suggests that for Korean users, the perception that ARSGs can enhance productivity, efficiency, or communication may outweigh personal discomfort related to privacy. In contrast, for Americans, perceived usefulness alone was insufficient to fully counterbalance strong privacy concerns, indicating that emotional and ethical apprehensions weigh more heavily in shaping technology adoption.

6. Conclusions

6.1. Theoretical Contribution

This study offers meaningful theoretical contributions by extending the TAM into the cultural domain of privacy concerns related to ARSGs. While prior studies have widely applied the TAM to explain technology adoption [11,45,48], few have examined how cultural differences in privacy sensitivity interact with the TAM's constructs. Our findings reveal that privacy concerns do not exert uniform effects across cultures but instead operate in culturally specific ways that reshape core TAM relationships.

In the U.S., consistent with previous research, privacy concerns significantly dampened attitudes toward ARSGs, ultimately reducing behavioral intention to adopt the technology [47,48]. However, in South Korea, despite higher overall privacy concerns, the negative influence on attitudes was minimal, and behavioral intention remained strong. This demonstrates that privacy concerns may function more as a negotiable factor than a fixed barrier in collectivist societies, particularly when social conformity and perceived societal benefits are involved [15,42]. These findings confirm that the TAM's predictive power is deeply shaped by cultural values such as collectivism, technological optimism, and the regulatory context.

Additionally, this study builds on McCoy et al. [42] by empirically validating the call to incorporate cultural moderators—like privacy concerns—into the TAM, offering a more context-sensitive framework. Our research also suggests that perceived usefulness consistently drives behavioral intention across cultures, but ease of use may play a smaller role in emerging technologies like ARSGs, where familiarity remains limited.

By integrating privacy concerns into the TAM within a cross-cultural context, this study advances theory by demonstrating how sociocultural norms and legal frameworks reshape the cognitive evaluation of new technologies. These insights offer a valuable foundation for future cross-cultural studies on privacy-sensitive technologies and call for a more dynamic, culturally informed application of the TAM.

6.2. Practical Implications

The findings of this study provide valuable insights for practitioners involved in developing, marketing, and regulating ARSGs. For product manufacturers and developers, recognizing that privacy concerns vary greatly between cultural groups is critical. In S. Korea, where privacy concerns coexist with a pragmatic acceptance of technology, marketers and developers can emphasize practical advantages, such as increased productivity, social engagement, or collective benefits. For example, promotional strategies in Korea could highlight ARSGs applications like efficient public transportation navigation, collaborative work environments, or improved educational experiences, thus aligning with Korean users' value systems.

In contrast, service providers and marketers in the U.S. face a different challenge, where strong privacy concerns can inhibit behavioral adoption despite perceived utility. Here, companies should focus heavily on transparency and user-control mechanisms, clearly communicating how personal data is collected, stored, and used. For instance, ARSGs developers could integrate clear privacy consent processes or provide intuitive controls allowing users to manage data sharing proactively. Marketing campaigns targeting American consumers should explicitly address data security, emphasizing user empowerment and data protection to alleviate skepticism or resistance.

Both Korean and U.S. marketers should design strategies that directly demonstrate the concrete value and minimal privacy risks associated with ARSGs' usage. User training programs or community engagement initiatives could further familiarize skeptical users, reducing fear of surveillance or unauthorized data sharing. Lastly, policy-makers might consider cultural variations in privacy concerns when establishing regulations for ARSGs, ensuring policy frameworks reflect and respect local norms and expectations, thereby fostering wider acceptance and adoption across diverse global markets.

6.3. Limitations and Future Study Directions

This study has several limitations and suggests directions for future research. Firstly, as ARSGs technology is still evolving, future research could use cross-sectional designs to capture changing perceptions and increased familiarity with ARSGs, providing a more comprehensive understanding of privacy concerns over time. Second, although the Korean and U.S. research firms used in this study attempted to recruit a representative sample, there are factors that need to be considered in any online study. The potential pool of respondents willing to take online surveys and share information online may be systematically different from those who are not able or willing to do so. This may be a potential issue when assessing privacy attitudes about new technology. Third, privacy concerns likely vary by culture and context, necessitating the development of culturally sensitive measures. Future studies should explore additional situational factors such as public versus private environments, the purpose of recording, and whether consent was explicitly provided, which would allow more precise comparisons across diverse cultural settings. Lastly, there was a gap in the times of data collection for the two countries (South Korea in 2022 and the U.S. in 2023). It is possible that public attitudes toward ARSGs and privacy concerns may shift over time as technology adoption progresses and societal discourse evolves. Emerging media reports, technological advancements, or high-profile privacy incidents could influence users' perceptions differently across periods. Future studies may benefit from longitudinal designs to capture potential time-sensitive shifts in privacy concerns and technology acceptance.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/app15137430/s1>. Table S1: Measurement Items and Scales for Study Variables; Table S2: Study Variables and Their Abbreviations for Analysis.

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