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Research Article

Why Millennials Continue to Use WhatsApp? A Focus on Culture and Computer–Human Dialogue

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Continuous usage behavior among millennials is crucial, yet factors influencing this behavior are not well understood. This study integrates human-computer interaction and marketing research to investigate the relationship between persuasive dialogue support (PDS), attitudinal loyalty (AL), and continuous-use intention (CI) in the context of WhatsApp. The study also examines the moderating role of four cultural dimensions: uncertainty avoidance (UA), power distance (PD), masculinity (MAS), and individualism (IND) in these relationships. Data was collected from 287 WhatsApp users in four countries, and the proposed theoretical model was tested using structural equation modelling (SEM-PLS). The results indicate that PDS has a direct positive impact on AL, which in turn leads to CI. The study also found that cultural differences can moderate the relationship between PDS and AL and between AL and CI. Therefore, app developers need to consider cultural differences when designing their products and implement persuasive design aspects to boost user loyalty and intention to use. To ensure optimal app performance in diverse cultural settings, developers should strike an appropriate balance between universal design principles and culturally sensitive adaptation. However, the study's limitations, such as reliance on self-reported data and a relatively small sample size, suggest the need for future research to expand its scope to include participants from a broader range of cultural backgrounds.

1. Introduction

In the last decades, the rapid development of technology has resulted in the widespread use of the Internet [1], which has impacted individuals' daily lives in many areas such as social media [2, 3], medicine [4, 5], and education [6, 7]. Communication is one of the most popular of these fields, and in today's digitally connected world, smartphones have become indispensable tools, revolutionizing the way we communicate, work, and access information. As a result, the global mobile app industry is experiencing unprecedented growth, with projections indicating a potential market value of 1 trillion USD by 2032, up from an estimated 200 billion USD in 2022, boasting a compound annual growth rate of 20% [8, 9]. This explosive expansion is evident from the staggering number of mobile apps available for download across the top three app stores: Google Play Store hosts approximately 3.55 million apps, Apple App Store offers access to 1.6 million apps, and Amazon Appstore boasts a library of 0.5 million apps [10]. Yet, amid this abundance, a substantial portion of these apps faces a disheartening fate as they are tried and swiftly abandoned by users after a single session of use, a predicament illustrated by a study conducted in 2018, which reported a concerning 21% abandonment rate among 37,000 apps [11].

Messaging apps have become an integral part of our daily lives, and several popular communication apps like WhatsApp, KakaoTalk, Line, and Telegram facilitate instant communication and connections with friends and family worldwide [12]. WhatsApp, in particular, is a widely-used messaging application that allows users to send text messages, make voice and video calls, and share various media files, making it a versatile platform for instant communication [13]. Despite the profusion of mobile apps and the

myriad businesses revolving around them, previous research has predominantly cast a broad net, primarily focusing on apps in general, rather than delving into the specific dynamics of individual app categories or industries [14–16].

Intriguingly, within the user demographics of WhatsApp, millennials emerge as the most dominant cohort, constituting a staggering 54% of its user base [17]. As a generation born between 1981 and 1996, millennials claim the largest share among adult cohorts worldwide, encompassing approximately 23% of the global population, equivalent to a staggering 1.8 billion individuals [18]. Having grown up in the digital age, they are adept at navigating technology, having assimilated internet use, digital devices, and diverse communication methods from an early age. Their reliance on social media eclipses that of any other generation, with their behavior, habits, and communication patterns intricately intertwined with the digital realm [19, 20].

At the heart of this study lies a fundamental question: How can users be encouraged to invest more time in an app and revisit it with greater frequency? According to Hoehle et al. [21], well-designed mobile applications hold the potential to augment user satisfaction and enhance the overall user experience. In pursuit of this objective, app designers are increasingly exploring the principles of persuasive dialogue design, a vital facet in captivating and retaining users, especially in the context of social networking applications [22]. Persuasive dialogue technology, often abbreviated as PDS, encompasses the extent to which an application reassures, motivates, and supports users to interact with the system continuously [13, 23–26]. PDS finds its roots in the work of B.J. Fogg, who coined the term "Persuasive Technology" in his book titled *Persuasive Technology: Using Computers to Change What We Think and Do* [27]. The premise is that persuasive technology can influence both attitudes and behaviors [27].

Central to our exploration is the concept of attitudinal loyalty (AL), a cornerstone in marketing research that consistently denotes attitudes toward brands [28], positive word-of-mouth communications [29, 30], and resistance to counter-persuasion [31]. Likewise, the concept of continuous intention (CI) holds a prominent position in the literature. Previous research has underscored that customer retention and continuous usage constitute pivotal factors in determining the ultimate success of a product or service [32]. While researchers have often gravitated toward examining initial adoption or first-time use of mobile apps, recent studies have begun scrutinizing the factors that influence ongoing usage [33, 34].

In the realm of mobile apps, culture assumes a pivotal role in shaping user attitudes and behaviors, acting as a potent lens through which individuals interact with technology. WhatsApp, a globally renowned messaging app, serves as a pertinent case study for this investigation. Culture, in essence, encompasses the collective programming of the mind that distinguishes one human group from another [35]. While past research has diligently addressed the need for cultural sensitivity in software development for computers [36–38], it becomes increasingly apparent that cultural nuances warrant equal attention in the realm of mobile app development. The pervasive influence of technology on cultural norms makes it imperative to consider cultural tendencies when creating mobile apps. As one of the most widely used messaging apps worldwide, WhatsApp transcends cultural boundaries, making it a compelling subject for examining the cultural dimensions that contribute to its widespread acceptance.

The existing literature firmly establishes a connection between attitudinal loyalty and continuous intention among consumers [15]. Nevertheless, while there is a burgeoning interest in deciphering consumer loyalty within the context of mobile apps [16, 39], a significant gap persists concerning the influence of persuasive dialogue support (PDS) on loyalty [22, 40]. Moreover, the intricate interplay between persuasive dialogue technology, loyalty, continuous intention, and culture has hitherto been examined in a fragmented manner, lacking a comprehensive overview. Furthermore, the potential moderating effects of cultural dimensions, such as uncertainty avoidance (UA), power distance (PD), masculinity (MAS), and individualism (IND), on loyalty and continuous intention, remain insufficiently explored at the individual consumer level [15, 32]. To address these substantial gaps, this study embarks on a quest to answer the following pivotal research questions: What is the effect of PDS on loyalty? How does attitudinal loyalty, stemming from PDS, subsequently shape continuous intention? To what extent do cultural dimensions act as moderating factors in the relationship between PDS, attitudinal loyalty, and continuous intention? Given WhatsApp's substantial millennial user base, this study places particular emphasis on this demographic group.

This paper injects fresh insights into the interdisciplinary realms of information systems and marketing research, aligning with Taylor and Strutton's call to harness the collaborative potential of these fields to unravel the complexities of online consumer behavior [41]. By seamlessly intertwining persuasive dialogue technology (information systems) with loyalty and continuous intention (marketing research), this study assembles a comprehensive model of online consumer behavior. Moreover, while extensive research has scrutinized user acceptance and behavior concerning information technology, a limited body of work has delved into the predictive power of persuasive dialogue technology concerning loyalty and continuous intention. This unique vantage point may assist app designers in crafting solutions that positively sway user behavior. Lastly, by delving into the potential moderating role of cultural dimensions, this study underscores culture's pivotal role in shaping consumer attitudes and behaviors toward mobile apps.

To accomplish these objectives, this study turns its gaze toward persuasive dialogue support, loyalty, and continuous intention as contextual variables, with cross-cultural variables stepping in as moderators.

2. Literature Review

2.1. Persuasive Dialogue Support (PDS). Although systems cannot communicate in the same manner humans can, some research suggests that computer–human persuasion may

employ some patterns of interaction similar to human communication [42]. Persuasive systems refer to interactive technologies designed to reinforce, change, or shape users' attitudes and/or behavior [26, 27]. For example, healthcare apps may be designed to encourage people to engage in healthy behavior to prevent health problems [43]. Persuasive dialogue refers to the extent to which an application reassures, motivates, and supports users to have continuous interaction with the system through employing seven features: reminders, suggestions, social role, liking, similarity, rewards, and praise [23].

(1) Reminders. Notification features in WhatsApp entice the user to read unread messages. The user feels compelled to read the unread messages.

(2) Suggestions to Take Action. Persuasive applications should persuade users to utilize the different functions in the application. In WhatsApp, for example, when using Desktop WhatsApp and searching for messages, users will receive the following message: "Use WhatsApp on your phone to see older messages".

(3) Social Role/Actor. WhatsApp plays a social actor role as it supports and persuades users to communicate and interact with other users. For example, WhatsApp tells the user the last time the other users used WhatsApp.

(4) Liking. The app system should have a look that appeals to users to keep them moving toward achieving their target behavior [44]. WhatsApp provides a simple interface and features (e.g., no usernames or passwords and WhatsApp Web) that appeal to users, allowing them to communicate easily either individually or in groups. For users, WhatsApp has become their preferred platform that maintains their multifaceted communication with people [45].

(5) Similarity. Persuasive applications should imitate and remind users of themselves in a more meaningful way by imitating their users in some specific way. This principle is excluded since it is not applicable to WhatsApp.

(6) Rewards. Persuasive applications should reward users for achieving target behavior. However, this principle is excluded since it is not applicable to WhatsApp.

(7) Praise. Persuasive applications should offer praise. This principle is excluded since it is not applicable in WhatsApp.

In the context of WhatsApp, four principles are applied: reminder, social role, suggestions, and liking. Table 1 shows the persuasive dialogue features employed by WhatsApp. It demonstrates the feedback and notifications that motivate users to use it daily. Notifications are a prompting feature used to keep the user coming back to the app. They entice the user to read unread messages. A notification is defined as a visual cue, auditory signal, or tactile alert generated by an application and designed to attract attention [46]. The user feels compelled to read the unread messages to remove the badge. Using dialogue messages that appear on the user's mobile screen, even when the device is inactive, is one of the effective ways to attract users to return to the application [47, 48].

In essence, PDS refers to the extent to which an application utilizes techniques such as reminders, suggestions, social roles, likes, similarity, rewards, and praise to motivate and inspire regular usage of the system. Within the WhatsApp platform, only the reminder, social role, suggestions, and like principles are employed. These features play a crucial role in encouraging users to maintain their usage of the app on a regular basis and sustain their interest. Specifically, the app's notification function is a powerful tool for incentivizing continued usage. PDS is crucial when designing a system intended to influence user behavior, attitude, and loyalty.

2.2. Persuasive Dialogue Support (PDS) and Altitudinal Loyalty (AL). Computer–human persuasive dialogue support in information technology applications provides users with relevant and inspiring system feedback using words, images, sounds, and other media to help users achieve their goals [26, 49–51]. PDS employs tactics such as reminders, suggestions, liking, praise, reward, and cues to trigger the user. By giving users proper guidance and feedback, the dialogue can help improve users' experience. PDS outlines the fundamental ideas that must be upheld to keep the user engaged in the system and to change their behavior [52–54].

Users often respond to information technology applications as if they were interacting in a social setting and view their interactions with these apps as interpersonal [55–57]. Supporting communication between people and information technology applications is crucial [52]. PDS was found to have a direct impact on perceived persuasiveness and credibility [53]. Reminders have a positive impact on the efficacy and adherence of web-based interventions that affect users' attitudinal loyalty to technology [47, 50]. By employing PDS features, the application reassures, motivates, and supports users to have continuous interaction [23]. Therefore, PDS features facilitate AL.

In conclusion, PDS plays a crucial role in maintaining user interest in IT apps by utilizing techniques such as reminders, suggestions, praise, rewards, and liking. Users view their interactions with these apps as social, and PDS directly affects their perceived persuasiveness and credibility. Reminders have been found to enhance the effectiveness and adherence of web-based interventions that influence users' attitudes and loyalty to technology. Therefore, it is important for app developers to incorporate PDS principles into their designs to improve user engagement and loyalty. Therefore, we propose the following hypothesis to test the relation between PDS and attitudinal loyalty:

H1: PDS has a significant impact on AL.

2.3. Attitudinal Loyalty (AL) and Continuous-Use Intention (CI). The CI helps to identify long-term behavioral changes which develop attitudes in individuals toward certain products or services [58]. Some studies have established a positive direct relationship between satisfaction and the AL [52, 53], and these relationships influence others to use certain products or services [53–55]. Previous studies have shown that a

Table 1: The persuasive dialogue support principles employed by WhatsApp.

Principle of persuasive dialogue technology	Feature in WhatsApp	Explanation and illustrative example in WhatsApp
Reminder	Push notifications	The notification that we receive when the app is not open.
	Badges	Users are motivated to read the messages to remove the budges. Badges are shown on WhatsApp icon and chat, status, and call tabs when they have messages or miscalls, for example, (i) Badge WhatsApp icon with red dot or number (ii) Badge chat tab with dots or numbers (iii) Badge status tab with dots or numbers (iv) Badge call tab with dots or numbers
	Vibrations/buzzing	A vibrating alert notification notifying the user of an incoming message.
	Flashlight blinking	Blink or pulse to inform and notify the user of new missed calls and/or incoming SMS messages without turning on the screen at all.
	Conversation tones	Play sounds for incoming and outgoing messages (the sounds played when you send and receive a message).
	Troubleshooting	A systematic approach to problem-solving that is often used to find and correct issues with WhatsApp. For example, if someone's message is not yet received because their phone needs to come online, WhatsApp will send a message "Waiting for this message. This may take a while."
Social Role	Last seen	The last time the contact used WhatsApp
	Read receipt	Two blue check marks appear when all participants in the group have read your message. For example, last seen today at 5:12 PM. It displays when the message or chat is viewed by the recipient (two blue ticks).
	Status notifications	It has a prompting feature to keep the user coming back to the app Everyone in the user's network would be notified when a user's status changed ("I woke up late" or "I'm on my way).
	Enter/exist notifications in group	Notifying in the chat that somebody has entered/exited the group
	Disappearing messages notifications (message+clock icon)	When enabled, the following message will appear in the chat box: "Disappearing messages have been turned on. All new messages will disappear from this chat 24 hours after they are sent. Clock icon will appear next to the contact or group's picture to notify that messages will disappear 24 hours, 7 days, or 90 days after the time they are sent.
Suggestions	Use mobile WhatsApp suggestion	When using Desktop WhatsApp and searching for messages, you will get the following message: "Use WhatsApp on your phone to see older messages"
	Word suggestions	Word autocorrection and suggestion in WhatsApp keyboards
	Image suggestions	During the writing process, WhatsApp suggests images of the text. For example, when we write coffee, a picture of coffee appears; when we write cake, a picture of cake appears; when we write morning, an image of a rising sun appears.
Liking	Simple interface and features	WhatsApp has a simple look that appeals to its users. For example, no username and password, simple sending and receiving text messages, simple sending and playing voice messages, and WhatsApp Web to send and receive messages via computers.

crucial factor in a product or service's success is the ongoing use of subscribers and that customer satisfaction is crucial in determining whether they will stick with a service or switch to another [46, 56]. Additionally, it was discovered that customers are more likely to migrate to another service provider if their allegiance is not tied to a positive opinion of the current one [32, 47]. Behavioral loyalty is heavily influenced by AL [57, 59].

In order to operationalize customer AL, three constructs have consistently been used: attitudes toward the provider [15], word-of-mouth rumors [6, 47], and resistance to counter-persuasion [50]. Inferred from the foregoing, it is projected that customers will continue to use WhatsApp if they become loyal to it, and therefore, AL will be a major determinant of continued WhatsApp use intention [60].

AL refers to the emotional attachment that a customer has toward a specific product or service. It goes beyond just customer satisfaction and measures the depth of the emotional connection that a customer has with a company. Customers with high levels of AL have a strong emotional bond with the product or service, which increases the likelihood of their continued loyalty in the future. AL plays an important role in predicting CI. Customers who have a positive emotional attachment to a product or service are more likely to remain loyal to it even when faced with challenges such as competition or market changes. Such customers identify strongly with the brand, and their loyalty is not easily swayed. Thus, accounting for AL can greatly aid in the prediction of CI. Businesses should focus on creating meaningful emotional connections with their customers to enhance loyalty and retention. By prioritizing customer service, companies can increase their long-term success and boost consumer loyalty. Accordingly, to test the relationship between AL and CI, the below-mentioned hypothesis is proposed:

H2: AL has a significant impact on CI to use WhatsApp.

2.4. Cross-Cultural Dimensions. Culture is a multifaceted and abstract concept that influences and forms human behavior [47, 61]. It is a learnt phenomenon acquired through socialization rather than a genetic trait [48, 62, 63]. There are many ways to define culture, which is thought of as the mental programming that distinguishes the members of one group of people from those of another [46, 56, 64]. People construct their own subjective reality based on their cultural conventions, beliefs, values, and logic [42, 65]. Each nation has its own unique set of cultural values, but there are also minor variations among separate regions of bigger nations and even among other socioeconomic groupings [6, 47]. Culture needs to be categorized and scientifically documented to create a path for future research. Daily customs eloquently express the layers of symbols, rituals, and heroes [66]. Symbols are found to be the most easily modifiable and clearly viewable. Values, on the other hand, are the constant and most challenging aspects of a culture to alter [67]. The cross-cultural approach is founded on values since, in every culture, values are the knowledge of what is just and moral. Equality, fairness, dominance, wealth, prestige, accountability, individualism, and responsibility are a few examples of values [60, 68]. The proposed approach for measuring cross-cultural traits consists of four components. PD is the most important dimension, followed by IND, UA, and MAS.

In brief, culture is a complex concept that influences human behavior and needs to be categorized and documented for future research. Values are the most challenging aspects of a culture to change, while symbols are the most easily modifiable. Cross-cultural dimensions include PD, IND, UA, and MAS.

2.5. Moderating Effect of Cross-Cultural Dimensions on PDS-LT Relation

2.5.1. Power Distance and PDS-LT Relation. The degree to which people in a nation expect and accept the unequal distribution of wealth or power is referred to as the power distance (PD) dimension. In strong PD cultures, the emphasis is on social status, hierarchical structures, and authority (such as Malaysia, Mexico, and the Arabic world). In contrast, individuals prefer to emphasize egalitarianism in small PD societies (such as Austria, Germany, and the USA). Interdependence between those in authority or who are powerful and those who are less powerful exists in these nations [65].

In certain studies, the association between work fit and job satisfaction is moderated by PD [69]. According to this study, people give cultural norms a higher priority than their own needs and demands, which means that their satisfaction with high PD culture is influenced by their cultural norms. There is a function for PD, but it does not have a detectable or substantial influence, which is an important field for research [70]. In contrast, the dimensions typically have a large moderating effect [66].

In brief, PD is a cultural dimension that reflects the acceptance of unequal distribution of power. Strong PD cultures emphasize hierarchy and authority, while small PD societies prefer egalitarianism. Therefore, to test the moderating effect of PD on the PDS and AL relationship, the following hypothesis is formulated.

H3a: PD moderates the relation between PDS and LT.

2.5.2. Individualism and PDS-LT Relation. In countries that value individualism, interpersonal ties are loose, and people are expected to take care of themselves and their immediate families. Examples of highly individualistic nations include the USA and European nations [61, 71]. In these communities, speaking one's mind is seen as a sign of honesty [56, 66], and people prioritize getting a job done over maintaining relationships [57, 70, 72]. On the other hand, people in collectivist nations, such as Malaysia, South Korea, and the Arab world, are part of strong, cohesive in-groups that protect them in exchange for unwavering devotion [38]. In collectivist nations, people frequently avoid direct conflict and strive to coexist in peace.

Cultural individualism emphasizes personal autonomy and self-sufficiency, potentially affecting people's response to PDS and their perception of an item's AL. Cultural characteristics are defined by common norms and assumptions about the world, including the IND dimension, which focuses on individualism versus collectivism. To establish long-term loyalty, businesses must consider cultural differences when creating marketing strategies that effectively engage their target audience. In summary, the IND dimension can influence the relationship between PDS and AL, and hypothesis H3b tests this relationship.

H3b: individualism moderates the relation between PDS and AL.

2.5.3. Uncertainty Avoidance and PDS-LT Relation. A person's tolerance for ambiguity or uncertainty is determined by how intimidated they feel in unknown and strange circumstances [47, 50, 67]. Some nations, including Belgium, Greece, and Japan, have a propensity for being risk-averse and intolerant of uncertain circumstances [73]. Contrarily, those living in weaker nations (such as Singapore, Hong

Kong, and the USA) tend to be more daring and adventurous [55]. Depending on whether they are individualistic and avoid ambiguity with low UA (Americans) or collectivistic and avoid uncertainty with high UA, some factors determining consumers' online purchasing inclinations may vary [74, 75]. Online buyers in Turkey, where UA is the culture of choice, evaluate the quality of a service based on four criteria: website design, security, fulfilment, and customer service [50, 76]. People who live in societies with a high degree of UA, like Japan, want to minimize personal risk and increase security [48, 67].

In brief, the level of ambiguity that a person can tolerate in unknown circumstances determines their level of intimidation. Some cultures are risk-averse, while others are more adventurous. Factors that influence online purchasing may vary [77] depending on individualistic or collectivistic tendencies and the level of uncertainty avoidance. To test the moderating effect of uncertainty avoidance on the PDS-LT relation, the following hypothesis is formulated:

H3c: UA moderates the relation between PDS and LT.

2.5.4. Masculinity and PDS-LT Relation. The degree to which a person's prevailing values are "masculine" is called their level of MAS [70]. According to Hofstede, those who hold these beliefs are more likely to be competitive and assertive [65, 78]. Social gender roles are distinctly different in nations that are categorized as being masculine such as Japan, Germany, and Switzerland [79]. In these nations, women are expected to be sensitive and concerned with life quality, whereas men are expected to be tough and driven by material success. In nations categorized as feminine, such as Sweden, Norway, and Denmark, social gender roles overlap [15], with both men and women expected to be sensitive and concerned about the standard of living [57, 71]. As a result, managers in strongly patriarchal societies give operating performance careful consideration because it is linked to their sense of social acceptance and self-worth [14]. Therefore, executives operating in high MAS countries prefer to limit their risk appetite and take on less risky initiatives in order to mitigate the bankruptcy risk and maintain their public image because bankruptcy is the obvious outcome of their personal failure [36].

In brief, the MAS dimension refers to the degree to which a person's values are competitive and assertive. In masculine cultures, men are expected to be tough and driven by material success, while women are expected to be sensitive and concerned with life quality. The moderating effect of MAS on the PDS-AL relation is hypothesized to be tested.

H3d: MAS moderates the relation between PDS and LT.

2.6. Moderating Effect of Cross-Cultural Dimensions on AL-CI Relation

2.6.1. Power Distance and AL-CI Relation. The perception of unequal power distribution by the less powerful individuals in a culture or organization depends on how it is distributed. Large PD cultures have centralized decision-making and management hierarchies where decisions are made by superiors, while small PD cultures have decentralized decision-making and management structures that are less hierarchical and more flexible [56, 80, 81]. PD has been found to negatively impact technology adoption [82–84]. A person's satisfaction with a high PD culture depends on their cultural norms, as they prioritize such standards over their own needs and desires [63, 85]. Additionally, it has been noted that in high PD cultures, where individuals are less receptive to adopting innovation, trust plays a larger role in determining customer behavioral intentions to use e-commerce [36]. Individualism positively moderates the association between service quality and satisfaction leading to AL, while the cultural aspects of UA negatively moderate the relationship between service quality and satisfaction [70]. Accordingly, the following hypothesis is developed to examine the moderation of PD for the AL-CI relationship.

H4a: PD moderates the relation between AL and CI.

2.6.2. Individualism and AL-CI Relation. Customers are independent, self-centred, and more demanding in societies with high levels of individualism [71, 81]. On the other hand, groups are valued in a collectivist society, and AL is expected throughout one's lifetime [56, 81]. In this culture, upholding social harmony and avoiding direct conflict are priorities. Additionally, good service results in customer happiness, which in turn produces AL [53, 55]. Even when they receive good service, people in more individualistic cultures are less likely to give the service provider praise; in contrast, if they receive terrible treatment, they are more likely to switch to another provider or spread bad rumors [13, 24, 66].

In brief, individualistic cultures prioritize personal needs and demand more from services, while collectivist cultures value groups and expect loyalty throughout their lives. Therefore, to examine the moderation of individualism for the LT-CL relationship, hypothesis H4b is proposed.

H4b: individualism moderates the relation between AL and CI.

2.6.3. Uncertainty Avoidance and AL-CI Relation. The degree to which people in a society try to deal with anxiety by reducing ambiguity in a circumstance is reflected in UA [41, 47, 56, 86]. Additionally, it could be interpreted as the degree to which a culture's citizens perceive themselves as being threatened by ambiguous and uncharted territory [65, 81]. This dimension addresses the degree to which a person can tolerate ambiguity and uncertainty [28, 63]. Decisions are made by a person on a shaky foundation that is influenced by their desire to preserve the status quo and by the idea that anything different is harmful [70]. Analysis must be shifted toward the reality of emotional demands, rules, and norms in order to comprehend the direction and relevance of this form of society [57, 62].

To summarize, UA reflects a society's tolerance for uncertainty and ambiguity and can influence decision-making processes. In cultures with high UA, people are less receptive to adopting innovation, and trust plays a significant role in determining customer behavioral intentions. In contrast, cultures with low UA tend to be more adventurous.

To examine the moderation of UA for the relationship between AL and CI, hypothesis H4c is proposed.

H4c: UA moderates the relation between AL and CI.

2.6.4. Masculinity and AL-CI Relation. The feminine paradigm encourages people to balance work and family life, whereas the masculine paradigm prioritizes the person's job and emphasizes a greater focus on work-life [36]. These different perspectives place varying values on strengths and weaknesses. Feminine societies show sympathy for the weak, while masculine societies respect and engage in conversation with the strong [70]. Comparing different paradigm viewpoints reveals not only differences in attitudes but also the degree to which they embrace technology. Past research has also shown that those who are more feminine place a high value on developing relationships, unlike men who may be less keen on working with others. We anticipate that people who are more feminine will place greater value on the design of social media applications, motivating them to continue using these platforms as they tend to value interpersonal communication [50, 63, 64].

In summary, the cultural dimension of MAS reflects the degree to which a society values competition and assertiveness. The proposed hypothesis examines its influence on the AL-CI relationship.

At the conclusion of this literature review, we present a conceptual model (see Figure 1) that summarizes these relationships.

H4d: MAS moderates the relation between AL and CI.

3. Methodology and Analysis

3.1. Respondents. The sample frame consists of millennials (born between 1981 and 1996) from four countries, namely, Germany, The Netherlands, Malaysia, and the Kingdom of Saudi Arabia (KSA). These countries were selected based on the varying cultural dimension scores according to Hofstede's value survey module (VSM), representing a diverse cultural spectrum as shown in Table 2. While Germany and The Netherlands are both European countries and have relatively similar scores in power distance (35 for Germany and 38 for The Netherlands), they exhibit differences in other cultural dimensions such as MAS, UA, and IND. Germany has a higher score in MAS (66 for Germany and 14 for The Netherlands) and UA (65 for Germany and 53 for The Netherlands), but a lower score in IND (67 for Germany and 80 for The Netherlands). Additionally, while Malaysia and KSA have relatively similar scores in PD (100 for Malaysia and 95 for KSA) and IND (26 for Malaysia and 25 for KSA), they exhibit differences in MAS and UA. Malaysia has a lower score in MAS (50 for Malaysia and 60 for KSA) and a much lower score in UA (36 for Malaysia and 80 for KSA). Additionally, Malaysia and the Kingdom of Saudi Arabia represent different cultural backgrounds, as these countries are in different regions and have distinct cultural values. Therefore, these countries were selected as they exhibit different cultural dimensions that justify their inclusion in the study.

We invite local educational institutions to help us circulate the e-survey in the WhatsApp groups of students.

Table 3 shows the demographic characteristics of respondents. The sample consisted of 56% of men and 44% of women. Three-quarters of the sample were between 25 and 45 years old. Around three-quarters had bachelor's or postgraduate degree. The table shows that the vast majority (90.8%) of respondents were employees with an average work experience of 4 years.

3.2. Measures. All measures were rated on a 5-point Likert scale (1 = "strongly disagree" and 5 = "strongly agree").

Continuous Intention: To assess the extent to which an individual intends to continue using WhatsApp, the three-item continuous intention scale developed by Bhattacherjee [87–89] was used (e.g., "I intend to continue using WhatsApp").

Attitudinal Loyalty: To assess the extent to which an individual has positive beliefs and feelings about the brand, expresses a liking for it, will recommend it to others, and feels committed to it [90], a six-item scale was developed based on Pritchard et al. [31] and Zeithaml et al. [91] (e.g., "I consider WhatsApp to be my first choice as a messaging application; I say positive things about WhatsApp to other people"; "Even if close friends recommended another smartphone messaging application, my preference for WhatsApp would not change").

Persuasive Dialogue Support: To assess the extent WhatsApp application reassures, motivates, and supports users to have continuous interaction with the system, six items were developed by the researchers based on the design principles of Oinas-Kukkonen and Harjumaa [26], e.g., "WhatsApp notifies me when a recipient reads, plays, or sees a message." The data for this measure were collected using WhatsApp July version 2022.

Culture: Hofstede's cross-cultural scale was measured using a 20-item scale adopted from Krüger [55] covering the 4 cultural dimensions: uncertainty avoidance (5 items), power distance (5 items), masculinity (4 items), and individualism (6 items).

3.3. Statistical Techniques. To analyze the data, SPSS and WarpPLS were used. Descriptive statistics have been analyzed using SPSS. Partial least squares (PLS) were used to test the hypothesized structural equation model using WarpPLS v. 8. The model fit and acceptance were reported.

3.4. Common Method Bias. To prevent common method bias, both procedural precautions before data collection and statistical techniques postdata collection were utilized. The survey's instruction section included introductory and contextual information, ensured anonymity, and confirmed that it would be only used for academic research to decrease the level of evolution apprehension [75, 92].

Statistically, CMB was assessed by PLS-SME. The average full collinearity (AFVIF) is 2.358 which is less than or equal to 3.3. This indicates that the model can be considered free of CMB [93]. In addition, Table 4 shows the correlations among the latent variables. The highest correlation is 0.759.

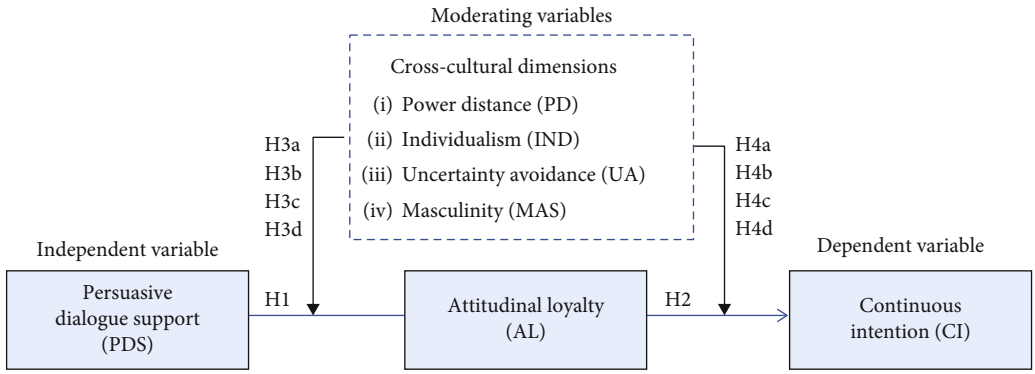

Figure 1: The conceptual model.

Table 2: Cultural dimension scores of the four countries (scale: 1-100).

Country	Power distance	Individualism	Masculinity	Uncertainty avoidance
Germany	35	67	66	65
The Netherlands	38	80	14	53
Malaysia	100	26	50	36
Kingdom of Saudi Arabia	95	25	60	80

Table 3: Demographics characteristics of respondents.

Variables	Categories	Number	Percent
Gender	Male	230	82.7
	Female	48	17.3
Marital status	Single	65	23.4
	Married	213	76.6
Age	26-30	50	18.0
	31-35	140	50.3
	36-41	88	31.7
Educational level	Secondary and less	47	16.9
	Diploma	123	44.2
	Bachelor	92	33.1
	Postgraduate	16	5.8
Work experience	Less than 5 years	44	15.8
	From 5 to less than 10	130	46.8
	From 10 to less than 15	72	25.9
	15 years and more	32	11.5
Total		278	100%

Since none of the correlations are higher than 0.90, this indicates that CMB is unlikely to be significant and, therefore, does not appear to be a serious threat for the interpretation of the data [79, 92].

3.5. Reliability and Validity of the Measurement Model. To verify the measurement model, both reliability and validity were examined [94]. First, to inspect the indicator reliability, squared loading for each indicator was checked. Indicators LT_4 and LT_6 were dropped from the loyalty scale and PDS_4 and PDS_6 from the persuasive dialogue support scale due to weak loading that is less than 0.05 [95].

Second, to check the construct reliability (internal consistency), Cronbach's alpha, composite reliability, and Dijkstra-Henseler's rho_A were checked. Table 5 shows that the minimum CA, CR, and rho_A values were found to be 0.799, 0.87, and 0.807, respectively. Dijkstra and Henseler's rho_A is considered to be the most important reliability measure for PLS [96]. Table 5 shows that all the CA, rho_A, and CR values exceed the minimum threshold value of 0.7 signifying the good reliability of the measurement model [95].

Third, convergent validity was checked using the average variance extracted (AVE) and outer loadings of the indicators. Table 5 shows that all the AVE values for the constructs are higher than the threshold value of 0.5 [95]. The lowest value of AVE is 0.613 for the construct PDS which is also more than 0.5, the minimum threshold. In addition, all outer loadings of the indicators shown in Table 4 ranging from 0.710 to 0.946 were above the acceptable threshold of 0.7 [95].

Fourth, discriminant validity (DV) was assessed using the Fornell and Larcker criterion [97]. Table 6 shows that the square root of AVE for all constructs was higher than the correlation coefficients with other constructs confirming the discriminant validity of the constructs.

3.6. The Structural Model. Before examining the results of the structural model, collinearity was first checked by examining the inner variance inflation factor (VIF) values of all sets of predictors (exogenous constructs) in the structural model. Table 7 revealed that the VIF values of exogenous constructs are below threshold 5 [95]. Therefore, collinearity issue among the predictor constructs in the structural model is not critical.

Table 4: Indicator loading and cross-loading value.

Indicator	Attitudinal loyalty (AL)	Continuous intention (CI)	Uncertainty avoidance (UA)	Power distance (PD)	Masculinity (MAS)	Individualism (IND)	Persuasive dialogue support (PDS)
AL_1	**(0.911)**	-0.089	-0.001	-0.051	0.066	-0.006	0.012
AL_2	**(0.894)**	-0.051	0.013	0.023	0.011	-0.053	-0.039
AL_3	**(0.875)**	0.177	0.059	-0.054	-0.028	0.033	-0.083
AL_5	**(0.831)**	-0.034	-0.075	0.088	-0.055	0.028	0.116
CI_1	-0.083	**(0.928)**	-0.004	-0.012	0.007	0.055	0.009
CI_2	-0.010	**(0.920)**	0.054	-0.031	-0.002	-0.028	-0.045
CI_3	0.092	**(0.946)**	-0.049	0.042	-0.005	-0.027	0.035
UA_1	-0.087	-0.142	**(0.757)**	0.151	0.037	-0.060	0.088
UA_2	0.216	-0.123	**(0.856)**	0.004	-0.056	-0.007	-0.046
UA_3	0.063	-0.059	**(0.860)**	-0.056	0.060	-0.013	-0.080
UA_4	-0.086	0.092	**(0.871)**	0.050	-0.036	0.012	0.000
UA_5	-0.119	0.221	**(0.828)**	-0.138	0.000	0.062	0.050
PD_1	0.008	0.082	0.058	**(0.805)**	-0.013	-0.106	0.106
PD_2	-0.005	0.087	-0.066	**(0.823)**	-0.077	0.078	0.049
PD_3	0.123	-0.266	-0.027	**(0.823)**	0.102	0.027	-0.094
PD_4	-0.221	0.075	0.080	**(0.837)**	0.097	-0.039	-0.009
PD_5	0.104	0.023	-0.048	**(0.784)**	-0.116	0.041	-0.051
MAS_1	-0.079	0.036	-0.065	0.250	**(0.774)**	0.070	-0.059
MAS_2	-0.013	0.220	-0.120	-0.031	**(0.808)**	0.019	-0.038
MAS_3	0.054	-0.158	0.047	0.040	**(0.867)**	-0.002	-0.001
MAS_4	0.035	-0.096	0.150	-0.286	**(0.710)**	-0.096	0.110
IND_1	0.121	-0.203	0.151	0.088	0.000	**(0.723)**	0.024
IND_2	0.245	-0.267	0.091	-0.119	-0.077	**(0.764)**	0.117
IND_3	-0.137	0.057	-0.123	-0.047	0.040	**(0.817)**	0.149
IND_4	-0.204	0.174	-0.019	-0.074	0.102	**(0.845)**	-0.028
IND_5	-0.087	0.211	-0.056	0.150	-0.103	**(0.801)**	-0.090
IND_6	0.099	-0.015	-0.022	0.010	0.029	**(0.798)**	-0.166
PDS_1	-0.287	0.343	0.134	-0.129	-0.026	0.092	**(0.818)**
PDS_2	-0.321	0.375	0.156	0.089	0.041	-0.358	**(0.712)**
PDS_3	0.332	-0.318	-0.128	0.068	-0.101	0.075	**(0.783)**
PDS_5	0.250	-0.354	-0.223	0.032	0.017	0.129	**(0.754)**

Note: AL_4, AL_6, PDS_4, and PDS_6 were dropped due to their poor loading.

Table 5: Convergent validity and construct reliability.

Latent construct	Cronbach's alpha	Composite reliability	Dijkstra (rho_A)	Average variance extracted (AVE)
Persuasive dialogue support (PDS)	0.841	0.887	0.852	0.613
Loyalty (AL)	0.901	0.931	0.904	0.771
Continuous intention (CI)	0.923	0.951	0.924	0.867
Uncertainty avoidance (UA)	0.891	0.92	0.894	0.698
Power distance (PD)	0.873	0.908	0.874	0.664
Masculinity (MAS)	0.799	0.87	0.807	0.627
Individualism (IND)	0.881	0.91	0.883	0.628

The results of the hypothesis testing with the respective β values, p values, and t values, are shown in Table 7 and Figure 2. The t values greater than 1.96 show that the relationship is significant at a 95% confidence level ($\alpha = 0.05$). In line with our hypotheses, the results show that PDS was positively related to AL ($\beta = 0.526, \rho < 0.001$) and AL was positively related to CI ($\beta = 0.690$, $\rho < 0.001$). Thus, H1 and H2 were supported.

Moreover, the moderation results show that UA and MAS negatively moderate the PDS-LT relation ($\beta = -0.164$,

Table 6: Discriminant validity results (Fornell-Larcker criterion).

	AL	CI	UA	PD	MAS	IND	PDS
AL	(0.878)						
CI	0.759	(0.931)					
UA	0.507	0.542	(0.836)				
PD	0.009	-0.197	-0.021	(0.815)			
MAS	0.277	0.111	0.267	0.431	(0.792)		
IND	0.319	0.304	0.519	0.180	0.415	(0.792)	
PDS	0.524	0.598	0.560	-0.113	0.209	0.295	(0.783)

Table 7: Hypothesis testing (outcome of the structural model).

H	Structural paths	Path coefficient (β)	p values	t values	Effect size (F^2)	Variance inflation factor (VIF)	Result
Direct effect							
H1	PDS ➔ AL	0.526	<0.001	9.579	0.298***	1.130	Supported
H2	AL ➔ CI	0.690	<0.001	12.888	0.528****	1.509	Supported
Moderating effect							
H3a	PDS * UA➔ AL	-0.164	0.003	-2.806	0.056**	1.993	Supported
H3b	PDS * PD➔ AL	0.079	0.092	1.334	0.005	1.162	Not supported
H3c	PDS * MAS➔ AL	-0.098	0.049	-1.665	0.01*	1.207	Supported
H3d	PDS * IND➔ AL	-0.111	0.03	-1.89	0.028**	1.745	Supported
H4a	AL * UA➔ CI	-0.171	0.002	-2.929	0.093**	2.156	Supported
H4b	AL * PD➔ CI	0.112	0.028	1.911	0.041**	1.698	Supported
H4c	AL * MAS➔ CI	-0.148	0.006	-2.53	0.048**	1.976	Supported
H4d	AL * IND➔ CI	-0.027	0.323	-0.46	0.01	1.824	Not supported

Note: *too weak effect; **small effect; ***medium effect; ****large effect.

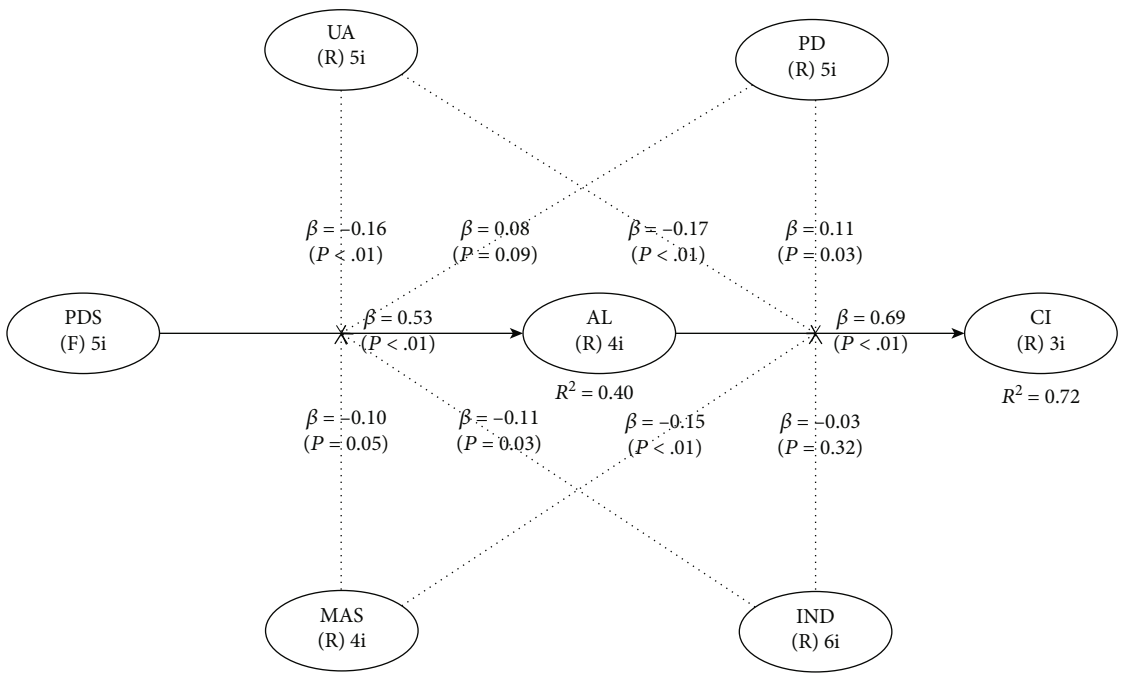

Figure 2: Outcome of the structural model using WarpPLS version 8.0.

$\rho = 0.003$; $\beta = -0.098$, $\rho = 0.049$) and AL-CI relation ($\beta = -0.171$, $\rho = 0.002$; $\beta = -0.148$, $\rho = 0.006$), respectively. Thus, H3a, H3c, H4a, and H4c are supported.

Furthermore, results show that PD does not have a significant moderating effect on the PDS-LT relation ($\rho = 0.09$ 2) but positively moderates the AL-CI relation ($\beta = 0.112$, $\rho = 0.028$). Thus, H3b is not supported, but H4B is supported. In addition, IND negatively moderates the PDS-LT relation ($\beta = -0.111$, $\rho = 0.03$) but does not have a significant moderating effect on the AL-CI relation ($\beta = -0.027$, $\rho = 0.323$). Thus, H3d is supported, but H4d is not supported.

R square (R^2) values of the endogenous latent variable were examined. Following the thumb rule, the R^2 values are evaluated based on 0.75, 0.5, and 0.25 representing substantial, moderate, and weak [95]. The average R^2 value of the model can be considered moderate as it can only explain 55.8% of the endogenous variable. This implied that exogenous constructs reflect a moderate explanation of the variance in AL and, therefore, are regarded as meaningful for interpretation.

The study also assesses the effect size for each path coefficient using the effect size provided in WarpPLS, which is similar to Cohen's f^2 (1988), but calculated through a different procedure to avoid a distortion inherent in the use of PLS-based SEM algorithms [98]. Effect sizes can ascertain whether the effects indicated by path coefficients are small = >0.02, medium = >0.15, or large = >0.35 [99, 100]. From a practical point of view, f^2 values below 0.02 suggest that effects are too weak to be considered relevant [98, 101, 102]. The exogenous variables in Table 7 have f^2 values ranging from too weak to large size.

In addition to evaluating the R^2 value, the predictive relevance of the model was assessed. Following the blindfolding procedure, Stone-Geisser's Q-squared coefficient of the path model was used as a criterion of additional predictive accuracy of the model [103–106]. The Q^2 value for loyalty and continuous intention in the model are 0.374 and 0.623, respectively, which are greater than zero. In accordance with the thumb rule, a Q-squared coefficient value greater than zero signifies that the model has predictive relevance for a particular dependent construct [95].

3.7. Model Fit of the Structural Model. Finally, the quality indices in Table 8 show that the model has a good fit with the data as they are within the range of generally accepted benchmarks for model fit [94]. For instance, average path coefficient (APC) = .213, $p < 0.001$ (acceptable if $p \leq 0.05$); average R-squared (ARS) = 0.558, $p < 0.001$ (acceptable if $p \leq 0.05$); average adjusted R-squared (AARS) = 0.550, $p <$ 0.001 (acceptable if $p \leq 0.05$); Average block VIF (AVIF) = 1.640 (acceptable if ≤5, ideally ≤ 3.3); average full collinearity VIF (AFVIF) = 2.358 (acceptable if ≤5, ideally ≤ 3.3); Tenenhaus' GoF (GoF) = 0.692 (small ≥ 0.1, medium ≥ 0.25, and large ≥ 0.36); Sympson's paradox ratio (SPR) = 1.000 (acceptable if ≥0.7, ideally = 1); R-squared contribution ratio (RSCR) = 1.000 (acceptable if ≥0.9, ideally = 1); statistical suppression ratio (SSR) = 1.000 (acceptable if ≥0.7); and nonlinear bivariate causality direction ratio (NLBCDR) = 0.800 (acceptable if ≥0.7). The indices corroborate with the standardized root mean square residual (SRMR) criterion on the approximate model fit. An SRMR value of less than 1 would provide support for any model to have a good fit [94]. The SRMR value of 0.094 in this study indicates a good fit for the PLS path model.

4. Discussion

Our study is aimed at investigating the relationships between persuasive dialogue support (PDS), attitudinal loyalty (AL), and continuous intention (CI) to use WhatsApp, while also exploring the moderating effects of various cross-cultural dimensions. To achieve these objectives, the direct effects of PDS on AL and AL on CI were first analyzed, followed by the moderating roles of four cultural dimensions, including uncertainty avoidance (UA), power distance (PD), masculinity (MAS), and individualism (IND), on the PDS-AL-CI relationship.

Our analysis revealed a significant direct impact of PDS on AL. This finding aligns with existing research, underlining the positive influence of persuasive dialogue support on attitudinal loyalty [94]. The sense of motivation and belongingness fostered by PDS may provide a plausible explanation for this relationship [80, 93]. These results emphasize the importance for app developers to prioritize and enhance persuasive dialogue support in their app designs, with the aim of increasing user acceptance and promoting sustained usage.

Consistent with our expectations, AL was found to have a significant direct impact on CI. This result is in line with previous research demonstrating the positive impact of attitudinal loyalty on continuous intention [94]. The sense of attachment and loyalty users develop toward an app can significantly contribute to their intention to continue using it. Therefore, creating an environment that fosters a sense of belongingness and motivation may further enhance app loyalty and ultimately lead to continuous intention to use.

In the first part of our analysis, we examined the influence of cross-cultural characteristics on the relationship between persuasive dialogue support (PDS) and loyalty (LT). Our results have uncovered fascinating insights into how different cultural dimensions shape this connection.

Power distance (PD), a measure of hierarchical structures in societies, did not exhibit a significant moderating effect on the PDS-LT relationship. However, individualism, uncertainty avoidance (UA), and masculinity (MAS) emerged as prominent moderators. These findings are in line with prior research that delves into the impact of cross-cultural dimensions on user adoption behaviors, especially within the context of smartphone apps in collectivist societies [31, 61, 107].

A noteworthy pattern that emerges from our results is the contrasting impact of collectivist and individualistic cultural orientations on the relationship between PDS and user adoption. Collectivist societies, characterized by a focus on group harmony and interdependence, displayed a heightened receptivity to persuasive designs. In these contexts, we

Table 8: Model fit indices.

Indices	Results	Acceptable thresholds
Average path coefficient (APC)	.213	$p < 0.001$
Average *R*-squared (ARS)	0.558	$p < 0.001$
Average adjusted *R*-squared (AARS)	0.550	$p < 0.001$
Average block VIF (AVIF)	1.640	Acceptable if ≤5, ideally ≤ 3.3
Average full collinearity VIF)AFVIF(	2.358	Acceptable if ≤5, ideally ≤ 3.3
Tenenhaus GoF	0.692	Small ≥ 0.1, medium ≥ 0.25, large ≥ 0.36
Sympson's paradox ratio (SPR)	1.000	Acceptable if ≥0.7, ideally = 1
R-squared contribution ratio (RSCR)	1.000	Acceptable if ≥0.9, ideally = 1
Statistical suppression ratio (SSR)	1.000	Acceptable if ≥0.7
Nonlinear bivariate causality direction ratio (NLBCDR)	0.800	Acceptable if ≥0.7
Standardized root mean squared residual (SRMR)	0.094	Acceptable if ≤0.1
Standardized mean absolute residual (SMAR)	0.073	Acceptable if ≤0.1

observed a robust positive association between PDS and user adoption. In contrast, individualistic societies, which emphasize individual autonomy and self-expression, exhibited a weaker connection in this regard [84, 94].

Furthermore, the moderating effect of uncertainty avoidance (UA) was evident in our analysis. Higher levels of UA seemed to weaken the otherwise positive relationship between persuasive designs and user acceptance. This implies that individuals with elevated UA tendencies may perceive persuasive app designs as riskier, leading to greater caution and reduced willingness to adopt these apps. Consequently, app developers should be mindful of designing exceptionally convincing and persuasive app features to counteract this perception, especially when targeting users with lower levels of UA.

It is worth noting that our analysis uncovered a common trend toward relatively high UA across all countries included in the study. This universal prevalence of high UA poses a challenge for app developers, as it suggests that users worldwide may approach persuasive designs with a certain level of caution. Hence, developers must strive for even more compelling and persuasive design strategies to stand out in a highly competitive app market.

The subsequent part of our moderation analysis explored how various cross-cultural dimensions influence the attitudinal loyalty- (AL-) continuous intention (CI) relationship. In this section, we found that power distance (PD), uncertainty avoidance (UA), and masculinity (MAS) significantly moderate this relationship, while individualism (IND) demonstrated an insignificant moderating effect. These findings align with prior research, which had already hinted at the nuanced interplay between cultural dimensions and the impact of persuasive designs on user acceptability [50, 64, 67].

Our results provided further depth by elucidating the implications for different countries. Specifically, countries known for restraint and lower individualism, such as Germany, tend to exhibit higher consumer approval for persuasive and convincing designs. These societies value conformity and hierarchical structures, making them more receptive to the influence of persuasive app designs. Conversely, countries characterized by higher levels of individualism, like the Netherlands, exhibit a somewhat paradoxical pattern. While high individualism fosters a favorable disposition toward app acceptance, it paradoxically diminishes the effectiveness of persuasive app designs in influencing user acceptance. This could be attributed to the autonomy and self-expression valued in individualistic cultures, which may lead users to prioritize their own preferences over persuasive elements.

Additionally, our findings spotlight the influence of masculinity (MAS), indicating its significance in moderating the AL-CI relationship. In cultures with higher MAS, which emphasize assertiveness and competitiveness, persuasive designs appear to have a more substantial impact on users' attitudinal loyalty and continuous intention.

In summary, our discussion of the moderating effects of cross-cultural dimensions adds depth to our understanding of how culture interacts with persuasive design and its implications for app adoption. While cultural differences can impact app design persuasiveness and user adoption, our study also highlights that cross-cultural differences may not have as significant an impact on app user acceptance as previously thought [56, 63, 80]. Consequently, our findings suggest that app developers should consider incorporating persuasive design features into their apps to increase user loyalty and intention to use, irrespective of cultural differences.

However, it remains essential to account for cultural norms in app design. Our findings emphasize the need for app developers to strike a balance between universal design principles and culturally sensitive adaptation to optimize their app's performance in different cultural contexts.

In conclusion, our study underscores the direct impact of PDS on AL and AL on CI, along with the substantial moderating effects of IND, UA, and MAS on the PDS-LT relationship and PD, UA, and MAS on the AL-CI relationship. Achieving optimal results in different cultural contexts necessitates a careful balance between incorporating persuasive design features and adapting to cultural norms.

Therefore, app developers should adopt a balanced approach, considering both universal design principles and culturally sensitive adaptation to enhance their app's performance across diverse cultural contexts.

5. Contribution to the Theory

The study's findings challenge previous research on the influence of culture in app adoption, suggesting that persuasive design plays a more significant role in the adoption of new applications and technology in general. This emphasizes the importance of incorporating persuasive design features into mobile applications to enhance user acceptance and AL. The study also found that only a few cross-cultural dimensions, including PD, IND, UA, and MAS, significantly impact the association between PDS, AL, and CI. This suggests that while cultural variations should still be taken into account when designing apps, people are increasingly developing design beliefs that are not solely determined by their local cultures. Rather, the impact of personality on digital culture should be considered in app design and development.

Furthermore, the study supports the idea that globalization is transforming how people perceive the world and fostering a more interconnected culture. As people become increasingly immersed in a global digital culture, their perspectives and the way they form opinions are changing. The study's findings demonstrate that there are fewer variations across countries than anticipated in terms of PDS, AL, and CI, indicating that people are more inclined to build beliefs that are not determined solely by their national cultures. This highlights the need for a more nuanced understanding of the impact of globalization on app adoption and the development of a PSD tool specifically for mobile applications. Overall, the study contributes to our understanding of the complex relationship between culture, persuasive design, and app adoption in a rapidly changing global digital landscape.

6. Practical Implications

The study's findings suggest that incorporating persuasive design features can significantly enhance user loyalty and intention to use mobile apps. The study reveals that the impact of culture on app design and development is not as significant as previously believed. Therefore, app designers can focus on creating technology and products that have a global appeal rather than catering to specific cultural preferences.

In the past, creating products that catered to regional markets led to culturally specific designs, increasing design and development expenses, and prolonging the time required to reach markets across different cultures. However, with the widespread acceptance of apps like WhatsApp, Facebook, Google.com, and most gaming programs that use persuasive design features in their designs, designers can now create technology and goods that will sell on a global scale. This means that designers can now focus on creating technology and products that are universally appealing, rather than catering to specific cultural preferences.

While local culture still plays a role in shaping user beliefs and preferences, the study suggests that designers should incorporate local characteristics into their designs rather than adapting to local beliefs and viewpoints. This way, designers can ensure that what they create is appropriate for many cultures. Our research confirms that characteristics such as PD, IND, UA, and MAS demonstrated by respondents in a particular nation determine how compelling an app design is on user acceptance. By focusing on the characteristics that are most likely to appeal to a broad audience, app designers can create designs that are appropriate for many cultures.

Overall, these findings suggest that designers need to strike a balance between universal design principles and culturally sensitive adaptation to achieve the best results in different cultural contexts. By focusing on the elements that have a significant impact on user adoption and acceptance, designers can create persuasive designs that appeal to a global audience, while also incorporating local characteristics into their designs to ensure cultural relevance.

7. Limitations and Future Research Directions

The limitations of this study need to be acknowledged. One major limitation is that the data used in this study was self-reported by WhatsApp users, which may lead to subjective responses and potential biases. Additionally, the study focused solely on the use of WhatsApp and did not examine other popular mobile apps, which limits the generalizability of the findings to other app contexts. The sample size was also limited to only four countries, which may not be representative of the broader global app market. Specifically, the study did not include any countries from the Americas or Africa, and future research should consider expanding the scope to include a more diverse set of nations with varying cultural dimensions. Another limitation is that demographic subgroups, such as age and gender, were not analyzed, which could provide further insights into the relationship between persuasive design and app adoption. Future research should explore the impact of these demographic factors on the PDS-LT-AL-CI relationship. Furthermore, this study did not investigate the specific role of security, trust, and privacy. Future research may explore their influence on AL and CI, providing a deeper understanding of app adoption in a security-conscious environment. Despite these limitations, this study provides important insights into the role of persuasive design and cultural dimensions in mobile app adoption and usage, which can inform future research and the development of mobile apps.

8. Conclusions

In conclusion, this study has provided valuable insights into the relationship between PDS, AL, and CI, as well as the moderating effects of cross-cultural dimensions on these associations. The study has demonstrated that incorporating persuasive design features can significantly enhance user

loyalty and intention to use mobile apps. The results also suggest that the impact of culture on app design and development is not as significant as previously believed. The study's findings on user-friendliness and the impact of cultural differences were consistent with previous research. However, it is worth noting that the study was limited to WhatsApp users and only included four countries, which may not be representative of the overall worldwide app market. Thus, there is a need to expand the scope of this study to include more countries with diverse cultural dimensions.

The study's findings have several practical implications for app designers and developers. By focusing on the characteristics that are most likely to appeal to a broad audience, designers can ensure that what they create is appropriate for many cultures. Local elements should now be effortlessly integrated into the creation of a product or technology, according to PSD. Additionally, the study highlights the importance of considering the impact of personality traits, such as UA, on app acceptability, especially in collectivist cultures.

In future research, it would be interesting to examine the moderating effects of other cultural dimensions, such as long-term orientation and uncertainty avoidance, on the relationship between PDS, AL, and CI. It would also be beneficial to investigate the impact of demographic factors, such as age and gender, on app acceptance and the role of personality traits in determining user behavior. Overall, this study contributes to the growing body of research on persuasive dialogue technology and provides a foundation for the development of effective persuasive design strategies for mobile apps.

Data Availability

The survey data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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