WACANA SENI
Journal of Arts Discourse

Culturally Driven Emotional Connection in Technology Acceptance: Extending TAM for Elderly Smartphone Interface Design

Huang Linqi[1,2], Rasslenda Rass Rasalingam[1]* and Norfarizah Mohd Bakhir[1]
[1]School of The Arts, Universiti Sains Malaysia, 11800 USM, Pulau Pinang, Malaysia
[2]Institute of Creativity and Innovation, Xiamen University, Zhangzhou, Fujian 363105, China

*Corresponding author: rasslenda@usm.my

Submitted: 13 January 2026 ● **Accepted:** 23 May 2026 ● **Published online:** 30 September 2026

To cite this article: Huang Linqi, Rasslenda Rass Rasalingam and Norfarizah Mohd Bakhir. 2026. "Culturally Driven Emotional Connection in Technology Acceptance: Extending TAM for Elderly Smartphone Interface Design." *Wacana Seni Journal of Arts Discourse* 25(2): 98–119. https://doi.org/10.21315/ws2026.25.2.7

To link to this article: https://doi.org/10.21315/ws2026.25.2.7

ABSTRACT

As population ageing accelerates, the acceptance of smartphone interfaces among elderly users has become an important challenge for digital inclusion. Many existing smartphone interfaces remain insufficiently adapted to elderly users' operating habits and cognitive characteristics, limiting their effective use. To address this issue, this study investigates the factors influencing elderly users' acceptance of smartphone interfaces based on the Technology Acceptance Model (TAM). An exploratory sequential mixed-methods approach was employed. Semi-structured interviews with nine elderly smartphone users in the Minnan region of China were conducted to identify key influencing factors, followed by a questionnaire survey of 433 elderly users to empirically validate the proposed relationships. Perceived Affective Connection (PAC) is defined as an affective response triggered by culturally familiar interface cues, such as regional symbols, local dialects, and place-related imagery. The results show that PAC significantly predicts Attitude Toward Using ($\beta = 0.183$, $P < 0.001$). By integrating PAC grounded in Arnold's Appraisal Theory of Emotion, this study extends the traditional TAM and demonstrates how regional culture functions as an active emotional trigger rather than a background variable. The findings provide theoretical insights into technology acceptance among elderly users and inform emotionally and culturally grounded interface design.

Keywords: TAM, *affective factors*, *elderly users*, *smartphone interface*, *regional culture*

INTRODUCTION

Global population ageing has created increasing demands for technological adaptation, particularly in relation to information access and social interaction. Although smartphone adoption among elderly users in China was relatively low before 2015, recent national surveys indicate that usage has increased substantially. By the end of 2022, approximately 50% of adults aged 65 to 69 and 31.2% of those aged 70 to 79 reported using smartphones (Xinhua 2023). Despite this growth, elderly users often experience age-related cognitive and physiological decline, which makes digital technologies more difficult to use compared with younger

© Penerbit Universiti Sains Malaysia, 2026. This work is licensed under the terms of the Creative Commons Attribution (CC BY) (http://creativecommons.org/licenses/by/4.0/).

populations (Neves et al. 2018). Many existing products also fail to adequately consider elderly users' cognitive abilities and operational habits in their interface design (Xie et al. 2021; Yazdani-Darki et al. 2020). Complex functions, small fonts, and unintuitive interaction processes may therefore hinder daily smartphone use and reduce their willingness to adopt the technology (Contreras-Somoza et al. 2021; Wildenbos et al. 2018). Previous research suggests that emotional factors play an important role in technology acceptance. Emotionally supportive interfaces can reduce technology anxiety, strengthen familiarity and belonging, and facilitate technology adoption among elderly users (Fisk et al. 2020; Zhou et al. 2022).

Although emotional factors have received growing scholarly attention, limited research has examined how cultural context influences affective mechanisms in elderly users' technology acceptance. Prior research shows that cultural context shapes emotional perception and behavioural responses (Markus and Kitayama 1991) and is associated with affective responses among elderly users (Benvenuti et al. 2020; Zisberg 2017). In this study, regional culture is not treated as a background variable, but as a set of culturally familiar interface-level cues—such as local symbols, dialects, and place-related imagery—that function as emotional stimuli triggering affective responses during interaction. Building on this perspective, the study explores how emotional connections formed through regional cultural cues in smartphone interface design influence elderly users' acceptance of smartphone interfaces.

Based on the Technology Acceptance Model (TAM) and Appraisal Theory of Emotion (ATE), this study adopted an exploratory sequential mixed-method design (Creswell and Plano Clark 2017) and conducts an empirical investigation in the Minnan region. Semi-structured interviews were first conducted to explore contextual factors influencing elderly users' acceptance of smartphone user interfaces. A questionnaire survey using established measurement scales was then analysed with structural equation modelling to examine the relationships among these factors. By integrating qualitative contextual insights with quantitative validation, the study provides a structured empirical framework for understanding how affective and cultural factors influence smartphone interface acceptance among elderly users (Tashakkori et al. 2020).

Prior research applying the TAM to elderly users has primarily examined functional and usability-related determinants, particularly Perceived Usefulness (PU) and Perceived Ease of Use (PEU), to explain technology adoption behaviours among elderly users (Guner and Acarturk 2020; Martín-García et al. 2022). These studies have generated important insights into age-related usability barriers and cognitive challenges in digital technology use. However, emotional and cultural dimensions are often treated only as contextual factors rather than as explicit mechanisms influencing technology acceptance. In particular, limited research has examined how culturally familiar interface cues may evoke affective resonance and shape elderly users' attitudes toward technology. As a result, although emotional factors have received increasing attention in user experience research, the mechanisms through which culturally grounded affective responses influence elderly users' technology acceptance remain insufficiently understood. Addressing this gap, the present study investigates how emotional connections triggered by regional cultural cues in smartphone interface design influence elderly users' acceptance of smartphone interfaces.

By examining the role of emotional factors in elderly users' acceptance of smartphone user interfaces, this study extends the TAM by integrating an affective dimension grounded in ATE. Specifically, the study introduces Perceived Affective Connection (PAC) as an affective construct that captures emotional connections triggered by culturally familiar interface cues during interaction. This perspective reframes regional culture not as a background variable but as a source of interface-level stimuli that activate affective responses. Empirical validation in the context of elderly smartphone interface use demonstrates that PAC significantly shapes

attitudes toward technology use alongside usability- and usefulness-related evaluations. These findings clarify the role of culturally grounded affective mechanisms in technology acceptance and provide implications for culturally informed interface design and digital inclusion among elderly users.

LITERATURE REVIEW

Smartphone User Interface and Emotional Factors

A smartphone user interface consists of the visual and interactive elements through which users interact with a smartphone, such as icons, menus, buttons, and gestures (Salman et al. 2018). Emotional design refers to approaches that evoke users' emotional responses through visual, interactive, and feedback elements to enhance user experience (Norman 2004). Fisk et al. (2020) highlight that the emotional needs of elderly users significantly influence their technology adoption behaviour and identify emotion as a key factor in the acceptance of new technologies among active elderly users.

Existing research on emotional factors in interface design mainly focuses on two areas. One line of research examines how emotional acceptance can be enhanced through visual interface design. For example, Zhou et al. (2022) show that interface layout, colour selection, information density, and content arrangement can promote emotional resonance and improve interface acceptance among elderly users. Another line of research examines the multidimensional nature of emotional factors. Liu et al. (2021) suggest that emotional attachment and positive affective experiences can significantly influence elderly users' intention to adopt smartphone applications.

Overall, existing studies demonstrate the importance of affective factors in elderly users' technology acceptance; however, most research focuses either on affective feedback following user experience or on identifying which affective dimensions influence acceptance. The mechanisms through which affective responses are formed during interaction remain relatively underexplored. Although some studies note the relationship between cultural background and elderly users' affective experiences (Zisberg 2017; Benvenuti et al. 2020; Alsswey and Al-Samarraie 2020), systematic research explaining how elderly users interpret interface cues and contextual meanings to form affective responses—and how these processes subsequently influence technology acceptance—remains limited. This gap highlights the need to further examine how cultural meaning shapes elderly users' affective experiences during smartphone interface interaction.

Cultural Meaning and Emotional Resonance in Interface Design

In user–interface interaction, emotional experience does not arise solely from functional feedback or task outcomes, but from the meanings users attribute to interface cues and their subjective interpretation of those cues (Hassenzahl 2010). Kim and Sundar (2012) further indicate that users interpret interface information based on prior experiences and cognitive frameworks, and that this interpretive process is often accompanied by emotional appraisal and affective responses. When interface design incorporates culturally familiar elements, these cues may activate users' existing cognitive and emotional experiences, eliciting affective resonance, psychological comfort, and more positive attitudes toward technology use.

Within interface design, cultural meaning is typically expressed through interface-level cues such as symbolic forms, linguistic styles, visual imagery, and design elements related to users'

lived experiences. Research in human–computer interaction suggests that culturally congruent interface cues can enhance usability and familiarity, thereby eliciting positive emotional responses during interaction (Čeněk and Čeněk 2015). For elderly users in particular, cultural familiarity plays a critical role in shaping emotional responses. Familiar interface cues can reduce uncertainty and cognitive load while alleviating technology-related anxiety (Wang et al. 2025). Furthermore, when interface design evokes emotional resonance, it can foster more positive attitudes toward technology and stronger intentions for continued use among elderly users (Spatola et al. 2022). Based on this discussion, regional cultural elements embedded in interface design may evoke emotional resonance through culturally familiar cues. These affective experiences provide the basis for conceptualising PAC in elderly users' technology acceptance.

Factors Influencing on the Acceptance of Smartphone User Interface Technologies

As a well-established theoretical framework for understanding and predicting user acceptance of new technologies, the TAM explains how PU and PEU influence user acceptance of technology. PU and PEU influence Behavioural Intention to Use (BI) through the mediating variable Attitude Toward Using (ATU). PU represents perceived performance benefits, while PEU reflects the perceived ease of using a technology (Davis 1989). PU and PEU, as core independent variables in TAM, have been validated and applied by numerous studies (Al-Adwan et al. 2023; Teo 2009). Building upon the core TAM constructs, this study introduces PAC as an additional independent variable. In this study, PAC is defined as an affective connection experienced by elderly users during interaction with smartphone interfaces, which is triggered by culturally familiar interface cues.

In technology acceptance and user experience research, affective factors have been conceptualised through related constructs such as perceived enjoyment, emotional attachment, affective trust, aesthetic pleasure, and emotional satisfaction. Although these constructs capture different aspects of affect in user–system interaction, they differ in their theoretical emphasis. Compared with these constructs, PAC does not primarily refer to immediate emotional pleasure, nor to long-term emotional attachment developed through extended use. Instead, PAC focuses on whether users experience a sense of emotional connection during interaction, grounded in their interpretation of meanings embedded in interface cues, particularly when cultural familiarity is involved. PAC therefore represents an affective connection grounded in meaning interpretation and emotional appraisal rather than a single emotional state or post-use satisfaction. By emphasising how affective responses are formed—rather than merely identifying affective states—PAC provides a distinct analytical perspective for understanding technology acceptance among elderly users.

Methodological Foundations for Measuring Technology Acceptance

The measurement of variables in the TAM has commonly been approached through two complementary methodological strategies: qualitative interviews and quantitative questionnaires. Qualitative approaches typically explore constructs such as PU, PEU, and affect-related factors through semi-structured interviews (Carmona et al. 2024; Zhao et al. 2021).

Relationships among TAM variables are most often examined using questionnaire-based surveys adapted from the original TAM scales proposed by Davis (1989). These instruments have been widely applied and empirically validated across numerous TAM studies, demonstrating strong reliability and validity (Guner and Acarturk 2020; Martín-García et al. 2022). TAM measurements

are typically operationalised using Likert-type scales (Field 2018), with five-point and seven-point formats most commonly adopted in technology acceptance research and widely supported for their psychometric reliability (Šumak et al. 2011).

Research Foundation and Conceptual Framework

Although existing studies have emphasised the importance of elderly users' emotional needs, systematic research examining how affective factors influence technology acceptance among elderly users remains limited, particularly regarding the mechanisms through which emotional resonance is triggered during interaction. Previous studies have shown a strong relationship between cultural context and emotional factors among elderly users (Benvenuti et al. 2020), suggesting that culturally embedded elements shape affective experiences during technology use. Building on the TAM, incorporating an affective dimension provides a theoretical pathway for examining how cultural meaning may influence elderly users' expectations and technology acceptance, thereby informing more adaptive interface design strategies.

This study integrates the TAM with ATE. While TAM explains technology acceptance primarily through PU and PEU, it does not sufficiently account for affective influences, which are particularly relevant in the context of elderly users (Venkatesh and Bala 2008). Therefore, drawing on ATE, this study introduces PAC into the TAM framework to examine how culturally grounded affective responses influence technology acceptance. The proposed conceptual framework is presented in Figure 1.

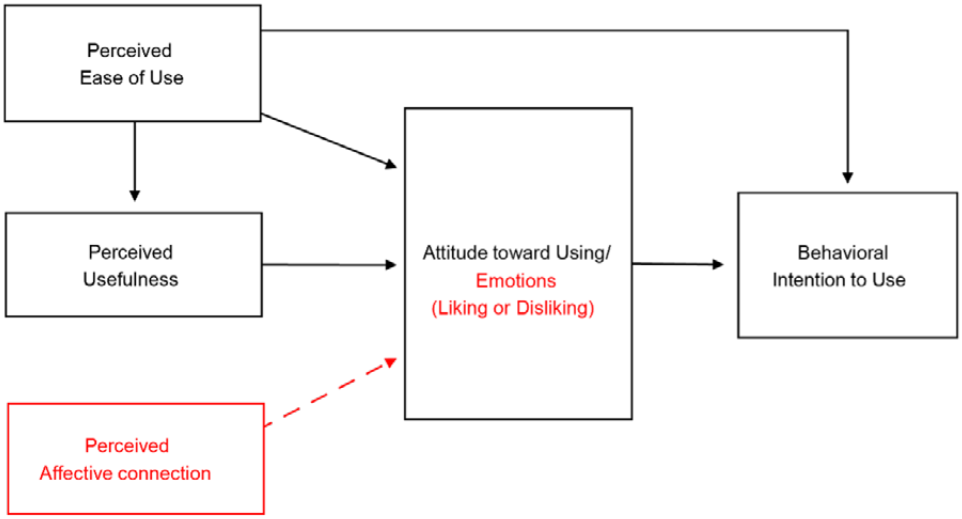


Figure 1 Conceptual framework based on TAM.

Source: Author's illustration based on Davis (1989) and Arnold (1960).

Hypotheses Development

Based on the TAM, this study re-examines the established relationships among PEU, PU, ATU, and BI in the context of elderly users' smartphone interface acceptance (H1–H5). In addition, a new affective pathway is introduced by examining the influence of PAC on ATU (H6).

H1: PEU positively influences PU.

H2: PEU positively influences ATU.

H3: PU positively influences ATU.

H4: ATU positively influences BI.

H5: PEU positively influences BI.

H6: PAC positively influences ATU.

The proposed effect of PAC on ATU (H6) is theoretically grounded in Arnold's (1960) ATE, which suggests that emotions arise from individuals' appraisal of environmental stimuli and can influence attitudes and behavioural tendencies. In this context, culturally familiar interface cues may evoke emotional responses that strengthen users' positive attitudes and subsequently shape behavioural intentions. Introducing PAC therefore extends the explanatory scope of TAM by incorporating affective mechanisms into the technology acceptance process. Integrating TAM with ATE provides a theoretical basis for understanding how culturally grounded affective responses influence technology acceptance and highlights the importance of emotional needs in interface design for elderly users (Bagozzi 2007).

To examine these relationships, this study first conducted semi-structured interviews with elderly users in the Minnan region to explore the independent variables in the conceptual model (RQ1). Subsequently, questionnaire data were used to assess the fitness of the conceptual model and to examine the path relationships among the variables (RQ2). Specifically, the study addresses the following research questions:

RQ1: What are the key factors affecting the acceptance of smartphone UI design by elderly users in the Minnan region?

RQ2: How do the influencing factors impact the elderly users' BI of smartphones?

METHODS

Research Design

This study adopted an exploratory sequential mixed-methods design, combining qualitative and quantitative approaches to examine elderly users' acceptance of smartphone user interfaces. Semi-structured interviews with elderly users in the Minnan region were first conducted to identify key influencing factors. A subsequent questionnaire survey was then used to empirically validate the relationships among these factors. Ethical approval was obtained and informed consent was secured from all participants.

Samples

Elderly smartphone users in the Minnan region of China were recruited using purposive sampling to ensure relevance to the research questions (Palinkas et al. 2015). Participants were required to meet the following criteria: aged between 60 and 75, with at least one year of smartphone use, permanent residency in the Minnan region for more than three years, and willingness to participate. Individuals with severe visual or motor impairments affecting smartphone use were excluded.

The study sample comprised two groups: participants in semi-structured interviews and respondents to the questionnaire survey. With assistance from staff at community elderly activity centres and universities for the elderly in the Minnan region, nine participants were recruited for the qualitative interviews. The interview participants included four males and five females aged between 60 and 75 with educational backgrounds ranging from primary school to

bachelor's degree. For the quantitative phase, a total of 433 valid questionnaires were collected, exceeding the minimum sample size of 384 recommended by Krejcie and Morgan (1970). A detailed summary of respondents' demographic characteristics and smartphone usage profiles is provided in Appendix A.

Instrument

This study employed semi-structured interviews for the qualitative phase and structured questionnaires for the quantitative phase. The interview protocol was organised around the three core constructs in the conceptual framework: PU, PEU, and PAC. Fourteen questions were developed based on these themes, with reference to established instruments in prior studies (Guner and Acarturk 2020; Guo et al. 2023; Ugalde et al. 2023). The interview guide is provided in Appendix B.

For the quantitative phase, a structured questionnaire was designed to test the hypothesised relationships among the five variables in the conceptual framework (PU, PEU, PAC, ATU, and BI). The quantitative measures were adapted from established TAM-related instruments, while PAC items were operationalised based on affect-related constructs in prior literature and interpreted within the Minnan cultural context (Lamm et al. 2020; Guner and Acarturk 2020; Guo et al. 2023; Ugalde et al. 2023). The qualitative interviews were used solely to support construct relevance and contextual grounding. Semi-structured interviews were considered appropriate because they enable participants to describe subjective experiences and contextual meanings, helping researchers understand how theoretical constructs operate within specific interaction contexts (Creswell and Plano Clark 2017; Hennink et al. 2020). In this study, the interviews ensured that PAC and related TAM constructs reflected elderly users' culturally situated smartphone experiences in the Minnan context.

Considering the cognitive characteristics of elderly users, the questionnaire employed simple and clear wording. All items were measured using a five-point Likert scale, widely used in technology acceptance research (Joshi et al. 2015).

Data Collection

Data collection was conducted after obtaining ethical approval. Prior to participation, all elderly participants were provided with detailed informed consent forms outlining the purpose of the study, procedures, potential risks, and their rights. Given the characteristics of the elderly users, appropriate response measures were in place, and participants could be accompanied by a family member or healthcare professional if needed.

Semi-structured interviews were conducted following the completion of a brief demographic survey and guided by a predefined interview protocol (Appendix C). Interviews lasted approximately 30 to 60 minutes (Hennink et al. 2020). With participants' consent, interviews were audio-recorded, transcribed and anonymised. Each participant received compensation (CNY 50).

The questionnaire survey was administered using both online and offline methods. Online questionnaires were distributed via a commonly used survey platform (Questionnaire Star), accessible through participants' daily social networking applications (e.g., WeChat). Paper-based questionnaires were provided to participants who were unable to complete the online version, with assistance offered when necessary. A total of 570 questionnaires were distributed, of which 433 valid responses were obtained. All collected data were anonymised to ensure participant privacy.

Data Analysis

Qualitative interview data were analysed using Template Analysis. A priori themes were derived from the TAM and ATE, focusing on three core constructs: PU, PEU, and PAC. During familiarisation and initial coding, the template was iteratively refined to better reflect the data, resulting in a final coding template used to interpret how these themes shaped elderly users' attitudes and behavioural intentions. NVivo 11 was used to support code management and tracking (Brooks et al. 2015).

To enhance qualitative trustworthiness, all transcripts were first coded by the first author following Template Analysis procedures (King 2012). A second researcher with qualitative expertise independently reviewed the coding framework and a subset of coded transcripts. Discrepancies were resolved through negotiated consensus, which informed refinements to the final template. Thematic saturation was assessed iteratively following qualitative research guidance for relatively homogeneous samples (Hennink et al. 2020). After the eighth interview, no new themes relevant to the research questions emerged, and the ninth interview confirmed coding stability.

Quantitative data were analysed using SPSS 26.0 and AMOS 23.0 with structural equation modelling. Prior to hypothesis testing, reliability and validity were examined. The analysis proceeded from descriptive statistics to confirmatory factor analysis for convergent validity and internal consistency, followed by structural model fit assessment and path analysis to evaluate the hypothesised relationships.

RESULTS

Results of Semi-structured Interview Analysis (RQ1)

Semi-structured interview data were analysed using Template Analysis based on TAM and ATE. Three a priori themes (PU, PEU and PAC) were identified, each comprising two higher-level categories and multiple codes (Figure 2).

Perceived Usefulness

The interview findings indicate that PU plays a central role in elderly users' acceptance of smartphone interfaces, particularly in supporting social communication, daily activities, leisure, and personalised needs.

In terms of social communication, respondents frequently reported that smartphone interfaces facilitated interpersonal interaction and emotional closeness. Applications such as WeChat were widely regarded as essential communication tools. As one participant noted, "The most useful one should be WeChat, which is mainly used to communicate and connect with other people" (S9).

Regarding daily life convenience, mobile payment was one of the most frequently mentioned functions. One respondent stated, "Now you can pay for groceries and shopping with your smartphone, which is much more convenient than before" (S8). Other commonly cited functions included online medical appointment systems, navigation, information search, and online shopping, all of which were perceived as reducing effort and improving daily efficiency.

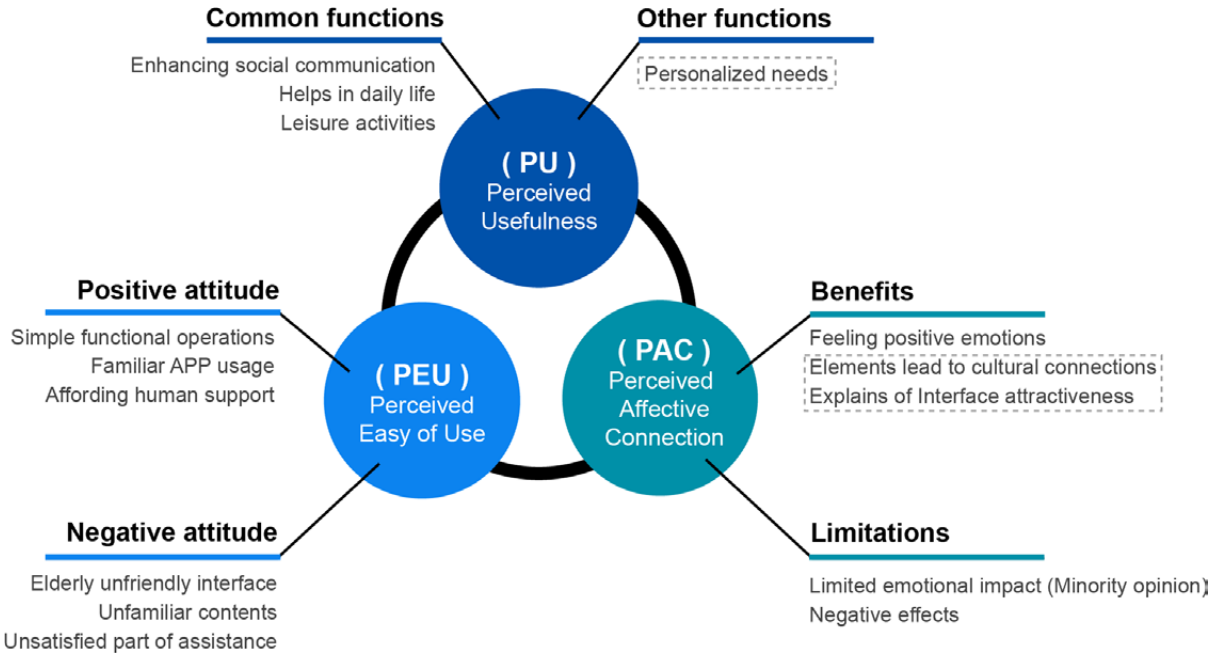


Figure 2 Results of the semi-structured interview analysis (RQ1).

Source: Author's illustration.

Smartphone interfaces were also considered useful for leisure and entertainment. Respondents described accessing news, watching short videos, and playing mobile games as common leisure activities. In addition, several interviewees highlighted personalised motivations for smartphone use. For example, one participant emphasised the importance of photography as a key purchasing consideration, stating, "Taking photos is one of the main functions I considered when I bought a smartphone, mainly based on my personal use needs" (S9). Other personalised uses included online learning and file sharing.

Perceived Ease of Use

The interview data revealed mixed perceptions regarding the ease of use of smartphone interfaces among elderly users. Respondents generally appreciated interface features that supported simple and intuitive operation. Adjustable settings such as font size, screen brightness, and sound level were frequently mentioned as helpful. One participant remarked, "Adjustments for font size, screen brightness, and sound level were easy to find" (S3).

Familiar applications with clear layouts and straightforward interaction flows were also perceived as easy to use. For instance, one respondent commented, "The interface design of WeChat is easy to use, and you can make a video call with just a tap of a button, which is especially practical for us old people" (S1). When encountering technical difficulties, respondents tended to seek face-to-face assistance from family members, although some also reported willingness to accept remote guidance from acquaintances.

However, several respondents expressed dissatisfaction with certain interface designs. Issues such as complicated navigation structures, small or low-contrast text, excessive advertising, and crowded layouts increased operational difficulty. As one participant noted, "Some of the text is too small or too light, it's not clear enough" (S2). Another mentioned, "There are too many recommended products on the page, so it takes several clicks to find my orders" (S6).

In addition, system updates and the introduction of new features were reported to increase learning burden. One respondent explained, "I can handle familiar functions by myself, but might need assistance when facing new features or software" (S8). Participants also noted insufficient in-app support such as tutorials and guidance functions, which negatively affected their ability to resolve problems independently.

Perceived Affective Connection

The interview analysis further revealed that smartphone interfaces influenced elderly users' PAC by eliciting emotional resonance and feelings of familiarity. Many respondents reported feelings of comfort and familiarity with interface design, which contributed to emotional acceptance. One participant noted that culturally familiar elements could evoke affectionate emotions, stating, "Hometown elements can bring a kind of affectionate emotion, and looking at them makes people appreciate and praise them" (S3).

Cultural elements embedded in interfaces were frequently identified as an important source of emotional connection. Respondents expressed interest in interfaces featuring local landmarks, natural scenery, regional symbols, and dialects. As one interviewee described, "Seeing famous people from my hometown, or hearing stories in the Minnan dialect, gives me a sense of closeness" (S4). These cues enhanced interface attractiveness and emotional engagement.

However, affective responses were not uniform across participants. Some respondents reported limited emotional sensitivity to cultural elements and prioritised operational efficiency instead. Some expressed concerns that excessive cultural or decorative elements could distract attention or reduce usability. For example, one participant stated, "I do not have any special emotional response even if hometown cultural elements are added; it doesn't make the interface more attractive to me" (S2), while another remarked, "I prefer modern, universal designs—too many cultural elements are unnecessary and may interfere with efficiency" (S9).

Results of Questionnaire Analysis (RQ2)

The questionnaire data were analysed using confirmatory factor analysis and structural equation modelling. Confirmatory factor analysis was conducted to examine measurement validity, followed by structural model fit testing and path analysis. The results confirmed all original TAM relationships, and the proposed PAC to ATU path also showed a significant positive effect.

Validation Factor Analysis

Table 1 presents the confirmatory factor analysis results. All standardised factor loadings exceeded 0.6, the average variance extracted values for all constructs were above 0.5, and the composite reliability values exceeded 0.7, indicating good convergent validity and internal consistency.

Table 1 Validation factor analysis results.

Dimension	Item	Standardised factor loading	Average variance extracted	Composite reliability
PU	PU1	0.766	0.671	0.910
	PU2	0.789		
	PU3	0.834		

(continued on next page)

Table 1 *(continued)*

Dimension	Item	Standardised factor loading	Average variance extracted	Composite reliability
	PU4	0.843		
	PU5	0.859		
PEU	PEU1	0.835	0.663	0.907
	PEU2	0.829		
	PEU3	0.833		
	PEU4	0.863		
	PEU5	0.700		
PAC	PAC1	0.841	0.652	0.882
	PAC2	0.844		
	PAC3	0.825		
	PAC4	0.713		
ATU	ATU1	0.809	0.613	0.863
	ATU2	0.823		
	ATU3	0.807		
	ATU4	0.685		
BI	BI1	0.756	0.502	0.800
	BI2	0.766		
	BI3	0.618		
	BI4	0.683		

Structural Equation Modelling

Table 2 summarised the model fit results. All fit indices reached acceptable or excellent levels, indicating a satisfactory model fit.

Table 2 Model fit test results.

Fit index	Evaluation standard	Result	Model fit degree
Absolute fit indices			
χ^2/df	1-3 is excellent; < 5 is acceptable	2.156	Excellent
Goodness-of-fit index	≥ 0.9 is excellent; ≥ 0.8 is acceptable	0.913	Excellent
Adjusted goodness-of-fit index	≥ 0.9 is excellent; ≥ 0.8 is acceptable	0.892	Acceptable
Root mean square error of approximation	≤ 0.05 is excellent; ≤ 0.08 is acceptable	0.052	Acceptable
Incremental fit indices			
Normed fit index	≥ 0.9 is excellent; ≥ 0.8 is acceptable	0.922	Excellent
Relative fit index	≥ 0.9 is excellent; ≥ 0.8 is acceptable	0.912	Excellent
Comparative fit index	≥ 0.9 is excellent; ≥ 0.8 is acceptable	0.957	Excellent
Parsimonious fit indices			
Parsimonious normed fit index	> 0.5 is excellent	0.811	Excellent
Parsimony goodness-of-fit index	> 0.5 is excellent	0.733	Excellent

Path Relationship Analysis of Variables

The path analysis results are presented in Table 3. ATU showed the strongest effect on BI. The relationships PEU to PU, PEU to ATU, and PU to ATU all demonstrated significant positive effects. The proposed path PAC to ATU was also significant (β = 0.183), confirming the role of PAC in influencing users' attitudes. The path PEU to BI was weaker but significant.

Table 3 Path analysis results.

Path	Unstandardised coefficient	Standard error	t-value	P-value	Standardised coefficient
PEU → PU	0.329	0.045	7.294	< 0.001	0.377
PEU → ATU	0.215	0.042	5.155	< 0.001	0.289
PU → ATU	0.213	0.047	4.515	< 0.001	0.250
PAC → ATU	0.186	0.052	3.593	< 0.001	0.183
PEU → BI	0.084	0.039	2.171	0.030*	0.121
ATU → BI	0.449	0.063	7.119	< 0.001	0.478

*P < 0.05

Figure 3 illustrates the structural equation model tested in this study. The empirical results support the hypothesised relationships among the latent variables and confirm that the proposed model demonstrates a satisfactory fit.

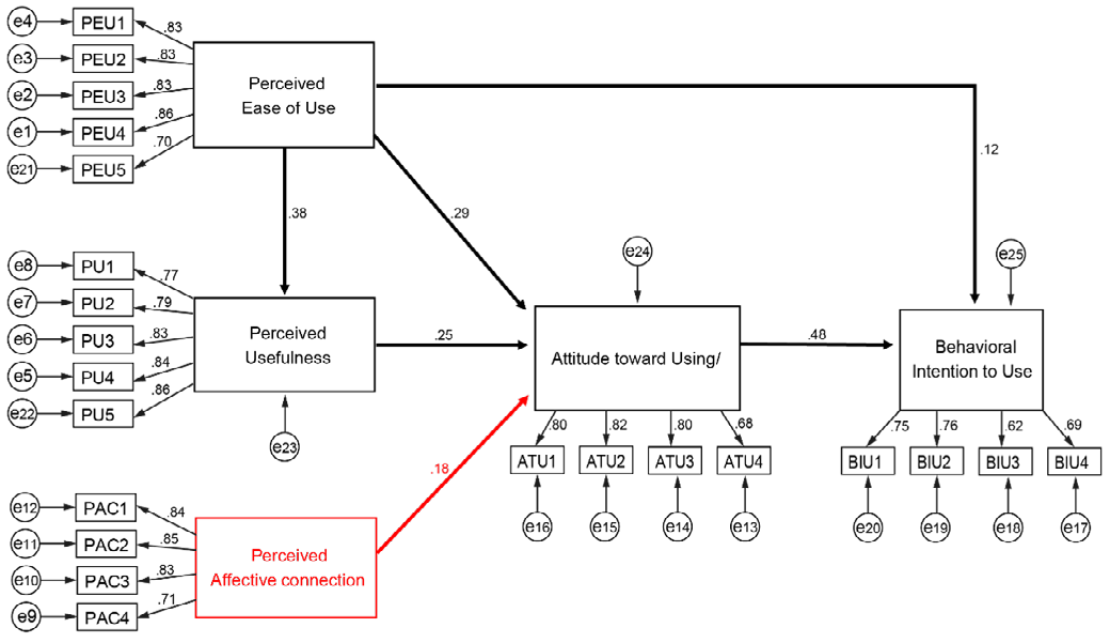


Figure 3 Structural equation modelling results.

Source: Author's illustration.

DISCUSSION

This study examined how emotional connection influences elderly users' acceptance of smartphone user interfaces within a regional cultural context. Semi-structured interviews identified three key dimensions—PU, PEU, and PAC—while structural equation modelling analysis confirmed their relationships. The results indicate that PU, PEU, and PAC significantly influence ATU, which in turn affects BI, with PEU also directly influencing BI, highlighting the role of emotional connection in the technology acceptance process.

Qualitative In-depth Discovery of Original Dimensions

PU: Combination of Functional Utility and Personalised Value

The interview findings indicate that elderly users clearly perceive the usefulness of smartphone interfaces in social communication, daily life management, and leisure activities. These findings are consistent with previous studies showing that smartphones can improve social participation and quality of life among elderly users (Kawaguchi et al. 2024). This study further highlights the importance of personalised functions—such as photography and information searching—in shaping elderly users' perceptions of usefulness. Several respondents described using these functions to record daily life or acquire new knowledge. These findings suggest that smartphone usefulness should also be understood in relation to personalised user needs.

PEU: Balancing Diversity Perception with Complexity Acceptance

Regarding PEU, the interviews revealed a dual perception of smartphone interfaces among elderly users. Many respondents considered basic smartphone functions relatively easy to use, particularly when applications provided simplified operations and familiar interaction patterns. This finding is consistent with prior studies on simplified interface processes for elderly users (Mohlman and Basch 2021). On the other hand, several interviewees reported usability challenges related to interface design, such as difficulty locating buttons and complicated operational procedures. These issues correspond with prior findings that poorly designed interfaces can reduce acceptance among elderly users (Zhu and Cheng 2024).

The findings also indicate that elderly users' understanding of "ease of use" is not uniform. While some users perceive smartphone interfaces as accessible, others experience usability difficulties due to design complexity or learning demands. This suggests that PEU is a dynamic and multi-dimensional perception shaped by users' cognitive abilities, learning processes, and available support mechanisms (Liu et al. 2023). Incorporating these factors may improve the explanatory power of TAM in elderly technology adoption contexts.

PAC: Psychological Interaction of Cultural Elements and Deep Values

Based on ATE, the interview findings provide qualitative insight into how PAC is formed during interaction with smartphone interfaces. Culturally familiar interface cues strengthened emotional closeness and identification. Rather than focusing solely on usability or aesthetic attractiveness, this study highlights culturally driven emotional meaning as an important mechanism through which interface experiences become personally resonant.

However, the affective influence of culturally embedded interface elements was not uniform across elderly users. Some participants were more emotion-sensitive and perceived culturally familiar cues as sources of comfort, identity, and emotional reassurance, which supported the

formation of PAC and fostered more positive attitudes toward technology use. In contrast, a smaller group prioritised efficiency, task clarity, and operational simplicity; for these users, excessive emotional or decorative elements were sometimes experienced as distracting and potentially detrimental to functional performance. This suggests that PAC is conditional rather than universal, shaped by individual differences in emotional sensitivity and usage priorities. This finding suggests that the effectiveness of PAC depends on users' motivational orientation toward emotional meaning versus functional efficiency. Accordingly, PAC-oriented interface design should avoid overgeneralisation and decorative excess, and instead balance emotional satisfaction with functional efficiency.

Implication of the Discovery of New Dimensions

The findings provide conceptual directions for future exploration in smartphone interface design for the elderly, suggesting a shift toward designs supporting diverse usage scenarios. Importantly, these design implications should not be interpreted as universally applicable; instead, PAC-oriented interface design needs to be adapted to different groups of elderly users and balanced against functional efficiency to avoid overgeneralisation and decorative excess. For example, by providing alternative interface versions for elderly users with different levels of digital literacy and usage habits. In addition, integrating regional cultural elements into smartphone interfaces may strengthen elderly users' emotional connection with the interface and enhance user engagement, while simultaneously supporting regional cultural representation in digital environments.

Path Relationship Test for the New Model

The structural equation model developed in this study validates the core path relationships of the TAM while extending the framework by introducing PAC as an additional construct. The significant positive relationship between PU and ATU indicates that elderly users tend to favour interface features that enhance daily efficiency, support self-care, or provide practical value. This result aligns with the original TAM proposition that PU plays a central role in shaping positive attitudes toward technology use (Davis 1989), and is consistent with empirical findings in studies of elderly users' technology adoption (Li and Luximon 2020; McCarthy et al. 2024). The results also confirm the dual influence of PEU on both PU and ATU. Interfaces that are easier to operate not only increase elderly users' ATU but also enhance PU.

By incorporating PAC into the model, this study expands the explanatory scope of TAM by integrating cultural and emotional dimensions. The PAC to ATU relationship indicates that elderly users evaluate interfaces through both functional and affective experiences. This result suggests that emotional resonance can function as an additional pathway influencing users' evaluative attitudes toward technology, particularly in contexts where unfamiliar technologies may generate uncertainty or anxiety. This finding also resonates with ATE, which proposes that emotions arise from individuals' evaluations of stimuli based on personal experiences, values, and cultural backgrounds (Arnold 1960). In the context of smartphone interfaces, culturally familiar elements may evoke feelings of belonging and identification, which in turn contribute to more positive attitudes toward technology use. By empirically demonstrating the PAC to ATU pathway, the study supports the integration of cognitive and emotional mechanisms within the technology acceptance process.

From a quantitative perspective, the structural model further shows that the effect of PAC on ATU, although statistically significant, is moderate in magnitude (β = 0.183) when compared with the effects of PU and PEU. This pattern suggests that while culturally driven affective connection plays a meaningful role in shaping elderly users' attitudes, usability and usefulness

remain the dominant drivers of technology acceptance. Such a result reflects the practical reality of elderly users' technology engagement, in which emotional resonance complements rather than replaces functional and efficiency-oriented evaluations. Importantly, PAC influences BI indirectly through ATU (PAC to ATU to BI), indicating that affective connection contributes to technology acceptance by shaping evaluative attitudes rather than directly determining usage intentions. This characteristic may also help explain why the TAM, as one of the earliest and most widely adopted frameworks, has traditionally prioritised PU and PEU as core determinants, while affective factors have not been explicitly incorporated.

Implication of New Models

The results of RQ2 provide insights for extending technology acceptance frameworks for elderly users by highlighting the role of affective factors. In particular, the findings suggest that geographical and cultural elements can strengthen emotional connection and influence technology acceptance, indicating that the TAM may be further extended by incorporating cultural contextual variables as external factors to improve its explanatory power in culturally specific settings. It should be emphasised that the present study does not seek to propose a prescriptive design framework or detailed interface guidelines. Rather, the practical implications discussed here are intended as conceptual design considerations derived from the validated theoretical model, which may inform future design research. The findings also have policy implications for smart ageing initiatives that integrate emotional design with regional cultural contexts, which may help reduce the digital divide while improving elderly users' quality of life.

CONCLUSION

This study adopted an exploratory sequential mixed-methods approach to examine how emotional connection influences smartphone interface acceptance among elderly users in the Minnan region within a regional cultural context. Drawing on the TAM and ATE, qualitative interviews were first conducted to explore the contextual basis of emotional connection in elderly users' smartphone experiences, followed by a questionnaire survey that empirically confirmed the positive influence of PAC on BI through ATU. The findings identify three key dimensions influencing elderly users' technology acceptance—PU, PEU, and PAC—and demonstrate that culturally grounded emotional resonance can enhance technology acceptance. By introducing PAC into the TAM framework, the study extends the explanatory scope of technology acceptance research and highlights the importance of integrating cognitive and affective mechanisms in understanding elderly users' interaction with smartphone interfaces.

Despite these contributions, several limitations should be acknowledged. First, the study focuses on elderly users aged between 60 and 75 in the Minnan region of China. While this regional focus enables an in-depth examination of culturally embedded affective mechanisms, it also limits the generalisability of the findings to other cultural contexts and to elderly users outside this age range, particularly those aged over 75 who may experience different cognitive and technological challenges. In addition, participants were primarily recruited from community centres and universities for the elderly, which may introduce sampling bias, as these individuals are likely to be more socially active and digitally literate than the broader elderly users. Second, although this study introduces PAC as a theoretically grounded construct, its conceptual boundaries may partially overlap with related affective constructs such as aesthetic pleasure or perceived enjoyment. Further conceptual clarification and validation across different interface contexts are therefore required. Finally, the study adopted a cross-sectional design that captures attitudes and behavioural intentions at a single point in time, and thus cannot examine how affective connection and technology acceptance may evolve through prolonged technology use.

Future research may address these limitations in several ways. First, larger samples and cross-cultural comparative studies could be conducted to examine how cultural contexts moderate the relationship between emotional connection and technology acceptance, thereby testing the generalisability of the proposed model. Second, future studies may build on the present findings to develop culturally informed emotional design tools or design-support frameworks that help interface designers systematically integrate regional cultural elements into user interface design while enhancing emotional value in use.

ACKNOWLEDGEMENTS

The authors would like to thank the community staff in the Minnan region for their assistance with participant recruitment and the field assistants who supported the questionnaire survey process. We are also grateful to all interview participants and questionnaire respondents for their valuable contributions. Special thanks to Dr. Cao Zihao for his valuable comments and suggestions during the preparation of this manuscript.

FUNDS

This research received no external funding.

ETHICS OF STUDY

This study was approved by the Human Research Ethics Committee of Universiti Sains Malaysia (USM/JEPeM/PP/25020228).

REFERENCES

Al-Adwan, Ahmad Samed, Na Li, Amer Al-Adwan, Ghazanfar Ali Abbasi, Nor Asiah Albelbisi, and Akhmad Habibi. 2023. "Extending the Technology Acceptance Model (TAM) to Predict University Students' Intentions to Use Metaverse-Based Learning Platforms." *Education and Information Technologies* 28(11): 15381–15413. https://doi.org/10.1007/s10639-023-11816-3

Alsswey, Ahmed, and Hosam Al-Samarraie. 2020. "Elderly Users' Acceptance of mHealth User Interface (UI) Design-Based Culture: The Moderator Role of Age." *Journal on Multimodal User Interfaces* 14: 49–59. https://doi.org/10.1007/s12193-019-00307-w

Arnold, Magda B. 1960. *Emotion and Personality: Psychological Aspects*. Vol. 1. New York: Columbia University Press.

Bagozzi, Richard P. 2007. "The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift." *Journal of the Association for Information Systems* 8(4): 244–254. https://doi.org/10.17705/1jais.00122

Benvenuti, Martina, Sara Giovagnoli, Elvis Mazzoni, Pietro Cipresso, Elisa Pedroli, and Giuseppe Riva. 2020. "The Relevance of Online Social Relationships Among the Elderly: How Using the Web Could Enhance Quality of Life?" *Frontiers in Psychology* 11: 551862. https://doi.org/10.3389/fpsyg.2020.551862

Brooks, Joanna, Serena McCluskey, Emma Turley, and Nigel King. 2015. "The Utility of Template Analysis in Qualitative Psychology Research." *Qualitative Research in Psychology* 12(2): 202–222. https://doi.org/10.1080/14780887.2014.955224

Carmona, Nancy, Edmund Seto, Lisa Hayward, et al. 2024. "Use of Portable Air Cleaners in Washington State Schools: A Qualitative Analysis Based on the Technology Acceptance Model." *Journal of School Health* 94(10): 939–949. https://doi.org/10.1111/josh.13482

Čeněk, Jiří, and Šašinka Čeněk. 2015. "Cross-Cultural Differences in Visual Perception." *The Journal of Education, Culture, and Society* 2015(1): 187–206. https://doi.org/10.15503/jecs20151.187.206

Contreras-Somoza, Leslie María, Eider Irazoki, José Miguel Toribio-Guzmán, et al. 2021. "Usability and User Experience of Cognitive Intervention Technologies for Elderly People with MCI or Dementia: A Systematic Review." *Frontiers in Psychology* 12: 636116. https://doi.org/10.3389/fpsyg.2021.636116

Creswell, John W., and Vicki L. Plano Clark. 2017. *Designing and Conducting Mixed Methods Research*. 3rd ed. Thousand Oaks: Sage Publications.

Davis, Fred D. 1989. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology." *MIS Quarterly* 13(3): 319–340. https://doi.org/10.2307/249008

Field, Andy. 2018. *Discovering Statistics Using IBM SPSS Statistics*. 5th ed. London: Sage Publications.

Fisk, Arthur D., Sara J. Czaja, Wendy A. Rogers, Neil Charness, and Joseph Sharit. 2020. *Designing for Older Adults: Principles and Creative Human Factors Approaches*. 2nd ed. Boca Raton: CRC Press. https://doi.org/10.1201/9781420080681

Guner, Hazel, and Cengiz Acarturk. 2020. "The Use and Acceptance of ICT by Senior Citizens: A Comparison of Technology Acceptance Model (TAM) for Elderly and Young Adults." *Universal Access in the Information Society* 19(2): 311–330. https://doi.org/10.1007/s10209-018-0642-4

Guo, Wenshan, Tao Chen, and Yuming Wei. 2023. "Intrinsic Need Satisfaction, Emotional Attachment, and Value Co-Creation Behaviours of Seniors in Using Modified Mobile Government." *Cities* 141: 104529. https://doi.org/10.1016/j.cities.2023.104529

Hassenzahl, Marc. 2010. *Experience Design: Technology for All the Right Reasons*. San Rafael, CA: Morgan and Claypool Publishers. https://doi.org/10.2200/S00261ED1V01Y201003HCI008

Hennink, Monique, Inge Hutter, and Ajay Bailey. 2020. *Qualitative Research Methods*. 2nd ed. London: Sage Publications.

Joshi, Ankur, Saket Kale, Satish Chandel, and D. K. Pal. 2015. "Likert Scale: Explored and Explained." *British Journal of Applied Science and Technology* 7(4): 396–403. https://doi.org/10.9734/BJAST/2015/14975

Kawaguchi, Kenjiro, Atsushi Nakagomi, Kazushige Ide, Katsunori Kondo. 2024. "Effects of a Mobile App to Promote Social Participation on Older Adults: Randomized Controlled Trial." *Journal of Medical Internet Research* 26: e64196. https://doi.org/10.2196/64196

Kim, Youjeong, and S. Shyam Sundar. 2012. "Anthropomorphism of Computers: Is It Mindful or Mindless?" *Computers in Human Behavior* 28(1): 241–250. https://doi.org/10.1016/j.chb.2011.09.006

King, Nigel. 2012. "Doing Template Analysis." In *Qualitative Organizational Research: Core Methods and Current Challenges*, edited by Gillian Symon and Catherine Cassell, 426–450. London: Sage Publications. https://doi.org/10.4135/9781526435620.n24

Krejcie, Robert V., and Daryl W. Morgan. 1970. "Determining Sample Size for Research Activities." *Educational and Psychological Measurement* 30(3): 607–610. https://doi.org/10.1177/001316447003000308

Lamm, Kevan W., Alexa J. Lamm, and Don Edgar. 2020. "Scale Development and Validation: Methodology and Recommendations." *Journal of International Agricultural and Extension Education* 27(2): 24–35. https://doi.org/10.5191/jiaee.2020.27224

Li, Qingchuan and Yan Luximon. 2020. "Older Adults' Use of Mobile Device: Usability Challenges While Navigating Various Interfaces." *Behaviour and Information Technology* 39(8): 837–861. https://doi.org/10.1080/0144929X.2019.1622786

Liu, Hao, Calvin Or, Vivian Lou, Yong Hu, Ning Xi. 2023. "Perceptions of and Intention to Use Wearable and Assistive Devices Among Older Adults." In *Human Factors and Wearable Technologies*, edited by Jesslyn Alekseyev and Christianne Falcão, 85: 158–164. AHFE Open Access. https://doi.org/10.54941/ahfe1003631

Liu, Ruisi, Xueai Li, and Junjie Chu. 2021. "More Love, More Behavioural Intention: Understanding Elderly's Acceptance of Smartphone Applications." In *2021 14th International Symposium on Computational Intelligence and Design (ISCID)*, 181–185. Hangzhou: IEEE. https://doi.org/10.1109/ISCID52796.2021.00050

Markus, Hazel R., and Shinobu Kitayama. 1991. "Culture and the Self: Implications for Cognition, Emotion, and Motivation." *Psychological Review* 98(2): 224–253. https://doi.org/10.1037/0033-295X.98.2.224

Martín-García, Antonio V., Rosa Redolat, and Sacramento Pinazo-Hernandis. 2022. "Factors Influencing Intention to Technological Use in Older Adults: The TAM Model Application." *Research on Aging* 44(7–8): 573–588. https://doi.org/10.1177/01640275211063797

McCarthy, Breda, Jagdeep Kaur Sabharwal, and Shailey Chawla. 2024. "Old Age or Cognitive Decline? Examining the Usability of a Mobile Health App for Older Australians." *Informatics for Health and Social Care* 49(1): 83–97. https://doi.org/10.1080/17538157.2024.2332691

Mohlman, Jan, and Corey H. Basch. 2021. "Health-Related Correlates of Demonstrated Smartphone Expertise in Community-Dwelling Older Adults." *Journal of Applied Gerontology* 40(5): 510–518. https://doi.org/10.1177/0733464820902304

Neves, Barbara Barbosa, Jenny Waycott, and Sue Malta. 2018. "Old and Afraid of New Communication Technologies? Reconceptualising and Contesting the 'Age-Based Digital Divide'." *Journal of Sociology* 54(2): 236–248. https://doi.org/10.1177/1440783318766119

Norman, Donald Arthur. 2004. *Emotional Design: Why We Love (or Hate) Everyday Things*. New York: Basic Books.

Palinkas, Lawrence A., Sarah M. Horwitz, Carla A. Green, Jennifer P. Wisdom, Naihua Duan, and Kimberly Hoagwood. 2015. "Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research." *Administration and Policy in Mental Health and Mental Health Services Research* 42(5): 533–544. https://doi.org/10.1007/s10488-013-0528-y

Salman, Hasanin Mohammed, Wan Fatimah Wan Ahmad, and Suziah Sulaiman. 2018. "Usability Evaluation of the Smartphone User Interface in Supporting Elderly Users from Experts' Perspective." *IEEE Access* 6: 22578–22591. https://doi.org/10.1109/ACCESS.2018.2827358

Spatola, Nicolas, Serena Marchesi, and Agnieszka Wykowska. 2022. "Different Models of Anthropomorphism Across Cultures and Ontological Limits in Current Frameworks: The Integrative Framework of Anthropomorphism." *Frontiers in Robotics and AI* 9: 863319. https://doi.org/10.3389/frobt.2022.863319

Šumak, Boštjan, Marjan Heričko, Maja Pušnik, and Gregor Polančič. 2011. "Factors Affecting Acceptance and Use of Moodle: An Empirical Study Based on TAM." *Informatica* 35(1): 91–100.

Tashakkori, Abbas, R. Burke Johnson, and Charles Teddlie. 2020. *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*. 2nd ed. Thousand Oaks: Sage Publications.

Teo, Timothy. 2009. "Is There an Attitude Problem? Reconsidering the Role of Attitude in the TAM." *British Journal of Educational Technology* 40(6): 1139–1141. https://doi.org/10.1111/j.1467-8535.2008.00913.x

Ugalde, Christian, Maria-Ines Acosta, and Jose-Paulo Carvallo. 2023. "Social Media Usage by Elderly: Application of Technology Acceptance Model." *Brazilian Journal of Development* 9(1): 5902–5918. https://doi.org/10.34117/bjdv9n1-401

Venkatesh, Viswanath, and Hillol Bala. 2008. "Technology Acceptance Model 3 and a Research Agenda on Interventions." *Decision Sciences* 39(2): 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Wang, Yulong, Huabei Sun, Shuxin Xu, et al. 2025. "Smart Home Technologies for Enhancing Independence of Living and Reducing Care Dependence in Older Adults: A Systematic Review." *Journal of Advanced Nursing* 81(6): 120–136. https://doi.org/10.1111/jan.16569

Wildenbos, G. A., Linda Peute, and Monique Jaspers. 2018. "Aging Barriers Influencing Mobile Health Usability for Older Adults: A Literature-Based Framework (MOLD-US)." *International Journal of Medical Informatics* 114: 66–75. https://doi.org/10.1016/j.ijmedinf.2018.03.012

Xie, Lin, Hua-lei Yang, Xue-yu Lin, et al. 2021. "Does Internet Use Improve the Mental Health of Chinese Older Adults?" *Frontiers in Public Health* 9: 673368. https://doi.org/10.3389/fpubh.2021.673368

Xinhua. 2023. "Half of China's Population Aged 65 to 69 Use Smartphones: Survey." *China Daily*, 14 February. https://global.chinadaily.com.cn/a/202302/14/WS63eaef79a31057c47ebaea90.html

Yazdani-Darki, Malihe, Zahra Rahemi, Mohsen Adib-Hajbaghery, and Fatemeh Sadat Izadi-Avanji. 2020. "Older Adults' Barriers to Use Technology in Daily Life: A Qualitative Study." *Nursing and Midwifery Studies* 9(4): 229–236.

Zhao, Shu, Kinshuk, Ying Yao, and Nan Ya. 2021. "Adoption of Mobile Social Media for Learning Among Chinese Older Adults in Senior Citizen Colleges." *Educational Technology Research and Development* 69(6): 3413–3435. https://doi.org/10.1007/s11423-021-10048-x

Zhou, Chengmin, Yawen Qian, Ting Huang, Jake Kaner, and Yurong Zhang. 2022. "The Impact of Different Age-Friendly Smart Home Interface Styles on the Interaction Behavior of Elderly Users." *Frontiers in Psychology* 13: 935202. https://doi.org/10.3389/fpsyg.2022.935202

Zhu, Xiaowen, and Xianping Cheng. 2024. "Staying Connected: Smartphone Acceptance and Use Level Differences of Older Adults in China." *Universal Access in the Information Society* 23(1): 203–212. https://doi.org/10.1007/s10209-022-00933-4

Zisberg, Anna. 2017. "Anxiety and Depression in Older Patients: The Role of Culture and Acculturation." *International Journal for Equity in Health* 16(1): 177. https://doi.org/10.1186/s12939-017-0666-z

APPENDIX A

Demographic frequency statistics for questionnaires (RQ2).

Item	Option	Frequency	Percentage (%)
Gender	Male	209	48.27
	Female	224	51.73
Age	60 to 65 years	201	46.42
	65 to 70 years	178	41.11
	70 to 75 years	54	12.47
Region	Quanzhou	148	34.18
	Zhangzhou	141	32.56
	Xiamen	144	33.26
Education	Primary school and below	137	31.64
	Junior high school to high school	265	61.20
	College degree and above	31	7.16
Owner of smartphone	Positive	433	100.00
Physical challenges	No effect at all	272	62.82
	Slightly affected but not significant	92	21.25
	Significantly affected	69	15.94
Duration of owning a smartphone	1 year and above	433	100.00
Daily usage duration of smartphone	Within 1 hour	41	9.47
	1 to 3 hours	270	62.36
	More than 3 hours	122	28.18
Proficiency level of use	Proficient	55	12.70
	Intermediate	267	61.66
	Beginner	111	25.64
Common types of apps	Social communication	325	75.06
	Mobile payment	310	71.59
	Video entertainment	274	63.28
	News	214	49.42
	Health-related	193	44.57
	Shopping	33	7.62
Total		433	100.00

APPENDIX B

The structured questionnaire for RQ2.

Perceived Usefulness	**Strongly disagree**	**Disagree**	**Agree nor disagree**	**Agree**	**Strongly agree**
I think the function settings of the mobile phone interface have a significant impact on my daily life.					
I can easily communicate with others through the mobile phone interface.					
The mobile phone interface allows me to access and find a lot of useful information quickly.					
I can access entertainment and shopping activities through the mobile phone interface.					
Overall, I find the mobile phone interface beneficial for my everyday activities.					
Perceived Ease of Use					
I can operate the mobile interface without assistance from others.					
Learning to use new functions on the mobile interface is easy for me.					
It is simple for me to accomplish specific tasks (e.g., making payments, finding directions) using the mobile interface.					
The mobile phone interface is organized in a way that is easy for me to understand.					
I find it easy to adjust settings like text size and volume on the mobile interface to suit my needs.					
Perceived Affective Connection					
When the mobile interface includes elements of the Minnan region, I feel a sense of familiarity.					
I feel a special connection when using a mobile interface that reflects Minnan cultural elements.					
The use of Minnan-themed colours, symbols, or language in the mobile interface makes me feel more comfortable using the device.					
I feel proud when the mobile phone interface includes features that represent Minnan culture.					
Attitude toward Using					
I believe that using the mobile phone interface is essential for my daily life.					
I like to use mobile phone interfaces that contain elements of Minnan culture, and I am willing to try out the various functions in it.					
The design of mobile phone interfaces that contain elements of Minnan culture encourages me to use my phone more frequently.					
I feel more confident using a smartphone when the interface is easy to understand.					
Behavioral Intention to Use					
I plan to use a mobile phone interface that includes elements of Minnan culture.					
I am likely to recommend a mobile phone interface that contains elements of Minnan culture to my friends or family.					
If there are new features related to Minnan culture in the mobile phone interface, I would like to try it out.					
Even though technology is developing, I still like the mobile phone interface to reflect the traditional Minnan cultural background.					

APPENDIX C

The Semi-structured interview outlines for RQ1.

Perceived Usefulness (PU)

1. Which features (software) of the smartphone interface are most useful to you? Can you share specific examples?
2. Does the smartphone interface facilitate your daily life? Please provide some examples of such scenarios.
3. Do you think that smartphone interfaces have enhanced your ability to connect with family and friends? Please discuss the strengths and weaknesses of the design of these software interfaces for contact interaction.
4. How often do you use your smartphone for leisure activities? Give examples of how it feels to use it.
5. How do you feel about the current smartphone interface in terms of interaction and operation? Please list the positive or negative examples that make you feel convenient and easy to use.

Perceived Ease of Use (PEU)

1. Are you confident in using the smartphone interface without relying on the help of others? Can you describe any difficulties you have experienced in operating your smartphone?
2. How did you learn to use the new features or applications on your smartphone? Did you encounter any applications that was difficult to learn to master? What do you think caused it?
3. Have you encountered applications that are confusing in terms of layout? Can you be more specific?
4. What do you think about button clicking and text reading on the smartphone interface you are currently using? What do you think could be done to improve the buttons and text?
5. When seeking help or guidance in using your smartphone, do you prefer face-to-face help or digital tutorials delivered via remote voice? Why?

Perceived Affective Connection (PAC)

1. Do you feel more comfortable when the interface of your smartphone contains elements of your hometown (Minnan) culture? Why or why not?
2. When using a smartphone with localised content or themes, does it make you feel more culturally connected to yourself? Please give examples of elements from your hometown that make you feel this way

3. Do you think that adding elements of your hometown (Minnan) culture to the interface of your smartphone would make the device more attractive to you or people of your age?

4. If you had a choice, would you prefer a smartphone interface that includes more traditional cultural features or a more modern, universal design? Why?

Other Issues to Consider (Design Preferences and Customisation)

1. Do you like to customise the look of your smartphone interface? If yes, which of these features do you think is the most important?

2. If it were possible to choose a specific theme, colour or icon for the smartphone interface that relates to one's cultural background, would you be willing to do so?

Accessibility and Physical Comfort

1. Do you experience discomfort when using your smartphone for long periods of time, and in what ways?

2. Is the ability to adjust font size, screen brightness or sound level important to you? Are these adjustments easy to find and use on your smartphone?