



Digital literacy in older adults and its influence on quality of life

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Abstract. Population aging has intensified the need to promote digital inclusion as a strategy to improve the well-being, autonomy, and social participation of older adults. This study analyzes the influence of digital literacy and the use of information and communication technologies (ICTs) on the quality of life of older adults in Mexicali, Baja California, Mexico. A quantitative, cross-sectional, non-experimental research design was employed. Data were collected from a sample of 390 adults aged 60 years and older using a structured questionnaire composed of 33 measurement items. The proposed conceptual model was evaluated through Partial Least Squares Structural Equation Modeling (PLS-SEM), allowing the examination of the relationships among digital literacy dimensions and quality-of-life outcomes. The results indicate that communication and social relationships significantly influence emotions and feelings ($\beta=0.505$, $p<0.001$), while emotions positively affect both user experience ($\beta=0.337$, $p<0.001$) and health and personal well-being ($\beta=0.376$, $p<0.001$). Furthermore, user experience exerts a significant positive effect on health and personal well-being ($\beta=0.255$, $p<0.001$), highlighting its mediating role in enhancing quality of life. These findings demonstrate that digital literacy extends beyond technology access by strengthening emotional well-being, social connectedness, autonomy, confidence in technology use, and active aging. The study contributes empirical evidence from a border-region context where demographic and technological conditions differ from those reported in other settings. It also provides practical implications for policymakers, educational institutions, and public organizations seeking to design inclusive digital literacy strategies, reduce the digital divide, and promote healthier, more independent, and socially engaged aging among older adults through accessible ICT training initiatives.

Keywords: Digital literacy; older adults; information and communication technologies; quality of life; active aging; PLS-SEM.

1. Introduction

Population aging has become one of the most significant demographic transformations of the twenty-first century, reshaping healthcare systems, social services, and public policies worldwide. According to the World Health Organization

(WHO), the number of people aged 60 years and older is expected to reach approximately 2.1 billion by 2050, making healthy aging one of the principal global development priorities. In this context, digital technologies have emerged as strategic tools for promoting autonomy, social participation, lifelong learning, and access to health and public services among older adults. However, the benefits derived from digital transformation largely depend on individuals' ability to effectively access, understand, and use digital technologies. Consequently, reducing the digital divide has become an essential challenge for governments, educational institutions, and healthcare systems. World Health Organization.

Beyond access to technology, digital inclusion has become a key social determinant of healthy aging and quality of life. The increasing digitalization of healthcare services, banking, public administration, education, and interpersonal communication requires older adults to acquire digital competencies that enable them to participate fully in contemporary society [1]. Consequently, digital literacy has evolved from being merely a technological skill to becoming an essential component of social inclusion, autonomy, emotional well-being, and overall quality of life [2].

Recent empirical evidence suggests that digital inclusion has significant implications for older adults' emotional well-being, social connectedness, and overall quality of life. The use of information and communication technologies (ICTs) enables older adults to maintain communication with family and friends, participate in community activities, access telemedicine services, conduct online financial transactions, and reduce feelings of loneliness and social isolation. These benefits became particularly evident during and after the COVID-19 pandemic, when digital technologies played a central role in maintaining interpersonal relationships and ensuring continuity in healthcare, education, and essential public services ([3] & [4]). Furthermore, recent studies have demonstrated that digital literacy positively contributes to self-efficacy, autonomy, resilience, and psychological well-being, promoting more active and independent aging among older adults ([5] & [2]).

Quality of life has become one of the central concepts in aging research because it reflects individuals' perceptions of their physical health, psychological well-being, social relationships, level of independence, and interaction with their surrounding environment. The World Health Organization defines quality of life as an individual's perception of their position in life within the context of their culture, value systems, personal goals, expectations, and concerns [1]. Among older adults, quality of life is increasingly influenced by opportunities for social participation, lifelong learning, autonomy, and access to healthcare and community resources. Consequently, maintaining an active and socially connected lifestyle has become one of the principal objectives of healthy aging policies worldwide [1].

Recent studies indicate that digital literacy has emerged as an important determinant of quality of life among older adults because it facilitates access to information, healthcare services, social interaction, financial management, lifelong learning, and civic participation. Digital competence also strengthens older adults' confidence in using technology, promotes independent living, and reduces the risks associated with

social isolation and digital exclusion. Furthermore, evidence suggests that older adults with higher levels of digital literacy report greater autonomy, better emotional well-being, increased life satisfaction, and stronger perceptions of social inclusion compared with those experiencing digital exclusion ([5], [3] & [2]). These findings support the growing recognition of digital literacy as a key contributor to active aging and improved quality of life.

Despite these advances, substantial digital inequalities continue to persist, particularly in developing countries and among socially vulnerable populations. In Latin America, disparities in internet access, digital infrastructure, educational opportunities, affordability, and technological skills continue to restrict the full participation of older adults in the digital society. According to the Economic Commission for Latin America and the Caribbean [6], socioeconomic conditions, educational attainment, age-related barriers, and limited opportunities for digital training remain among the principal determinants of digital exclusion throughout the region. These challenges highlight the need to develop comprehensive public policies that simultaneously promote technological accessibility and the acquisition of digital competencies required for meaningful participation in contemporary society [7].

In Mexico, internet access and smartphone ownership among older adults have increased steadily during the last decade. However, important inequalities remain regarding digital competencies and the effective use of ICTs beyond basic communication purposes. Although many older adults currently use mobile applications for messaging and social networking, the adoption of digital services related to healthcare, education, financial management, e-government procedures, and online learning remains comparatively limited (National Institute of Statistics and Geography [2]). This situation demonstrates that technological availability alone does not guarantee meaningful digital inclusion, making digital literacy an essential factor for improving quality of life, promoting active aging, and strengthening digital citizenship.

Within the border region of Baja California, particularly in the municipality of Mexicali, population aging coincides with an accelerated process of digital transformation driven by economic development, urbanization, and the increasing digitalization of public and private services. Nevertheless, empirical evidence regarding the influence of digital literacy on older adults' well-being remains scarce. Most previous studies have primarily focused on internet access, sociodemographic characteristics, or technology adoption, while limited attention has been devoted to examining the structural relationships among communication, emotions, user experience, and health outcomes through comprehensive analytical models. Consequently, an important research gap remains concerning the mechanisms through which digital literacy contributes to improving the quality of life of older adults living in border regions characterized by rapid technological transformation ([5] & [3]). Based on this gap, the following research question is proposed: ¿How does digital literacy, through the use of information and communication technologies, influence communication and social relationships, emotions and feelings, user experience, and

health and personal well-being among older adults in the municipality of Mexicali, Baja California?

Accordingly, the objective of this research is to analyze the structural relationships between digital literacy, communication and social relationships, emotions and feelings, user experience, and health and personal well-being among older adults using Partial Least Squares Structural Equation Modeling (PLS-SEM). Specifically, the study seeks to generate empirical evidence that contributes to understanding how ICT use promotes active aging, social inclusion, emotional well-being, and quality of life while providing scientific evidence to support the development of digital literacy programs and public policies aimed at reducing the digital divide among older adults [8].

Based on the theoretical background and the proposed conceptual framework, the following research hypotheses are formulated:

1. H₁: Communication and social relationships have a positive influence on the emotions and feelings of older adults.
2. H₂: Emotions and feelings have a positive influence on the health and personal well-being of older adults.
3. H₃: Emotions and feelings positively influence the user experience regarding the use of ICTs.
4. H₄: User experience positively influences the health and personal well-being of older adults.

Finally, this research contributes to the growing body of knowledge on digital literacy and healthy aging by integrating emotional, social, and technological dimensions into a comprehensive structural model applied to older adults living in a border region. Unlike previous studies that have predominantly examined technology adoption or access to digital resources, this study simultaneously analyzes the relationships among communication, emotions, user experience, and well-being through a PLS-SEM approach. Beyond its theoretical contribution, the findings provide practical implications for policymakers, educational institutions, healthcare organizations, and community programs interested in designing digital inclusion strategies that foster autonomy, social participation, healthy aging, and improved quality of life while reducing the digital divide among older adults.

2. Research Method

This study employed a quantitative research approach using a non-experimental, cross-sectional design, as the variables were observed without manipulation and data were collected at a single point in time. The research adopted a descriptive, correlational, and explanatory scope, aiming not only to characterize the study variables but also to examine the structural relationships among digital literacy, communication and social relationships, emotions and feelings, user experience, and health and personal well-being in older adults. This methodological approach is

appropriate for identifying predictive relationships among latent constructs within a real-world context [9].

The study was conducted in the municipality of Mexicali, Baja California, Mexico, focusing on adults aged 60 years and older who reported using at least one digital device, primarily smartphones or tablets, to access information or communication services. Because no official database specifically identifies older adults who regularly use digital technologies in the municipality, the required sample size was estimated using the formula for infinite populations with a 95% confidence level, a 5% margin of error, and maximum variability ($p=q=0.50$). Based on these parameters, a minimum sample size of 390 participants was obtained, providing sufficient statistical power for structural equation modeling (1).

$$n = \frac{WITH^2 S^2}{d^2} \quad (1)$$

Data were collected through a structured electronic questionnaire administered using the SurveyMonkey platform. The instrument consisted of 33 items measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was developed based on previous studies addressing digital literacy, technology acceptance, emotional well-being, and quality of life among older adults. Before its application, the instrument was reviewed by experts in digital inclusion and quantitative research to ensure content validity and conceptual clarity.

The questionnaire comprised four latent constructs: Communication and Social Relationships, Emotions and Feelings, Health and Personal Well-being, and User Experience. Communication and Social Relationships evaluated the use of ICTs for maintaining interpersonal relationships and social participation. Emotions and Feelings assessed participants' emotional responses associated with technology use. Health and Personal Well-Being measured perceived improvements in quality of life and psychological well-being, whereas User Experience evaluated perceived usefulness, ease of use, accessibility, and satisfaction with digital technologies.

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Additionally, an exploratory factor analysis was conducted to verify item grouping and construct validity. Examples of items included in the instrument include "Digital applications help me stay in touch with my family," "Using technology improves my mood," and "I find it easy to learn how to use new digital applications." These items allowed for the evaluation of participants' perceptions and experiences regarding the use of ICT in their daily lives.

The proposed conceptual model was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) implemented in ADANCO version 2.0. PLS-SEM was selected because it is particularly appropriate for predictive research involving complex relationships among multiple latent constructs, especially when the primary objective is theory development and prediction rather than theory confirmation [8]. Furthermore, PLS-SEM is well-suited for predictive and exploratory research in social sciences, particularly when analyzing models with multiple constructs and causal relationships.

The model evaluation was carried out in two stages: first, the measurement model was analyzed by reviewing factor loadings, composite reliability, convergent validity, and discriminant validity; subsequently, the structural model was examined through path coefficients, coefficients of determination (R^2), effect size (f^2), and significance tests using the bootstrapping technique with 4,999 resamples following the recommendations of Hair et al. [8]. Finally, in accordance with ethical research principles, the participation of older adults was entirely voluntary, and the confidentiality and anonymity of the information provided were guaranteed. Before answering the questionnaire, participants received informed consent, which explained the purpose of the study, the academic use of the data, and their right to withdraw from the research at any time without consequence.

3. Results

3.1 Sample Characteristics

The final sample consisted of 390 older adults residing in the municipality of Mexicali, Baja California. Women represented 76% of the participants, whereas men accounted for 24%. Regarding age distribution, 43% of respondents were between 60 and 64 years old, 30% were between 65 and 69 years old, and the remaining 27% were 70 years of age or older. With respect to educational attainment, secondary education represented the largest proportion (31%), followed by a bachelor's degree (20%), high school education (19%), and primary education (16%). Furthermore, most participants (86%) reported living with relatives or companions, whereas 12% indicated living alone. These characteristics reveal a heterogeneous sample, allowing the analysis of different perceptions regarding digital literacy and its influence on quality of life.

3.2 Descriptive Statistics

Table 1 presents the descriptive statistics of the observed variables. The mean values ranged from 2.47 to 3.35, indicating moderate perceptions regarding the use of information and communication technologies (ICTs) and their contribution to quality of life. Standard deviations were generally close to one, suggesting acceptable variability among participants' responses. The indicators associated with health and personal well-being exhibited the greatest dispersion, reflecting differences in how older adults perceive the impact of digital technologies on their overall well-being.

To evaluate the relationships between the latent variables, the structural equation model using partial least squares (PLS-SEM) was used, using ADANCO software version 2.0.

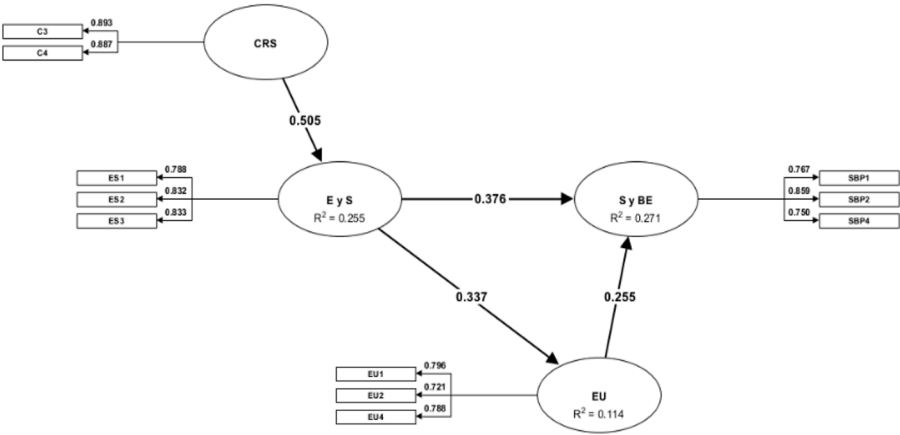
Table 1. Descriptive statistics.

	N	Minimu m	Maximu m	Average	Standard Deviation
ES1	390	1	4	2.85	.963
ES2	390	1	4	2.83	.953
ES3	390	1	4	2.97	.994
ES4	390	1	4	2.71	.943
EU5	390	1	4	2.92	.952
SBP1	390	1	4	2.73	1.003
SBP2	390	1	4	2.90	1.008
SBP4	390	1	4	2.90	1.002
SBP5	390	1	4	2.47	1.036
SBP6	390	1	5	3.35	1.238
EU1	390	1	4	2.82	.950
EU2	390	1	4	2.88	.959
EU3	280	1	4	2.93	.938
C3UsoCom	390	1	4	2.68	.954
C4ComFamTIC	390	1	4	2.74	.958

Note: Own elaboration.

3.3 Structural Model Estimated Using PLS-SEM

Figure 1 presents the estimated structural model obtained through Partial Least Squares Structural Equation Modeling (PLS-SEM) using ADANCO version 2.0. The model illustrates the standardized relationships among the four latent constructs analyzed in this study: Communication and Social Relationships, Emotions and Feelings, User Experience, and Health and Personal Well-being. The standardized path coefficients indicate positive relationships among all constructs, providing preliminary support for the proposed hypotheses. The statistical significance and strength of these relationships are presented in Tables 7 and 8 [9].



Note. Prepared by the author using ADANCO PLS-SEM software.

Figure 1. Structural Model Estimated Using PLS-SEM.

3.4 Measurement Model Assessment

The reliability and validity of the measurement model were assessed through factor loadings, composite reliability, convergent validity, and discriminant validity. As shown in Table 2, the standardized factor loadings ranged from 0.7212 to 0.8926, exceeding the recommended minimum threshold of 0.70 [8]. These results indicate that all observed indicators adequately represent their corresponding latent constructs.

Table 2. Factor loadings.

Latent construct	Item	Factor loading
Communication and social relationships	C3	0.8926
	C4	0.8874
Emotions and feelings	ES1	0.7876
	ES2	0.8319
	ES3	0.8334
Health and personal well-being	SBP1	0.7674
	SBP2	0.8590
	SBP4	0.7495
User experience	EU1	0.7963
	EU2	0.7212
	EU4	0.7879

Note. Prepared by the author based on analysis using ADANCO PLS-SEM software.

An exploratory factor analysis was performed using SPSS statistical software. This involved dimensionality reduction using the maximum likelihood extraction method and a Promax oblique rotation [11]. Taking into consideration the communality criteria. Likewise, the rotated factor matrix and the factor loadings corresponding to each variable were analyzed. This procedure was carried out in two phases: first, the factor loadings were reviewed (see Table 2), and subsequently, the composite reliability of the constructs was evaluated (Table 3).

Subsequently, the validity and reliability of the measurement model were evaluated using factor loading analysis, composite reliability, and convergent validity. Therefore, detailed analyses of the factor loadings corresponding to each item of the instrument were performed, as presented in Table 2. The values obtained in the model ranged from 0.7212 to 0.8926, exceeding in all cases the minimum acceptance criterion established by [8]. The parameter used as a reference consisted of verifying that the factor loadings (λ) of each construct were greater than $\lambda > 0.707$, according to the methodological recommendations proposed by these authors.

Latent variables are considered to maintain evaluative relationships with each other [9]. This allows the use of traditional methods of internal consistency, reliability measures, and construct validity for their evaluation [10].

One of the fundamental aspects in assessing the reliability of the instrument is composite reliability, according to the criteria proposed by Nunnally and Bernstein [10]. A composite reliability value of 0.70 or higher is considered acceptable. The results obtained show that the constructs exhibit adequate levels of reliability, indicating that the items comprising each variable are consistent and reliable in their measurement (See Table 3). This contributes to strengthening the internal validity of the instrument and supports the ability of the latent variables to accurately represent the concepts analyzed.

Table 3. Construct reliability.

Construct	Jöreskog's rho (pc)
Communication and social relationships	0.8840
Emotions and feelings	0.8583
Health and personal well-being	0.8355
User experience	0.8127

Note. Prepared by the author based on analysis using ADANCO PLS-SEM software.

The convergence of indicators within latent constructs is a key element in determining the convergent validity of the model. This condition is met when the average variance extracted (VPE) is greater than the reference value of 0.50 ([12] & [8]). The VPE allows us to estimate the level of variation of the indicators with respect to the latent construct with which they are related. The results presented in Table 4 show that all the model's constructs reach values above the required threshold, demonstrating adequate convergent validity and a correction group of the indicators around their respective latent constructs. (Table 4) shows the average variance extracted for the constructs.

Table 4. Convergent construct validity.

Construct	Average Variance Extracted (VPE)
Communication and social relationships	0.7921
Emotions and feelings	0.6690
Health and personal well-being	0.6295
User experience	0.5917

Note: Own elaboration.

The correlation matrix presented in Table 5 illustrates the relationships between the model's latent constructs using the Fornell-Larcker criterion. This methodology allows for comparing the correlations of each construct with its respective indicators against the correlations between the different constructs, thus facilitating the evaluation of convergent and discriminant validity. Furthermore, the values on the diagonal correspond to the average variance extracted (AVE) for each construct. Displays the squared correlations, and the AVE values for the constructs are shown on the diagonal.

Table 5. Fornell-Larcker discriminant validity.

Construct	Communicatio n and social relationships	Emotions and feelings	Health and personal well-bein g	User experience
Communication and social relationships	0.7921			
Emotions and feelings	0.2546	0.6690		
Health and personal well-being	0.1056	0.2132	0.6295	
User experience	0.0262	0.1139	0.1457	0.5917

Note. Prepared by the author based on analysis using ADANCO PLS-SEM software.

3.5 Structural Model Assessment

The Fornell-Larcker matrix shows that the latent constructs exhibit positive correlations with the indicators that comprise them, demonstrating adequate convergent validity. Furthermore, the correlations observed between the different constructs are lower than the average variance extracted (AVE), confirming both the convergent and discriminant validity of the model, in accordance with the theoretical frameworks of Fornell and Larcker [13].

These results indicate that the constructs maintain a clear differentiation from one another and that the indicators are correctly associated with the constructs they are intended to measure. Table 6 below shows the coefficient of determination values for the latent constructs.

The explanatory power of the structural model was assessed using the coefficient of determination (R^2). As shown in Table 6, the endogenous constructs presented R^2 values ranging from 0.1139 to 0.2708, indicating low-to-moderate predictive accuracy according to the criteria proposed by [8]. Although these values are relatively modest, they are considered acceptable in behavioral and social sciences, where human behavior is influenced by numerous external factors.

Table 6. Coefficient of determination.

Construct	R2	Stimulation level
Emotions and feelings	0.2546	Low
Health and personal well-being	0.2708	Low
User experience	0.1139	Low

Note. Prepared by the author based on analysis using ADANCO PLS-SEM software.

3.6 Hypothesis Testing

The significance of the structural relationships was assessed through the Bootstrapping procedure using 4,999 resamples; This procedure allows for estimating the stability of the coefficients and evaluating the statistical significance of the relationships between the variables, following the methodological recommendations of Henseler and Fassott [14].

The results confirmed that all four proposed hypotheses were statistically significant ($p < .001$). The strongest structural relationship was observed between Communication and Social Relationships and Emotions and Feelings ($\beta = 0.5045$), followed by the relationship between Emotions and Feelings and Health and Personal Well-being ($\beta = 0.3758$). Likewise, emotions and feelings significantly influenced user experience ($\beta = 0.3374$), whereas user experience exerted a positive effect on health and personal well-being ($\beta = 0.2548$).

Regarding effect size (f^2), the relationship between Communication and Social Relationships and Emotions and Feelings exhibited a large effect, whereas the relationship between Emotions and Feelings and Health and Personal Well-being demonstrated a moderate effect. The remaining structural relationships showed small effect sizes, although they remained statistically significant. The overall model fit was evaluated using the Standardized Root Mean Square Residual (SRMR). The obtained value (SRMR=0.0873) was slightly above the recommended threshold of 0.08. Nevertheless, considering the predictive orientation of PLS-SEM and the satisfactory reliability and validity indicators observed throughout the measurement model, the overall model fit can be regarded as acceptable (Table 7), [15].

Table 7. Summary of effects.

Direct effect	Beta	p-value		Valor t	f2
H1: CRS -> ES	0.5045	0.0000	***	12.6885	0.3415
H2: ES -> SBP	0.3758	0.0000	***	7.9285	0.1716
H3: ES -> EU	0.3374	0.0000	***	6.8608	0.1285
H4: EU -> SBP	0.2548	0.0000	***	5.3954	0.0789

Note. Prepared by the author based on analysis using ADANCO PLS-SEM software.

Overall, the findings support the proposed conceptual model, confirming that digital literacy contributes to improving older adults' emotional well-being and quality of life through enhanced communication, positive emotional experiences, and favorable user experiences with digital technologies.

From this analysis, a summary of the model validation was obtained, the results of which allow us to determine the magnitude and importance of the effects associated with the research hypotheses. These findings are presented in Tables 7 and 8. The beta (β) coefficients show significant effects among the analyzed variables. In particular, emotions and feelings exert a positive influence on health and personal well-being. While user experience also has a positive effect on this variable [16]. Likewise, communication and social relationships have a positive influence on emotions and feelings [17]. These coefficients far exceed the suggested minimum reference value of 0.20 for path coefficients [14]. Which confirms the relevance of the proposed relationships.

Furthermore, the statistical significance values (p-values) obtained for hypotheses H1, H2, H3, and H4 were 0.0000, demonstrating a high level of significance. These results support the hypotheses that communication and social relationships positively influence emotions and feelings and that these, in turn, favorably impact the health and personal well-being of older adults. Similarly, the mediating role of user experience in the relationship between emotions and feelings and health and personal well-being is confirmed. The interpretation of the significance values was carried out considering the conventional criteria: $p < 0.10$, $p < 0.05$, $p < 0.01$, and $p < 0.001$, with values close to 0.0000 being desirable when the beta coefficients are significant.

Regarding effect size (f^2), the results indicate that the relationship between Communication and Social Relationships and Emotions and Feelings (H1) has a large effect. In contrast, the influence of emotions and feelings on health and personal well-being (H2) shows a medium effect size. Meanwhile, the relationships between emotions and feelings and user experience (H3), as well as between user experience and health and personal well-being (H4), reflect less intense effects. The interpretation of these values is based on the criteria proposed by Hair et al. [8] Where values less than 0.020 indicate no substantial effect; between 0.020 and 0.150 represent small effects; between 0.150 and 0.350 correspond to moderate effects; and values greater than 0.350 show large effects.

The results obtained confirm the hypotheses put forward in the research, demonstrating that communication and social relationships exert a significant influence on emotions and feelings. Furthermore, it is shown that these factors have a positive impact on health and personal well-being through the mediating role of user experience. These findings provide relevant evidence for a better understanding of the relationships and interactions between these variables in the older adult population.

Table 8 summarizes the results of the hypothesis testing. All four proposed hypotheses were supported, indicating that the structural relationships specified in the conceptual model were positive and statistically significant. The strongest effect was observed between Communication and Social Relationships and Emotions and Feelings ($\beta = 0.5045$), whereas the weakest, although still statistically significant, was found between User Experience and Health and Personal Well-being ($\beta = 0.2548$). These findings provide empirical support for the proposed theoretical model and demonstrate the positive influence of digital literacy on older adults' quality of life through emotional and social mechanisms [5].

Table 8. Hypothesis testing.

Hypothesis	Structural Path	β	p-value	Decision
H1	Communication and Social Relationships $\rightarrow$ Emotions and Feelings	0.5045	< .001	Supported
H2	Emotions and Feelings $\rightarrow$ Health and Personal Well-being	0.3758	< .001	Supported

Hypothesis	Structural Path	β	p-value	Decision
H3	Emotions and Feelings → User Experience	0.3374	< .001	Supported
H4	User Experience → Health and Personal Well-being	0.2548	< .001	Supported

Note. Prepared by the author based on analysis using ADANCO PLS-SEM software.

4. Discussion

The findings of this study provide empirical evidence that digital literacy constitutes an important determinant of emotional well-being and quality of life among older adults. By integrating communication, emotional, and technological dimensions within a single structural model, the results demonstrate that ICT use contributes to healthy aging not only through access to digital technologies but also by strengthening social participation, emotional well-being, and positive users.

The strongest relationship identified in the structural model was between Communication and Social Relationships and Emotions and Feelings. This finding suggests that ICT-mediated communication represents considerably more than a technological activity for older adults [12]; rather, it functions as an important mechanism for maintaining emotional support networks, reducing loneliness, and strengthening interpersonal relationships. These findings reinforce previous evidence indicating that digital communication plays a critical role in promoting active ageing and mitigating social isolation among older populations ([3] & [4]).

These findings are consistent with those indicated by the World Health Organization [1], which states that digital inclusion is an important component for promoting active and healthy aging. Similarly, the Economic Commission for Latin America and the Caribbean [6]. It argues that digital technologies can significantly contribute to reducing conditions of social exclusion and strengthening the participation of older adults in different social and community environments. Similar findings have recently been reported in European and Asian contexts, where digital competence has been associated with higher levels of autonomy, life satisfaction, and psychological well-being [5]. Although sociocultural contexts differ, the consistency of these findings suggests that digital literacy represents a universal determinant of healthy ageing.

Furthermore, the results are consistent with recent studies conducted by Seifert et al [3]. These studies identify that access to and use of digital technologies in recent years has allowed older adults to maintain social connections, reduce feelings of loneliness, and improve their emotional well-being. The significant influence of emotions and feelings on health and personal well-being confirms that the benefits of ICT use extend beyond functional aspects. Emotional satisfaction derived from successful technology use may increase self-confidence, independence, and perceived quality of life, particularly among older adults who frequently experience barriers to social participation.

Similarly, the relationship between emotions and feelings and user experience shows that positive emotional perceptions directly influence acceptance and satisfaction with the use of technological tools. This finding aligns with that proposed by Sixsmith et al [18]. Who argue that ease of use, accessibility, and perceived usefulness of technologies represent determining factors for digital adoption in older adults?

Furthermore, the results show that user experience has a positive influence on health and personal well-being [19]. Although the relationship between user experience and health and personal well-being presented the smallest standardized coefficient, it remained statistically significant. This finding indicates that accessibility, usability, and perceived usefulness continue to play relevant roles in determining whether digital technologies positively affect older adults' daily lives.

These results are consistent with recent studies suggesting that intuitive and user-friendly digital environments facilitate technology acceptance, increase confidence, and improve satisfaction among older adults, ultimately contributing to healthier and more independent aging ([5] & [18]).

Methodologically, the structural model demonstrated adequate levels of reliability and convergent validity and also satisfactorily met the discriminant validity criteria using the Fornell-Larcker test. The relatively modest R^2 values observed in this study should not be interpreted as a weakness of the proposed model. Human behaviors, particularly among older adults, are influenced by multiple psychological, social, cultural, economic, and health-related factors that extend beyond digital literacy alone. Consequently, moderate explanatory power is expected in behavioral research and is considered acceptable within PLS-SEM applications in the social sciences. As noted by [8]. Predictive models in behavioral studies rarely explain the total variance of endogenous constructs because human decision-making is inherently multidimensional. Therefore, the explanatory power achieved in this study is consistent with previous research examining technology adoption and well-being among older populations.

From a theoretical perspective, this research extends previous studies on digital literacy and healthy aging by integrating communication and social relationships, emotions and feelings, user experience, and health and personal well-being within a single structural model. While previous investigations have generally examined these dimensions independently, the present study demonstrates their simultaneous interaction through Partial Least Squares Structural Equation Modeling (PLS-SEM). This integrated perspective contributes to a better understanding of the mechanisms through which digital literacy enhances quality of life and supports the growing recognition of digital competence as a multidimensional determinant of active aging ([2] & [5]).

From a practical perspective, the findings suggest that digital literacy initiatives for older adults should prioritize communication-oriented applications before introducing more complex digital services. Educational interventions centered on messaging platforms, video calls, and social networking applications may strengthen emotional engagement and increase users' confidence, thereby facilitating the subsequent adoption of telemedicine, e-government services, online banking, and other digital resources. Likewise, policymakers should promote accessible training programs that consider the cognitive, emotional, and social characteristics of older adults in order to reduce the digital divide and foster more inclusive and healthy aging ([4] & [6]).

Despite its contributions, this study presents several limitations. First, the research was conducted exclusively in the municipality of Mexicali, Baja California, which may limit the generalizability of the findings to other geographical contexts. Second, the cross-sectional design prevents causal inferences and limits the analysis of changes in digital literacy and well-being over time.

Finally, the study relied on self-reported data, which may introduce common method bias and social desirability effects, despite the confidentiality procedures implemented during data collection. Future studies could overcome these limitations by employing longitudinal designs, objective indicators of digital competence, and comparative analyses across different regions and cultural contexts ([20] & [8]).

5. Conclusions

This study analyzed the influence of digital literacy and the use of information and communication technologies (ICTs) on the quality of life of older adults in the municipality of Mexicali, Baja California. The proposed structural model confirmed that digital literacy extends beyond technological access, functioning as a multidimensional process that strengthens communication, emotional well-being, user experience, and perceived health among older adults. Consequently, the findings reinforce the growing recognition of digital literacy as a strategic component of healthy and active aging.

The empirical results supported all four proposed hypotheses. Communication and social relationships exert the strongest influence on emotions and feelings, demonstrating that digital interaction with family members, friends, and social networks represents one of the principal mechanisms through which ICTs improve older adults' quality of life. Likewise, positive emotional experiences significantly enhanced both user experience and health and personal well-being, confirming that emotional factors play a central role in the successful adoption and meaningful use of digital technologies.

From a theoretical perspective, this research contributes to the literature by integrating communication, emotional well-being, user experience, and health into a single structural model explaining the influence of digital literacy on quality of life. Unlike previous studies that have primarily examined technology access or digital competence independently, the present research demonstrates the interconnected nature of these dimensions through Partial Least Squares Structural Equation Modeling (PLS-SEM). This integrated approach provides a broader understanding of how digital literacy promotes healthy aging within rapidly digitalizing border regions.

From a practical perspective, the findings provide valuable evidence for policymakers, educational institutions, healthcare organizations, and community agencies seeking to reduce the digital divide among older adults. The results suggest that digital literacy programs should prioritize communication-oriented technologies and accessible learning environments that strengthen older adults' confidence, autonomy, and social participation before introducing more complex digital services such as telemedicine, e-government platforms, or online financial services. These strategies may contribute to more inclusive public policies and improve older adults' overall quality of life.

Although this study provides important empirical evidence, several limitations should be acknowledged. First, the research was conducted exclusively in the municipality of Mexicali, Baja California, limiting the generalizability of the findings to other geographical settings. Second, the cross-sectional design restricts causal interpretation and does not allow the observation of changes in digital literacy over time. Finally, the use of self-reported data may introduce response bias despite the methodological procedures implemented to ensure confidentiality and anonymity.

Future research should extend the proposed model by incorporating additional variables such as socioeconomic status, digital self-efficacy, cognitive functioning, family support, and digital resilience. Likewise, longitudinal and comparative studies conducted across different regions and countries would contribute to understanding the evolution of digital literacy throughout the aging process. Finally, emerging technologies—including artificial intelligence, virtual assistants, wearable health devices, telemedicine platforms, and smart home technologies—represent promising areas for future investigation regarding their potential contribution to healthy aging and improved quality of life.

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