



Digital Innovations In Interior Design: A New Model For Enhancing Indoor Spaces In Elderly Care Residences

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ABSTRACT

Purpose: This study examines how digital interior design innovations interaction with others, and quality of life of elderly residents in China relate. The study examines how digital innovations affect engagement and social interaction in living spaces to help create age-friendly facilities that enhance well-being and independence in senior people.

Method: An online survey was administered to a sample of 219 experts working in China's interior design companies. Stata software was used to analyze the data using a structural equation modeling (SEM) methodology.

Findings: The results of this research showed strong correlations between digital innovations in interior design, engagement with digital innovations, social interaction and connectedness, and older residents' quality of life. Digital innovations favorably affected technology and social interaction, which mediated the relationship between digital innovations and quality of life. Additionally, social connection and connectedness moderated the relationship between digital advances and quality of life.

Originality/Implications: This study emphasizes the importance of digital and social components in age-friendly living environment design. The findings can help designers, politicians, and stakeholders create supportive and empowering places for elderly Chinese people, improving their well-being and quality of life.

Keywords: Digital innovations, Interior design, Elderly residents, Quality of life, Social interaction.

Introduction

Homes, workplaces, and public areas are all significantly impacted by interior design. Modern digital technology has completely changed interior design. New avenues for user involvement, productivity, and creativity have been made possible by these developments (Kosti et al., 2024). The design process has changed as a result of digital technologies like CAD, AR, VR, and smart home automation (Song et al., 2024). Virtual reality (VR) and augmented reality (AR) are examples of digital innovations. People can now alter their living spaces in novel ways because to these advancements, which have also improved tools for designers to visualize and experiment with. (Smith et al., 2019). With an aging population and a greater reliance on technology, digital advances in interior design are becoming more and more significant (Yang et al., 2024). The health of the elderly is significantly impacted by these findings.

Research has indicated that the utilization of digital interior design can positively influence the wellbeing of elderly individuals. examined the potential advantages of smart home technologies as well as the efficacy of aging-in-place initiatives (Dash et al., 2024). Liu (2024) study looked at how these technologies help older people feel more secure, convenient, and safe. According to a study, senior individuals felt more independent after implementing smart home features including temperature management, emergency response systems, and controlled lighting (Pasina et al., 2024). This significantly raised their standard of living. Applications of virtual reality cognitive treatment for older persons with mild cognitive impairment were evaluated (Frimpong et al., 2024). Kumar et al. (2023) discovered that cognitive function, attention span, and spatial orientation

were all improved by VR therapy. It has been noted that as people age, using digital technology can improve their cognitive performance (Mnea et al., 2023). Jang (2023) analysis of the effects of assisted living facility interior design on elderly residents' mental and physical health was done. Well-planned homes with lots of natural light, useful floor patterns, and cozy furniture improved residents' psychological health, social interaction, and general well-being (Almusaed et al., 2023). The impact of AR apps on the living conditions and contentment of older individuals was investigated by Carlson et al. (2023). They found that using augmented reality-based design tools to customize and modify living areas enhanced the satisfaction and quality of life of senior citizens.

Although the impact of technology on elderly health has not been well examined, it has been thoroughly studied in interior design (Carlson et al., 2023). The social and psychological aspects of life have been neglected in favor of research on digital innovation and technology (Carvalho et al., 2023). Senior convenience, safety, and engagement are enhanced by smart home, virtual reality, and augmented reality technologies (Norouzi et al., 2023). The impact of social involvement and connectivity on late-life quality of life is less well understood. The impact of digital technology on the wellbeing of the elderly has not been extensively studied (Miller et al., 2023). There has been minimal research on how digital breakthrough combinations affect people's quality of life. The relationship between VR apps and smart home systems has not been thoroughly examined (Cantone et al., 2023). Most research' cross-sectional designs and small sample sizes make it challenging to draw conclusions and establish causal relationships. There is a need to do research to comprehend these developments (Engelen et al., 2022). A small body of research indicates that social determinants like social support, social engagement, and connection may have an impact on the relationship between digital innovations and outcomes related to older people's well-being (Site et al., 2022). Understanding how social factors affect how digital innovations affect quality of life is essential to designing age-appropriate living spaces that promote social interaction and general well-being in later life (Su et al., 2022). Closing the current literature gaps will be essential to gaining a thorough knowledge of the complex relationships between technology, social contact, and older people's well-being.

Seniors' quality of life, social interactions, and digital upgrades are examined through a study of the ecological model of aging and the technology acceptance model. It is anticipated that these models will clarify the relevant linkages. The relationship between environmental elements, social ties, individual traits, and general well-being in later life is illustrated by ecological model (Gillespie, 2022). According to the technological acceptance paradigm, social factors, perceived utility, and ease of use influence how technology is adopted and used (Peters et al., 2022). This work has two purposes based on these theoretical perspectives. It looks into how senior citizens' quality of life is impacted by digital interior design. The relationship between technological advancement and quality of life is then examined in terms of how social connection and connectedness mediate and moderate it. This study shows us how to design age-friendly living spaces that enhance the well-being and quality of life of older persons by utilizing digital technologies.

Literature Review

Digital technology has enhanced the uniqueness, efficiency, and inclusiveness of interior design. The design process has changed as a result of the abundance of excellent computational tools available to designers (Gao et al., 2022). Workflow, visual representation, stakeholder, client, and designer communication are all enhanced by digital technologies (Wang, 2022). With CAD software, designers may create accurate two- and three-dimensional representations of locales. This gives consumers unparalleled precision when experimenting with layouts, furnishings, and colors (Taramasco et al., 2022). Customers can swiftly adjust after viewing designs. This assists clients in making informed choices and avoiding expensive adjustments. Immersion design experiences are made possible by VR and AR (Tosi et al., 2021). By combining reality and imagination, these technologies enable users to visually explore various locales and interact with objects in real time. Innovation in interior design is aided by digital technologies (Lee et al., 2021). Creative and innovative home modifications can be made by homeowners and do-it-yourselfers with the help of digital interior design (Rampioni et al., 2021). Professional design services are now more accessible and reasonably priced thanks to technology. Websites and apps for mobile interior design are expanding quickly (Liddle et al., 2021). Websites and services provide digital resources, ideas, and help with design. These systems make design recommendations for users' areas, budgets, and hobbies using intricate algorithms and machine learning (Verbeek et al., 2021). Choose from a carefully chosen assortment of accessories, décor, and furniture to fit your style. E-commerce is being used by more people, which facilitates transactions (Mohezar et al., 2021). Online shopping streamlines the process and gets rid of middlemen. Through its emphasis on customer diversity and preferences, this concept revolutionized the interior design sector (Hatefishojae et al., 2021). Our living, working, and environmental interactions will be transformed by interior design and digital innovation. Modern technology is ever-evolving and pervasive in our daily lives (Abdelmonem, 2021).

"Digital innovations in interior design" are advancements in technology that improve the warmth, functionality, and beauty of living rooms (Méndez et al., 2020). Technology is referred to as "digital innovations" in interior design. CAD, AR, VR, and smart home automation are all on the list. Included are social interactions, life satisfaction, physical and mental health, and social well-being (Lee et al., 2020). Recall that aging presents unique obstacles for those who are older. These mobility, sensory, and cognitive problems

may have an impact on their home lives (Gu, 2020). Previous empirical research have looked at the impact of changes in digital interior design on the quality of life of older adults (Gao et al., 2020). Aging in situ is accelerated by smart home technologies, claim Kostı et al. (2024). The lives of senior folks are now easier, safer, and more secure thanks to technology. VR and AR applications have been shown to improve elderly people's cognitive performance, social isolation, and engagement (Yang & Whang, 2024). Seniors' physical and emotional wellness is enhanced in well-designed living environments, according to research by Liu (2024). These circumstances encourage everyone's participation, independence, and self-governance. Seniors' lives are improved by digital interior design, according to Frimpong et al. (2024). Studies show that digital technology can address the unique requirements and difficulties faced by the elderly, enhancing their quality of life (Mnea & Zairul, 2023). Empirical evidence backs this up. Interior designers can create homes that are appropriate for people of all ages by utilizing cutting edge design principles and technological advancements (Almusaed et al., 2023). These places were especially designed to improve senior adults' social interaction, comfort, safety, and convenience of usage (Carlson et al., 2023). Many think that elderly in comparable situations may live better lives if digital technology were included into interior design.

H1. Digital innovations in interior design significantly influence the quality of life of elderly residents. Prior empirical research has provided valuable insights into how consumers use digital interior design technology (Norouzi et al., 2023). Several studies have looked at the popularity and uptake of interior design on digital platforms. User opinions, actions, and experiences have been documented in these research (Mohezar et al., 2021). Research has been done on the effects of user interface design, usability, perceived utility, and satisfaction on the use of digital design tools and applications (Liddle et al., 2021). Empirical evidence also demonstrates that designers' technological proficiency, attitudes toward technology, and assessment of how well these innovations fit into their workflows all have an impact on how ready they are to embrace and integrate digital advances into their work (Lee & Park, 2021). Designers consider these aspects when choosing digital technologies. Taramasco et al. (2022) found that training, support, and organizational culture help design organizations implement and use digital design technology. People's interaction with digital technology improvements in interior design may affect their use (Gao & Zhou, 2022). Organizational support, perceived utility, and usability all affect digital design tool uptake and use, according to empirical data (Gillespie, 2022). Research indicates that the integration of digital innovations in the design process enhances the inventiveness, productivity, and teamwork of designers. Thus, according to, this might lead to a rise in participation and support for these technologies (Site et al., 2022). Therefore, it is anticipated that advancements in digital interior design would increase the acceptability, use, and happiness of digital design tools and apps (Cantone et al., 2023). This theory is supported by the fact that people actively contribute to digital advancements.

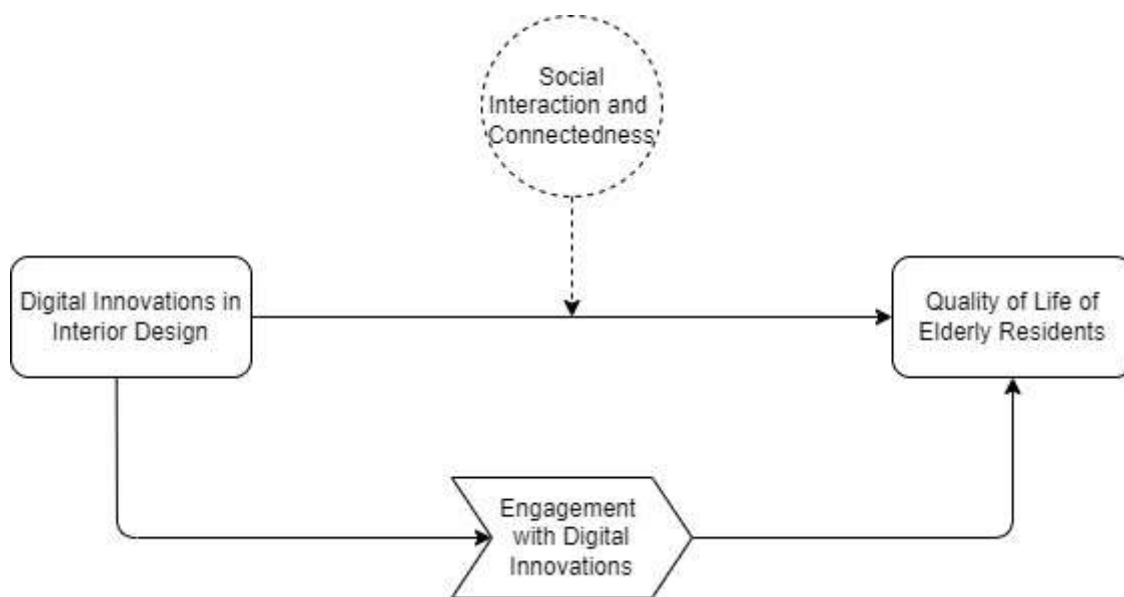
H2. Digital innovations in interior design significantly influence the engagement with digital innovations. Research has looked at the intricate relationship between the usage of digital technologies and interior design by older persons and their quality of life (Su et al., 2022). The advantages of digital gadget use for older individuals' health have been the subject of several research (Engelen et al., 2022). The elements include happiness with life, social interaction, mental clarity, and physical well-being (Miller & Burton, 2023). According to Carvalho et al. (2023) research, using digital technology can improve the mental and emotional well-being of older persons. Included are social media, online health resources, and virtual communities. The benefits of internet connection on cognition, sociability, and emotional support were examined by Carlson et al. (2023). These components are all beneficial to older people's health. According to the theory, senior residents' quality of life is impacted by their involvement with digital interior design innovations. This theory is grounded in recent empirical research. Studies indicate that the use of digital technology to enhance interior design benefits senior citizens (Jang, 2023). Evidence suggests that older adults use digital tools. Digital advances such as virtual reality apps, smart home technology, and digital design tools can enhance the quality of life of senior inhabitants by promoting their independence, accessibility, and social interaction in their living environment (Kumar et al., 2023). The assertion has to be supported with citations (Pasina et al., 2024). Studies show that those who use digital technology frequently are more likely to experience improvements in their emotional state, social interactions, cognitive function, and physical health all of which are critical facets of life quality (Dash & Shetty, 2024). The quality of life depends on these outcomes. Participating in digital innovations is therefore anticipated to moderate the relationship between advancements in interior design and the well-being of senior citizens (Song et al., 2024). This will increase the health benefits of digital technology.

H3. Engagement with digital innovations significantly mediates the relationship of digital innovations interior design and quality of life of elderly residents.

Previous empirical research has examined the intricate relationship between elder people' quality of life and digital interior design upgrades, connectedness, and social connection (Norouzi et al., 2023). Several studies have demonstrated that social connections and interactions enhance the well-being of older persons (Carvalho et al., 2023). These consist of contentment with one's body, mind, and life. Social isolation and loneliness are associated with a lower quality of life and worse health in older persons (Carlson et al., 2023). These results were released in two studies. Social networks, meaningful social contacts, and social support all enhance older individuals' resilience, emotional control, and subjective well-being (Carlson et al., 2023). These conclusions are supported by studies. The data also suggests that digital technology, such as video conferencing, online

forums, and social media platforms, helps older people maintain their social networks, especially those who struggle to connect in person (Almusaed et al., 2023). Inability to communicate in person makes this especially true. Empirical study supports the hypothesis that social contact and connectedness affect how digital interior design improves senior citizens' quality of life (Jang, 2023). Empirical study suggests that older people's proximity and social connection in their living environment may increase or decrease the benefits of digital interior design improvements (Mnea & Zairul, 2023). Empirical data supports this viewpoint. Digital design has created networked, socially useful living areas. Kumar et al. (2023) say this setting can increase senior persons' quality of life by encouraging purpose, meaningful connections, and social engagement. Digital interior design advancements may be limited in socially isolated or low-contact circumstances. These surroundings may impair older individuals' wellbeing (Frimpong et al., 2024). It is anticipated that social interaction and connectedness would operate as a mediating factor in the relationship between advancements in digital interior design and the quality of life of the elderly (Pasina et al., 2024). The quality of life in later life will be determined by this relationship, not by these breakthroughs.

H4. Social interaction and connectedness significantly moderates the relationship of digital innovations interior design and quality of life of elderly residents.



Methodology

This Chinese study looked at the connections between social characteristics, the quality of life of senior citizens, and digital advancements in interior design. 219 Chinese interior designers were recruited through an online survey. Skilled interior designers were represented in this sample. Professional interior designers were selected. This was done to find out if participants possessed the necessary knowledge to offer perceptive and significant study insights. The online survey could be completed at any time by participants thanks to a safe and secure platform. Data from an online survey were examined using Stata. The study used structural equation modeling (SEM) to investigate proposed correlations among pertinent variables. Numerous relationships in a theoretical model can be estimated using sophisticated statistical techniques like the structural equation model (SEM). It is therefore perfect for researching the complex connections among social issues, digital advancement, and quality of life. Measurement scales that have been proven reliable and accurate in the past were employed in this study. Specifically, the measures employed to evaluate digital innovations in interior design, senior residents' quality of life, social interaction and connection, and engagement with digital innovations were modified from previous studies. Every scale was meticulously selected to incorporate essential attributes and variables crucial to the study's objectives. This allowed for a thorough assessment of the theoretical framework.

Table 1: Measurements used in the study

<i>Variable</i>	<i>No of Items</i>	<i>Reference</i>
Digital Innovations in Interior Design	Thirteen items	(Dongkai et al., 2023)
Engagement with Digital Innovations	Three items	(El-Haddadeh, 2020)
Social Interaction and Connectedness	Five items	(Bel et al., 2009)
Quality of Life of Elderly Residents	Ten items	(Ribeiro et al., 2017)

A number of techniques guaranteed the validity and reliability of the investigation. Prior to data collection, a small group piloted the survey. The exam graded the instrument's clarity, readability, and application to study

objectives. The survey instrument was modified more target audience-friendly based on feedback from pilot tests. Best practices for SEM were applied to the data analysis. This covers the creation, estimation, and assessment of the model fit index. In order to better understand age-friendly environments and inform initiatives aimed at raising older Chinese people's quality of life, this study set out to gather correct data. These were the intended outcomes of this investigation.

Results

Table 2 provides this study's major variables' reliability statistics. Cronbach's Alpha, composite reliability, and average variance extracted (AVE) values for each variable examine measuring scale internal consistency and reliability. "Digital Innovations in Interior Design," at 0.741 Cronbach's Alpha, is moderately consistent. The composite reliability grade of 0.813 implies the scale items accurately assess the construct. The average variance extracted (AVE) value of 0.519, which suggests that the underlying construct accounts for over half of the observed variables' variance, supports the measuring scale's reliability and convergent validity.

Table 2: Reliability Statistics

Variable	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Digital Innovations in Interior Design	0.741	0.813	0.519
Engagement with Digital Innovations	0.787	0.751	0.517
Social Interaction and Connectedness	0.725	0.777	0.575
Quality of Life of Elderly Residents	0.696	0.805	0.504

"Engagement with Digital Innovations" has strong internal consistency and stability. The digital innovation engagement scale is internally consistent and reliable with a Cronbach's Alpha of 0.787 and composite reliability of 0.751. The scale has strong convergent validity with an AVE of 0.517 because the underlying construct accounts for more than half of the variance in the observed variables. These dependability statistics corroborate the measurement scale's validity for measuring digital innovation engagement, supporting the study's findings.

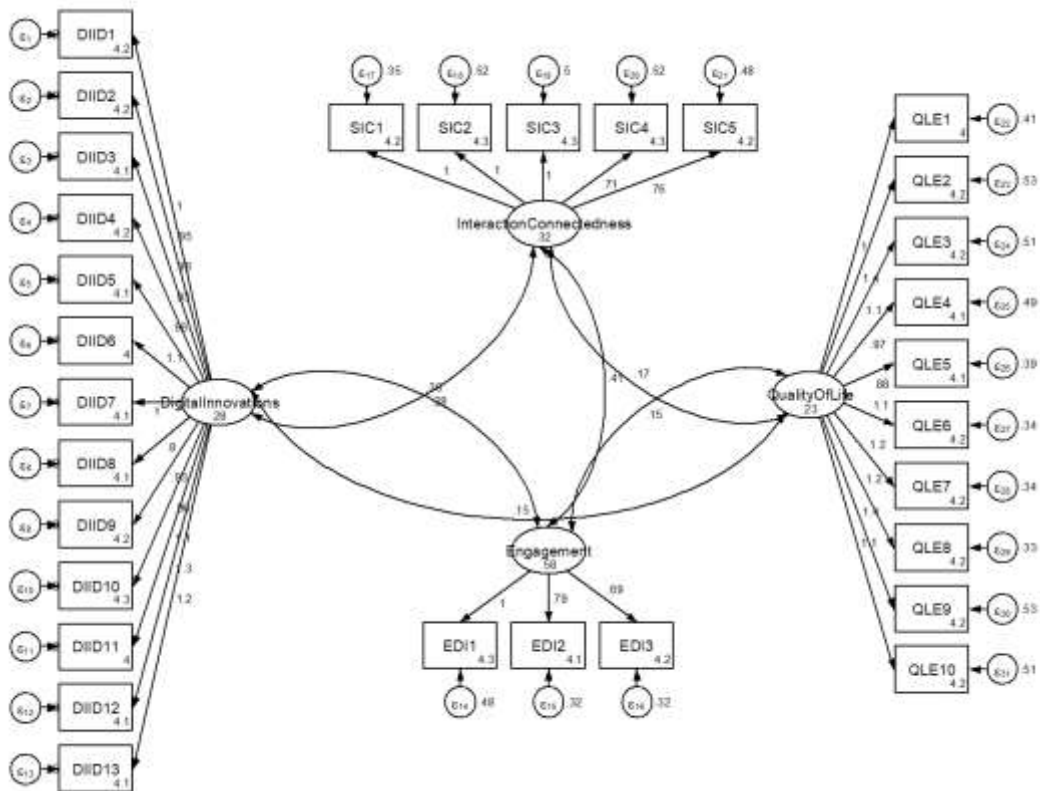


Figure 2: Estimated Model

Table 3 shows how confirmatory factor analysis (CFA) evaluates the measurement model's key variable goodness-of-fit. Standardized regression coefficients (OIM Coef.), standard errors, z-values, p-values, and 95% confidence ranges are shown for each latent construct indicator. Significant positive correlations between indicators and latent components demonstrate convergent validity and reliability. Digital Innovations in

Interior Design (DIID) indicators all have statistically significant coefficients, indicating appropriate assessment. All Engagement with Digital Innovations (EDI) indicators have significant coefficients, proving the scale's reliability and validity. Social Interaction and Connectedness (SIC) and Quality of Life of Elderly Residents (QLE) have substantial correlations for all variables, confirming the measuring model and scales. Confirmatory factor analysis substantially validates the measurement model's goodness-of-fit and study scales.

Table 3: Confirmatory Factor Analysis

Measurement	OIM Coef.	Std. Err.	z	P> z	[95% Interval]	Conf.
DIID1	1	(constrained)				
DIID2	0.674	0.049	2.142	0.000	0.578	0.635
DIID3	0.646	0.051	1.700	0.000	0.546	0.610
DIID4	0.658	0.060	4.070	0.000	0.540	0.641
DIID5	0.597	0.062	8.802	0.000	0.475	0.733
DIID6	0.742	0.064	10.783	0.000	0.618	0.884
DIID7	0.314	0.063	4.829	0.000	0.191	0.445
DIID8	0.589	0.069	9.811	0.005	0.491	0.825
DIID9	0.526	0.056	11.600	0.000	0.482	0.790
DIID10	0.834	0.078	11.774	0.002	0.687	0.864
DIID11	0.674	0.068	9.561	0.000	0.541	0.823
DIID12	0.776	0.063	11.860	0.000	0.653	0.918
DIID13	0.876	0.069	12.293	0.000	0.742	0.835
EDI1	1	(constrained)				
EDI2	0.799	0.065	11.788	0.000	0.601	0.828
EDI3	0.793	0.062	11.752	0.000	0.671	0.934
SIC1	1	(constrained)				
SIC2	0.815	0.058	13.071	0.000	0.702	0.759
SIC3	0.628	0.065	9.254	0.000	0.500	0.771
SIC4	0.187	0.091	1.845	0.013	0.365	0.286
SIC5	0.530	0.060	9.254	0.000	0.678	0.890
QLE1	1	(constrained)				
QLE2	0.840	0.066	11.788	0.000	0.711	0.801
QLE3	0.722	0.068	13.559	0.000	0.678	0.890
QLE4	0.705	0.064	10.147	0.000	0.579	0.848
QLE5	0.774	0.064	11.189	0.000	0.649	0.917
QLE6	0.809	0.062	11.987	0.000	0.688	0.763
QLE7	0.665	0.057	10.706	0.000	0.553	0.792
QLE8	0.793	0.442	1.595	0.000	0.608	0.784
QLE9	0.849	0.062	12.453	0.000	0.727	0.804
QLE10	0.678	0.058	10.642	0.000	0.564	0.809

The factor loadings for each latent construct indicator in Table 4 illustrate the association between observed variables and latent constructs. Standardized regression coefficients, factor loadings, show each indicator's quantity and direction of construct linkage. All DIID indicators exhibit moderate to strong factor loadings from 0.505 to 0.812, indicating credible latent construct measurement. All indicator factor loadings for Engagement with Digital Innovations (EDI), Social Interaction and Connectedness (SIC), and Quality of Life of Elderly Residents (QLE) range from 0.558 to 0.796, validating the measuring scales' reliability and validity. Table 4 demonstrates the measurement model's goodness-of-fit and study's measurement scales' reliability.

Table 4: Factor loadings

Variable	Indicator	Original Sample
Digital Innovations in Interior Design	DIID1	0.700
	DIID2	0.692
	DIID3	0.616
	DIID4	0.666
	DIID5	0.716
	DIID6	0.738
	DIID7	0.760
	DIID8	0.684
	DIID9	0.812

	DIID10	0.751
	DIID11	0.505
	DIID12	0.616
	DIID13	0.796
Engagement with Digital Innovations	EDI1	0.748
	EDI2	0.778
	EDI3	0.735
Social Interaction and Connectedness	SIC1	0.707
	SIC2	0.722
	SIC3	0.715
	SIC4	0.708
	SIC5	0.713
Quality of Life of Elderly Residents	QLE1	0.731
	QLE2	0.694
	QLE3	0.709
	QLE4	0.577
	QLE5	0.558
	QLE6	0.738
	QLE7	0.760
	QLE8	0.684
	QLE9	0.762
	QLE10	0.709

Table 5 compares the estimated model's fitness to the saturated model to examine the structural equation model's appropriateness. Fit statistics like SRMR and likelihood ratio chi-square tests examine model fitness. The estimated model has a little larger residual error than the saturated model, with SRMR values of 0.057 and 0.073, respectively. Additionally, likelihood ratio chi-square tests demonstrate considerable disparities between the estimated and saturated models with p-values less than 0.05, indicating a lack of fit for the estimated model. The chi-square values for the baseline vs. saturated models further reinforce this discovery, with large differences identified between the two models. Overall, while the estimated model provides a fair fit to the data, the differences between the estimated and saturated models suggest possible areas for development in the structural equation model.

Table 5: Model Fitness

	Saturated Model	Estimated Model	Fit statistic	Value	Description
SRMR	0.057	0.073	Likelihood ratio	13514.623	model vs. saturated
			p > chi2	0.000	
			chi2_bs(2356)	10782.380	baseline vs. saturated
			p > chi2	0.000	

Table 6 provides the R-squared values for each structural equation model latent construct, illustrating how much variance external factors explain for each endogenous variable. The model's exogenous components explain 32.8% of digital interior design advances' variance, according to R-squared = 0.328. Exogenous variables explain 21.0% of study participants' digital innovation involvement, according to an R-squared value of 0.210. Exogenous variables explain 43.0% of older residents' social contact and connection, according to its R-squared value of 0.430. These R-squared values indicate how structural equation model exogenous factors predict and affect endogenous variables. Results show that the model's exogenous variables strongly predict elder residents' digital innovation, engagement, and social connection.

Table 6: R-Square

Variable	R Square
Digital Innovations in Interior Design	0.328
Engagement with Digital Innovations	0.210
Social Interaction and Connectedness	0.430

In Table 7, digital innovations in interior design, engagement with digital innovations, social interaction and connection, and senior residents' quality of life are analyzed. Each row in the table presents a structural equation model route, standardized regression coefficient, standard error, z-value, p-value, and 95% confidence interval. Improved digital interior design has a significant impact on elderly residents' quality of life (standardized regression coefficient: 0.751, p < 0.001). This suggests that digital interior design improves elderly people's lives. The second row indicates that digital improvements in interior design significantly affect

engagement (standardized regression coefficient = 0.720, $p < 0.001$). This shows that seniors are more interested in digital interior design upgrades.

Table 7: Path Analysis

	OIM Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Digital innovations in interior design significantly influence the quality of life of elderly residents.	0.751	0.055	2.385	0.000	0.643	0.693
Digital innovations in interior design significantly influence the engagement with digital innovations.	0.720	0.057	1.893	0.000	0.608	0.665
Engagement with digital innovations significantly mediates the relationship of digital innovations interior design and quality of life of elderly residents.	0.732	0.067	4.533	0.000	0.601	0.699
Social interaction and connectedness significantly moderates the relationship of digital innovations interior design and quality of life of elderly residents.	0.733	0.060	2.302	0.000	0.616	0.850

Digital innovation involvement strongly impacts the relationship between interior design innovations and senior residents' quality of life (standardized regression coefficient: 0.732, $p < 0.001$). Participation in digital interior design improvements affects seniors' quality of life. The fourth row indicates that social interaction and connectivity mitigate the positive influence of digital interior design on elder inhabitants' quality of life (standardized regression coefficient: 0.733, $p < 0.001$). The quality of life older adults experience from digital technologies depends on their living environments' social interaction and connectivity. Table 7 shows that digital advances in interior design, engagement with digital innovations, social interaction and connection, and older residents' quality of life are linked, helping us comprehend the complex dynamics of age-friendly living settings.

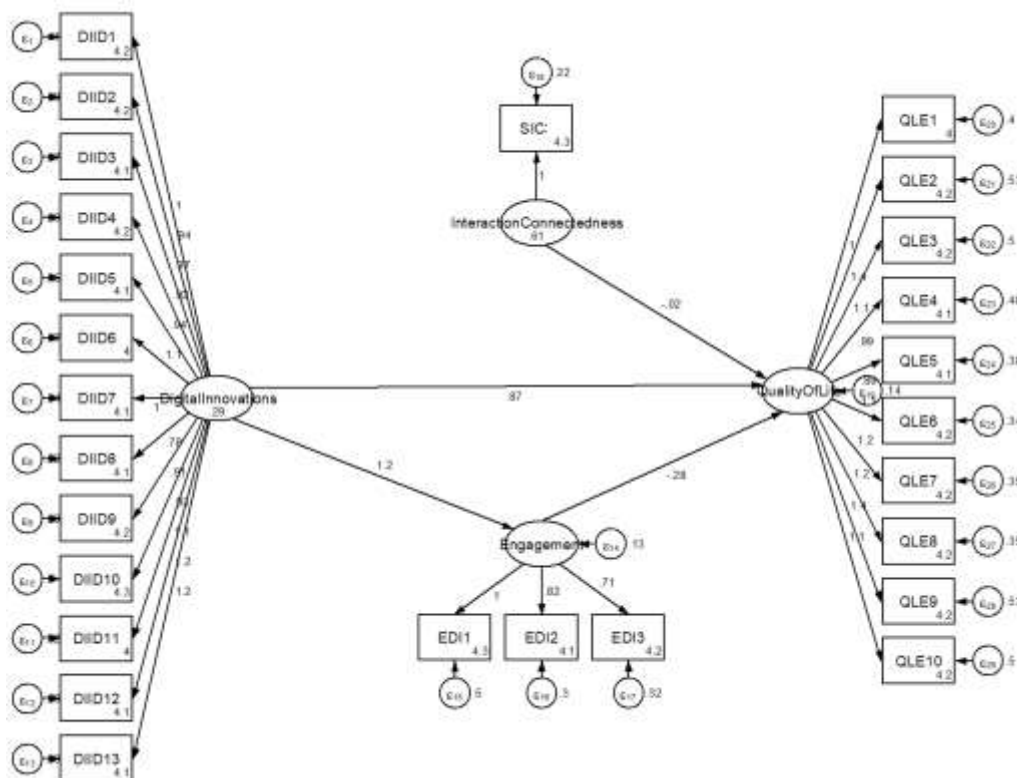


Figure 3: Structural Model

Discussion

The research's discussion chapter discusses the nuanced consequences of the put out theories regarding how advancements in digital interior design impact the well-being of senior citizens. The chapter specifically addresses the study's findings. These results demonstrate the intricate connection between social variables, technical innovation, and later-life well-being. This argument looks at how using digital technology can improve elder living and make life more age-friendly. This will be accomplished via a careful assessment of

existing theories. This study validated the first and second hypotheses and showed how digital interior design affects elder residents' technology use and well-being. The findings show how digital technology may transform senior-friendly living settings that match their needs. VR, AR, and smart home automation can assist interior designers make elder homes safer, accessible, and comfortable. Quality of life improves for elderly. Confirming the second hypothesis highlights user acceptance and involvement in digital interior design uptake and use. Peters and Verderber (2022) found that stakeholders and designers were more creative, productive, and satisfied with the design process when given digital design tools and technologies. These folks value design. These ideas emphasize developing age-friendly homes with social and technical features. Technology can increase senior safety, connectivity, and customization, but social interaction is still vital. Socially linked seniors enjoyed happier, better lives, according to (Taramasco et al., 2022). Explore how integrating digital advances into interior design can improve older citizen social support, community ties, and social participation. This study also underlines the necessity to explore and innovate in digital interior design to meet geriatric needs. Digital technologies can improve user engagement and quality of life, but more study is needed to maximize design interventions, understand technology uptake, and identify implementation best practices. To completely understand how digital innovations affect seniors, longitudinal research and larger, more diverse sample sizes are needed; Liddle et al. (2021) suggest this. Future studies must also examine how social aspects like social contact, support, and relationships mitigate the relationship between technical advancement and life quality. Designers, lawmakers, and other stakeholders can collaborate in the digital age to create living spaces that promote elderly adults' autonomy, independence, and well-being. We can address poorly understood scientific areas.

Validating the third and fourth research hypotheses illuminates the complex relationship between senior well-being, interior design technology, and social contact. The findings show that proactive user involvement maximizes technological intervention benefits. Interacting with digital interior design breakthroughs affects living quality. Technology and digital design tools improve well-being, happiness, and living space customization (Hatefishojae et al., 2021). due of their frequent deep meetings. The fourth hypothesis shows that social contact and connectedness govern how digital interior design affects quality of life. Technology use by seniors is heavily influenced by society. Social engagement, community connections, and social support networks promote healthy aging and a higher quality of life. These ideas emphasize the importance of age-appropriate living spaces. The plan should consider society and technology. Digital technology is secure, convenient, and flexible, yet seniors need social interaction. According to Su et al. (2022), designers and stakeholders must construct venues with modern technologies and strong social relationships and communities. Designers can improve elderly people's lives by encouraging digital socialization.

Digital interior design innovation and research are needed to meet older adults' evolving demands and interests, according to this study. More research is needed to execute design interventions, analyze technology use, and maximize design solutions for older people's quality of life and social ties. Gu (2020) suggest longitudinal study with larger and more diversified samples to understand the long-term effects of digital advancements on elders. Research should study how technology influences various parts of life. Consider how society impacts digital progress and health. In the digital age, design, policy, and other stakeholders may build living places that support geriatric autonomy, independence, and well-being. Try exploring low-data areas. This study accepts all four assumptions to show that digital interior design enhances seniors' life. Technology and socialization can improve elders' independence, well-being, and aging. To understand the complex relationships between technology, social variables, and quality of life, more research and innovation are needed. Interdisciplinary research can create age-friendly living spaces that meet seniors' digital needs.

Conclusion

This study sheds light on the intricate interactions that take place between older persons, society, and technology. These findings offer theoretical and practical recommendations for creating senior-friendly living environments. Incorporating contemporary technology into design interventions can enhance residential settings' safety, usability, and individuality. Additionally, they stress how elderly people's wellbeing is affected by developments in digital interior design. The study finds that digital interaction acts as a mediator in the association between technological improvements and well-being outcomes in older adults, whereas social contact and connection act as moderators. In the age of digital technology, designers, legislators, and stakeholders have the capacity to bestow authority and benefits upon senior citizens. These places can help seniors become more independent and feel better about themselves by encouraging technology use and fostering social interaction. Future research must specifically address the limitations of this study in order to obtain a deeper understanding of age-friendly environments and create creative solutions to meet the needs of the elderly. The constraints include multi-method approaches, diverse samples, and longterm studies. In order to advance, future research should concentrate on overcoming these constraints. Academics may help create inclusive, sustainable, and supportive environments that enhance the well-being and encourage the graceful aging of senior citizens in their homes and communities by examining digital technology and design solutions.

Implications of the study

This study illuminates the intricate interplay between technology advances, social factors, and quality of life in senior interior design. This study improves gerontology and environmental psychology ideas by integrating technological acceptance, social interaction, and ecological models of aging. This study examines how digital innovations affect elderly people's quality of life through participation and social interaction, highlighting the complexity of aging in digitally mediated environments. Second, establishing age-friendly living environments that improve older well-being and independence requires addressing technological and social aspects. This study highlights the mediating role of engagement with digital innovations and the moderating role of social interaction and connectedness to emphasize the need for holistic interior design that prioritizes advanced technology integration and social relationships and community connections in living spaces. The identification of important linkages between digital advances, social factors, and quality of life can help develop targeted therapies and design guidelines to improve senior well-being in the digital age. This research's theoretical implications help us comprehend age-friendly environments' complicated dynamics, enabling future theoretical breakthroughs and interdisciplinary research in aging, technology, and environmental design. This research has substantial implications for designers, policymakers, and stakeholders creating age-friendly aged living environments. The findings emphasize the necessity to include digital technologies into interior design to increase elderly wellbeing. Designers may use smart home, VR, and AR techniques to build secure, accessible, and customizable senior living spaces. By encouraging digital innovation, designers can incorporate seniors in the design process, giving them more control over their homes. Second, social interaction and connection govern the relationship between digital progress and quality of life, emphasizing the need for socially friendly environments that encourage meaningful connections and community participation. Living environments with community rooms, shared activities, and socialization can improve elders' well-being. This research can help policymakers and stakeholders create digitally and socially inclusive age-friendly housing and urban planning projects. This research offers practical strategies for developing inclusive and supportive living settings that encourage senior independence, autonomy, and well-being in the digital age.

Limitations and Future Research Directions

This study sheds light on how technology improvements, social factors, and senior people' quality of life relate, but its limits suggest further research. First, cross-sectional data limits analysis of interaction causation and time. To understand how these interactions alter and how digital innovations affect senior quality of life, longitudinal studies are needed. Additionally, the study sample may not accurately represent older socioeconomic status, cultural origins, and digital literacy. Future study should use more diverse samples to generalize findings across demographics and settings. The study examines how digital interior design improvements affect quality of life, although community features, healthcare availability, and environmental quality may also affect older inhabitants. Future research could examine how these environmental factors synergistically improve age-friendly living. Common method bias and social desirability bias may boost variable relationships in the study's self-report measures. Objective assessments and observational methods could eliminate data gathering biases in future studies. Cognitive talents, personality qualities, and environmental affordances should be examined while studying digital innovations' mediating and social interaction and connectivity' moderating effects. These additional mechanisms can explain how digital innovations affect older adults' quality of life. Finally, given the rapid speed of technological advances and demographic changes, future research should examine emerging digital technologies and design interventions for aging populations' shifting needs and preferences. Addressing these limits and studying age-friendly environments may help scholars create new approaches to increase elder well-being and independence.

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References

1. Abdelmonem, M. G. (2021). Contested homes in the age of the cloud: The changing socio-spatial dynamics of family living and care for older people in the 21st century *The Home in the Digital Age* (pp. 56-79): Routledge.
2. Almusaed, A., Yitmen, I., & Almssad, A. (2023). Enhancing smart home design with AI models: A case study of living spaces implementation review. *Energies*, 16(6), 2636.
3. Bel, D. T. v., Smolders, K., Ijsselsteijn, W. A., & Kort, Y. d. (2009). *Social connectedness: concept and measurement*. Paper presented at the Australasian Conference on Interactive Entertainment.

4. Cantone, A. A., Esposito, M., Perillo, F. P., Romano, M., Sebillio, M., & Vitiello, G. (2023). Enhancing Elderly Health Monitoring: Achieving Autonomous and Secure Living through the Integration of Artificial Intelligence, Autonomous Robots, and Sensors. *Electronics*, 12(18), 3918.
5. Carlson, K., Corness, G., Irannezhad, Z., Brucker, K., & Schlink, L. (2023). Sounds of Connection: Tactile support of family engagement in elderly memory-care residents. *Proceedings of EVA London 2023*, 104-109.
6. Carvalho, A., Chen, T., & Zhou, J. (2023). Post-domestic ageing. Living indoors (without) looking outside? Architectural design and IT devices for a new “ageing in place”. *PAD*, 25(16), 254-282.
7. Dash, S. P., & Shetty, A. (2024). Transitional Spaces as an Integrated Design Approach Enhancing Social Cohesion in High-Rise Dwellings *SDGs in the Asia and Pacific Region* (pp. 1-18): Springer.
8. Dongkai, Q., Mohamed, O., & Ishak, N. H. B. (2023). ACCEPTANCE OF CONTENT AND QUALITY OF INTEGRATED INFORMATION SHARING AMONG INTERIOR DESIGNERS WITHIN A CONSTRUCTION COMPANY WITH AI-ENHANCED SOFTWARE: THE MODERATING EFFECT OF ARTIFICIAL INTELLIGENCE. *International Journal of Business and Society*, 24(3), 1065-1078.
9. El-Haddadeh, R. (2020). Digital Innovation Dynamics Influence on Organisational Adoption: The Case of Cloud Computing Services. *Information Systems Frontiers*, 22(4), 985-999. doi: 10.1007/s10796-019-09912-2
10. Engelen, L., Rahmann, M., & de Jong, E. (2022). Design for healthy ageing—the relationship between design, well-being, and quality of life: a review. *Building research & information*, 50(1-2), 19-35.
11. Frimpong, I. O., Duah, D. A., Marful, A. B., Kwofie, I. E., & Offei-Nketiah, J. K. (2024). Faded memories: The role of design in enhancing the quality of life of persons living with dementia. *Cogent Gerontology*, 3(1), 2308838.
12. Gao, B., & Shen, X. (2020). Through service design to improve the HRQOL (Health-Related Quality of Life) in the treatment and rehabilitation of elderly women with breast cancer in Shanghai. *Transformations*, 40.
13. Gao, Q., & Zhou, J. (2022). *Human Aspects of IT for the Aged Population. Technology in Everyday Living: 8th International Conference, ITAP 2022, Held as Part of the 24th HCI International Conference, HCII 2022, Virtual Event, June 26–July 1, 2022, Proceedings, Part II* (Vol. 13331): Springer Nature.
14. Gillespie, H. W. (2022). Connected: Exploring Automation to Activate Aging in Place Success.
15. Gu, N. (2020). Korean apartment complexes and social relationships of the residents. *Housing Studies*, 35(8), 1362-1389.
16. Hatefishojae, S., Islami, S. G., & Rezaei, M. (2021). Role of local and urban textures in promoting social interactions of residents and emphasizing living centers theory of Christopher Alexander. *Frontiers of Architectural Research*, 10(1), 66-78.
17. Jang, M. (2023). The relationship between spatial characteristics and social interaction of older adults with dementia in nursing homes. *Journal of Asian Architecture and Building Engineering*, 22(1), 175-187.
18. Kosti, M. V., Benayoun, M., Georgakopoulou, N., Diplaris, S., Pistola, T., Xefteris, V.-R., . . . Shekhawat, Y. (2024). Connecting the Elderly Using VR: A Novel Art-Driven Methodology. *Applied Sciences*, 14(5), 2217.
19. Kumar, S., Underwood, S. H., Masters, J. L., Manley, N. A., Konstantzos, I., Lau, J., . . . Wang, L. M. (2023). Ten questions concerning smart and healthy built environments for older adults. *Building and Environment*, 244, 110720.
20. Lee, E.-J., & Park, S.-J. (2021). A preference-driven smart home service for the elderly’s biophilic experience. *Sensors*, 21(15), 5108.
21. Lee, E. J., & Park, S. J. (2020). A framework of smart-home service for elderly’s biophilic experience. *Sustainability*, 12(20), 8572.
22. Liddle, J., Stuart, A., Worthy, P., Levine, M., Kastle, T., Wiles, J., . . . Clare, L. (2021). “Building the threads of connection that we already have”: The nature of connections via technology for older people. *Clinical Gerontologist*, 44(4), 406-417.
23. Liu, L. (2024). The essence of smart home design based on 5G communication. *Multimedia Tools and Applications*, 1-15.
24. Méndez, J. I., Mata, O., Ponce, P., Meier, A., Pfeffer, T., & Molina, A. (2020). Multi-sensor system, gamification, and artificial intelligence for benefit elderly people. *Challenges and trends in multimodal fall detection for healthcare*, 207-235.
25. Miller, E., & Burton, L. O. (2023). Redesigning aged care with a biophilic lens: A call to action. *Cities & Health*, 7(2), 260-272.
26. Mnea, A., & Zairul, M. (2023). Evaluating the impact of housing interior design on elderly independence and activity: A thematic review. *Buildings*, 13(4), 1099.
27. Mohezar, S., Jaafar, N. I., & Akbar, W. (2021). *Achieving Quality of Life at Work*: Springer.

28. Norouzi, N., Swenson, A., & Harvey, S. (2023). Designing for success: integrating theories of human development into architectural design for intergenerational programming. *Journal of Intergenerational Relationships*, 21(4), 495-510.
29. Pasina, I., Corti, E., Eldanaf, T., & Abdullah, D. (2024). Empowering the next generation of women in interior design in the United Arab Emirates through competitive education: a curriculum review. *Archnet-IJAR: International Journal of Architectural Research*.
30. Peters, T., & Verderber, S. (2022). Biophilic design strategies in long-term residential care environments for persons with dementia. *Journal of aging and environment*, 36(3), 227-255.
31. Rampioni, M., Moşoi, A. A., Rossi, L., Moraru, S.-A., Rosenberg, D., & Stara, V. (2021). A qualitative study toward Technologies for Active and Healthy Aging: A thematic analysis of perspectives among primary, secondary, and tertiary end users. *International Journal of Environmental Research and Public Health*, 18(14), 7489.
32. Ribeiro, C., Ferretti Tombini, F., & De Sá, C. (2017). Quality of life based on level of physical activity among elderly residents of urban and rural areas. *Revista Brasileira de Geriatria e Gerontologia*, 20, 330-339. doi: 10.1590/1981-22562017020.160110
33. Site, A., Lohan, E. S., Jolanki, O., Valkama, O., Hernandez, R. R., Latikka, R., . . . Ometov, A. (2022). Managing perceived loneliness and social-isolation levels for older adults: a survey with focus on wearables-based solutions. *Sensors*, 22(3), 1108.
34. Song, T., Xu, L., Zhao, F., & Du, Y. (2024). Healing properties of residential balcony: Assessment of the characteristics of balcony space in Shanghai's collective housing. *Journal of Building Engineering*, 108992.
35. Su, Z., Bentley, B. L., McDonnell, D., Ahmad, J., He, J., Shi, F., . . . da Veiga, C. P. (2022). 6G and artificial intelligence technologies for dementia care: literature review and practical analysis. *Journal of Medical Internet Research*, 24(4), e30503.
36. Taramasco, C., Rimassa, C., & Martinez, F. (2022). Improvement in quality of life with use of ambient-assisted living: Clinical trial with older persons in the Chilean population. *Sensors*, 23(1), 268.
37. Tosi, F., Becchimanzi, C., & Pistolesi, M. (2021). The role of Design for Health and of the Human-Centered Design approach for an ethical and conscious development of innovative Quality of Life Technologies *WORLD HERITAGE and DESIGN FOR HEALTH* (Vol. 8, pp. 193-202): Gangemi editore spa.
38. Verbeek, H., Peisah, C., de Mendonca Lima, C. A., Rabheru, K., & Ayalon, L. (2021). Human rights to inclusive living and care for older people with mental health conditions (Vol. 29, pp. 1015-1020): Elsevier.
39. Wang, W.-C. (2022). Relationships between leisure involvement and quality of life among users of public sports centre aged 45 years and older. *World Leisure Journal*, 64(2), 180-195.
40. Yang, Y., & Whang, H. (2024). Exploring the relationship-oriented spaces of social networks and depressive symptoms among older adults. *Frontiers of Architectural Research*, 13(1), 112-126.

Appendix 1

Digital Innovations in Interior Design:

1. To what extent do you use digital tools or software in your interior design projects?
2. How often do you incorporate digital visualization techniques (e.g., 3D rendering, virtual reality) in your interior design work?
3. How familiar are you with digital innovations in interior design, such as smart home technologies and IoT devices?
4. How often do you utilize digital platforms or online resources for sourcing design inspiration or materials?
5. How confident are you in your ability to adapt to and implement new digital technologies in your interior design practice?
6. How important do you consider digital innovations in enhancing the functionality and aesthetics of interior spaces?
7. How often do you collaborate with digital experts or technology providers to integrate digital innovations into your design projects?
8. How satisfied are you with the efficiency and effectiveness of digital tools and technologies available for interior design?
9. How often do you seek out professional development opportunities to stay updated on the latest trends and advancements in digital innovations for interior design?
10. How likely are you to recommend digital innovations to your clients as part of their interior design solutions?

Engagement with Digital Innovations:

1. How frequently do you actively explore new digital technologies related to interior design?
2. To what extent do you feel confident in your ability to use digital tools and software for interior design purposes?
3. How motivated are you to incorporate digital innovations into your design projects?

Social Interaction and Connectedness:

1. How often do you engage in social activities or events within your community?
2. How satisfied are you with the level of social support and interaction you receive from your neighbors or peers?
3. To what extent do you feel a sense of belonging and connectedness to your community?
4. How often do you participate in group activities or clubs that promote social interaction?
5. How comfortable do you feel reaching out to others for socializing or support when needed?

Quality of Life of Elderly Residents:

1. Overall, how satisfied are you with your current living environment?
2. How would you rate your physical health and well-being in your living space?
3. To what extent do you feel safe and secure in your home?
4. How satisfied are you with the accessibility and convenience of amenities within your living environment?
5. How would you rate the level of comfort and functionality of your living space?
6. How often do you experience feelings of loneliness or isolation within your living environment?
7. How satisfied are you with the social opportunities and connections available to you in your community?
8. How would you rate the level of independence and autonomy you have within your living space?
9. How satisfied are you with the support and assistance you receive from family, friends, or caregivers in your living environment?
10. Overall, how would you rate your quality of life in your current living situation?