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ARTICLE

Assessing the Impact of Innovative Technologies on the Life Satisfaction of Older Adults in Russia and Vietnam

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ABSTRACT

This study uses the concept of "technological space," a term that defines the interplay between the social and technological environment, extending our understanding of environmental factors in various scientific domains. We examine the significance of technological space by looking at how older adults interact with modern technologies in the regional contexts of Russia and Vietnam. This study is motivated by the need to integrate older adults into the regional technological landscape. Although older adults face various challenges that may prevent them from adopting modern technologies in their daily lives, embracing these high-tech products and services can greatly improve their overall happiness and well-being. The analysis draws upon the data gathered through a sociological study in Russia's Tomsk region and a parallel study conducted in Vietnam in 2022. The research outcomes show a noticeable contrast in older individuals' readiness to embrace

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innovative technologies, highlighting their openness to adaptation under specific circumstances. Additionally, these findings underscore the limited and varied extent to which older generations engage with the contemporary regional technological space, as well as the constrained impact of innovative technology on their life satisfaction. These findings can be useful for regional policymakers seeking to enhance the adaptability of older adults in the face of socio-economic challenges.

KEYWORDS
technological space, innovations, life satisfaction, older adults, Tomsk region, Vietnam

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Introduction

In the modern era, the digital transformation of socio-economic systems creates the need to align the economy and society with shifting demographics. These processes determine the need for scholarly investigation into the institutional changes that can help individuals maximize their potential across their lifespans. Increasing the efficiency of resource use in an aging society can help develop technology solutions to address the challenges of the silver economy in an evolving technological landscape. This, in turn, plays a vital role in maintaining the well-being of older individuals and unlocking their resourcefulness. Research in the field of social policy in developed nations consistently reflects the following paradigm shift: there is a growing realization that we should move beyond merely assisting the elderly and focus on effectively leveraging their resource potential.

The development and diffusion of convergent and end-to-end technologies have eliminated territorial boundaries (Biniok et al., 2016; Mazilov & Sakhanevich, 2020). Technological space is no longer limited by formal geographical, cultural, institutional, or demographic boundaries (Borgmann, 2010; Grasland, 1992; Kurtev et al., 2002).

In this study, we use the term “technological space” to describe a combination of technologies and innovations available in a specific region that can impact the well-being of the population. It encompasses industrial, organizational, institutional, and social technologies, along with regional infrastructure, and it serves the needs of individuals living in that area (Ivanov, 2011). Another approach considers new technologies within the framework of an innovation space (Danilova & Kilina, 2019).

This study approaches the concept of technological space not as being limited by administrative or territorial boundaries but as an environment where technologies are accessible through regional socio-economic infrastructure. The extent to which people, including older adults, engage with these technologies depends on factors

such as age, economic status, social needs, and physical abilities, all of which contribute to their overall life satisfaction. Importantly, this research recognizes that older adults are not just consumers of technology but they can also play a role in shaping, adapting, and even creating new technologies, especially in the context of digitalization processes (Peine & Neven, 2019; Vasileva & Mosina, 2014).

Modern technological solutions designed to streamline routine and monotonous tasks have significantly enhanced our quality of life. Research conducted by the Institute for Statistical Studies and the Economics of Knowledge at the Higher School of Economics (HSE University) in 1996–2020 indicates a positive shift in public attitudes toward science and technology, particularly in the context of living standards, health, and environmental factors (Abdrakhmanova et al., 2022; Polyakova & Iudin, 2022).

Furthermore, studies conducted by the International Research Lab for the Improvement of Wellbeing Technologies of Older Adults, National Research Tomsk Polytechnic University (Barysheva et al., 2022; Casati et al., 2021; Pavlova et al., 2021) align with the findings made by the HSE team. There is evidence that new technologies enhance the daily convenience of older individuals and facilitate communication. However, these technologies may also have potential negative effects on the mental and cognitive faculties of older individuals. Some experts propose the use of these new technologies for managing overall life quality (Simakina, 2012).

Recent studies confirm that digitalization, as a socio-technical process, is increasingly impacting not only social and labor aspects but also various facets of older adults' daily lives (Shchekotin, 2022, p. 115). Innovative technologies have become an essential part of daily life, and it is becoming increasingly harder to tackle many everyday tasks without them. Moreover, numerous high-tech conveniences and services are no longer considered luxuries but rather necessary elements that enhance life satisfaction and living standards (Abdrakhmanova et al., 2021, p. 201). The increasing flow of information and the rise of digital technologies can make it challenging for older adults to fully embrace technology, leading to a generation gap in digital adoption, that is "digital gap" or "digital divide." It is evident that older adults are less engaged in the digital world, even though there are many services available and the Age-Tech Market is growing (Varlamova, 2022).

Research in this context predominantly focuses on the older population as the primary consumers of emerging markets related to gerontechnologies (Gomes et al., 2022). These technologies encompass a wide range of care-related technologies and services, health monitoring, robotic assistance, prevention of premature aging, and support for extended professional longevity (Bashkireva, 2016; de Oliveira Silva et al., 2012; Tarasenko & Ryzhkova, 2019). Over the past decade, there has been a notable trend in recognizing gerontology as a distinct category of innovative technology in aging societies.

Technologies aimed at preventing premature aging include widely adopted features such as "sensory rooms" for psychological rehabilitation, "virtual tourism," "adaptive physical education," "call-for-help systems" (telecare), "home medicine systems" (telehealth), "smart homes," and other ICT-based products and services designed to support older individuals in their homes (Rebko & Semutenko, 2016; Wright, 2009). These technologies enhance the efficiency of daily activities,

contributing to increased life satisfaction. Several studies emphasize the active role of older individuals in digital transformations, as they shape demand and actively engage in modifying digital technologies to compensate for age-related limitations, unlock their resource potential, foster social interactions, and create conditions for maintaining and enhancing their quality of life.

In the current context, the most pressing challenges are to encourage motivation and employ social technologies to support individuals in leading active and productive lives well into their retirement years. This includes promoting positive attitudes toward ongoing socio-economic participation. Additionally, it is important to address the digital gap between generations while enhancing the quality of life for older individuals.

The primary objective of this study is to examine the interaction between individuals and media of innovative technologies, particularly their role in shaping the technological landscape in a given region. We intend to assess how individuals from various age groups, particularly older generations, perceive and incorporate innovative devices like personal gadgets and elements of social infrastructure into their daily lives. This analysis, therefore, will focus on the following:

(a) the distribution of older people across various age groups in the regional technological space concerning innovative technologies;

(b) the involvement of the older generation in the operation and evolution of the regional technological space;

(c) the connection between the subjective well-being of individuals from different age groups (life satisfaction) and the material aspects of innovative technologies in the regional technological space.

The predisposition of individuals towards using innovative technologies is assessed through a questionnaire designed to gauge their interest in new home appliances, electronics, technical advancements, and elements of social infrastructure. The respondents were asked to evaluate various aspects of their technological environment and natural surroundings, including water and air quality, as well as the household appliances and electronic devices they use (such as personal vehicles, mobile phones, televisions, computers, refrigerators, and kitchen appliances). This evaluation also considered their willingness to upgrade these devices and their readiness to embrace technical innovations.

The study outlines the structure of the technological environment: older individuals are divided into age groups according to their participation in the regional technological ecosystem's functioning and advancement. To gain a better understanding of their subjective well-being, we employ questionnaires that measure respondents' life satisfaction and their appraisal of technology-related aspects in their daily lives. This examination relies on the data from two regions as illustrative examples.

The study focuses on various aspects of life that constitute the technological space, including the consumption of goods and services, diverse forms of communication, education, health and care, and housing arrangements. The rationale for this categorization aligns with the work of Klemasheva and Kashapova (2022).

We evaluate how different aspects of technological space affect life satisfaction, considering whether they have a positive or negative impact and how strong this impact

is. We intend to show that an individual's use of innovative technologies significantly influences their life satisfaction in older years. Moreover, the most pronounced impact of material components of the technological space on the life satisfaction of older individuals occurs when these individuals actively engage with technology, serving both as proponents of technological integration and as agents of its adaptation and evolution.

Theoretical Framework

The advent of digitalization in the economy has enabled older individuals to engage with new technologies (Chen & Schulz, 2016; Papa et al., 2017). However, there is evidence supporting the existence of an intergenerational digital divide (Iancu & Iancu, 2020; Varlamova, 2022; Vidiasova et al., 2022), which should be taken into account when designing and offering digital services for the older generation. Additionally, Östlund (2021) highlights a paradoxical situation characterized by substantial investments in advanced digital technologies for elderly care, which also needs to be further investigated.

Several scholars, including D. Rogozin, D. Leontiev, I. Grigorieva, P. Glucksman, K. Allen, L. Vidiasova, E. Kuznetsova, and E. Shchekotin, have examined the impact of digitalization and socio-economic transformations on the quality of life for older adults. Their work underscores the significance of integrating older individuals into the digital realm. While most conventional studies usually begin by identifying the needs and understanding of innovative processes among older adults, our study, in contrast, focuses on assessing how new technologies are practically used in their everyday lives and on their impact.

Our analysis of academic literature and Internet resources showed that several studies on the application of daily-use technologies by the older generation are incomplete. Consequently, we have identified several primary research goals to examine the elements of technological space in academic literature. Generally, the studies we reviewed addressed the following aspects. Information technologies have been explored in terms of their impact on citizens' quality of life, aiming to reduce living costs (Mishra & Chakraborty, 2020; Rybakova et al., 2019). The implementation of medical services through mobile devices (mHealth) has been studied in relation to older adults with cognitive impairments and its effect on health-related quality of life (HRQoL) (Christiansen et al., 2020). The use of smartphones and their influence on health and self-assessed quality of life have been analyzed (Ghahramani & Wang, 2020). The potential of "smart home" technologies and "telemedicine/telecare" to enhance the safety and integration of individuals with serious illnesses and special needs into society has been examined (Andone et al., 2020). Researchers have also explored the creation of a social work model to support safe and inclusive communities both online and offline and to promote human rights (Mathiyazhagan, 2022). Finally, access to information and communication technologies among the population has been studied by Sayed Umar et al. (2021) and Zubova (2022).

The primary focus of our research is to examine the impact of technological solutions on the living conditions of older adults and their perceived quality of life

resulting from the adoption of new technologies. We believe it is crucial to gain insights into the ongoing trend of increased life expectancy in Russia, which includes not only longer lifespans but also healthier aging. This trend offers unique opportunities to tackle urgent challenges and improve both overall quality of life and sustainable development.

In our study, we introduce a specific measurement termed the "life satisfaction indicator" to assess the quality of life and investigate how older adults perceive their use of technological solutions. This indicator serves as a valuable tool for understanding life satisfaction, encompassing an individual's assessment of their overall life as well as the specific conditions influenced by the technological environment. It is worth noting that similar approaches have been explored in the works of both Russian and international researchers (Andone et al., 2020; Averin & Sushko, 2019; Didino et al., 2018; George, 2006; Nekhoda et al., 2018; Sushko, 2021).

Research Methods and Materials

We verified our initial assumption by employing a combination of institutional and theoretical methods: reviewing pertinent academic literature, analyzing sociological survey data, and applying econometric techniques like correlation-regression analysis.

For the content analysis, we selected academic publications based on keywords such as "technological space," "elderly people," "older adults," "life satisfaction," and "technology." We then examined these selected publications in detail to estimate the current level of research on the subject.

To determine the scope and impact of elements of technological space, we conducted a sociological survey among older adults in Tomsk region in 2022. The survey involved 234 people and was carried out through standardized telephone interviews. We employed a combination of sampling methods, which included the random generation of telephone numbers and quota sampling based on respondents' area of residence, gender, and age. It should be noted at this point that there is no universally accepted definition of "older adults" in contemporary science and legislation. Researchers addressing issues related to aging use various approaches to define the boundaries of old age (Sinyavskaya et al., 2022). For the purposes of this study, we adopted the lower limit of 60 years, as suggested by several researchers and following the methodology of the World Health Organization (WHO) (Grigoryeva et al., 2019; Kalinkova & Orlikova, 2017; Kuvshinova, 2012).

As for respondents' socio-demographic characteristics, 28% were male and 72% were female. Of all the participants, 31% were aged 60–64; 46% were aged 65–74; and 23% were over 75 years old. Regarding their place of residence, the majority lived in urban areas, with 50% residing in Tomsk and 23% in small towns of the region. Additionally, 27% of the respondents lived in rural areas. In terms of education, the largest proportion (48%) had secondary education, while 28% had completed higher education.

We explored the use of high-technology items by examining such aspects as ownership of household appliances, the need for appliance upgrades, evaluation of product and service quality, assessment of environmental conditions, and income levels. Our assessment of respondents' life satisfaction and happiness was based on their

answers to the two key questions: "Considering all aspects of your life, how satisfied are you with it at the present moment?" (rated from 0 to 10, where 0 = *completely unsatisfied*, and 10 = *completely satisfied*) and "Given all aspects of your life, how happy are you?" (rated from 1 to 10, with 1 = *extremely unhappy* and 10 = *extremely happy*).

In 2022, as part of a collaborative project with Russian scholars, a similar sociological survey was conducted in Vietnam. The survey encompassed 27 provinces and cities, including both rural and urban areas. Data were collected through an online survey using Google Forms, with a total of 362 participants. In terms of socio-demographic characteristics, 44.2% of the respondents were male and 55.8%, female. As for age distribution, 25.4% were aged 60–64; 43.1% were aged 65–74; and 31.5% were over 75 years old. Rural residents constituted the majority (65.7%), while 34.3% lived in urban areas. As for education, 73.8% had attained secondary education or lower, and 26.2% held higher education degrees.

The survey data were processed with the help of Gretl and TIBCO Statistica® software packages for econometric modeling. Our analysis involved correlation analysis using Spearman's criteria and regression analysis, specifically linear regression. Additionally, we employed an interpretational method, elucidating the underlying meaning behind respondents' answers to the research questions posed.

Results and Discussion

Our survey results shed light on the demand for innovative technologies within the given age group and on the older generation's perceptions of the term "innovation." It should be noted that the prevailing perception of "innovation" leans toward the "improvement of existing products," as indicated by 48% of the respondents in Tomsk region. In the ranking of popular household technologies in this Russian region, "air pollution sensors" and "smart home" systems occupy the leading positions (30% and 29% of respondents respectively). "Functional nutrition" ranks third (26%). In Vietnam, the most popular technologies are the "remote doctor" (52%), "functional nutrition" (51.4%), and "household solar battery" (50.3%). In Tomsk region, relatively high levels of interest were observed regarding "garbage compactor," "remote doctor," and "voice assistant" (24–25%). In Vietnam, respondents displayed interest in "electric cars," "pollution sensors," and "smart home" technologies (22–32%).

As for the use of various robots, particularly assistant robots, 17% of respondents in Tomsk region and 19.4% in Vietnam expressed interest. These figures align with the findings published in *Tsifrovaia ekonomika: 2022: kratkii statisticheskii sbornik* [The digital economy: 2022: a statistical brief] (Abdrakhmanova et al., 2022, p. 38). However, it is worth noting that 27% of respondents in Russia showed no interest in the technologies presented in the survey.

There were 46% of respondents in Tomsk region and 56% in Vietnam who reported their interest in innovative food products. However, 9% and 12.5% respectively found it difficult to answer this question. A large number of older adults in Seversk (a town in Tomsk region) positively assessed the attractiveness of innovative food products (67%). Additionally, no significant correlation was found between responses from male

and female respondents in the 60 and older age group, indicating that both genders share a positive attitude toward innovative food products.

High-tech household appliances and electronics enjoy greater popularity compared to food products, with 58% of respondents in Russia expressing a positive attitude towards such technical innovations. This preference is particularly notable among residents of small towns, where 70% favor these innovations, compared to 58% in Tomsk, 56% in rural areas, and 50% in Seversk. Furthermore, if we look at different age groups, we see that the appeal of new household appliances and electronics diminishes with age. Specifically, only 43% of respondents in Russia aged 75 and older answered positively, while this figure reached 62% in the 65–74 age group and also 62% in the 60–64 age group.

To assess the impact of technological aspects on the life satisfaction of older adults, we evaluated their inclination towards technical innovations. Our findings were as follows. In Tomsk region, 36% of respondents indicated no need for new household appliances and electronics, whereas in Vietnam, this figure was 14.2%. In Tomsk region, 15% of respondents displayed a lack of enthusiasm for technical innovations, with 12% expressing a difficulty in understanding how to use new technologies and 3% feeling apprehensive about them. In Vietnam, 3.3% of respondents reported not understanding the concept of new home appliances and electronics, and 0.8% reported using them. However, 29% of respondents in Tomsk region expressed a desire to purchase new items when financially able, while 7% were entirely unwilling to pay for them. In contrast, in Vietnam, 56.2% of respondents expressed their intent to purchase new items if the opportunity arises while 10.6% were unwilling to pay for them.

Among the respondents aged 60–64, there is a notable interest in acquiring new household appliances and electronics. Specifically, 10% are willing to purchase them without hesitation, while 42% plan to do so when financially feasible. In the 65–74 age group, these percentages decrease to 6% and 31%, respectively. In the oldest age group, 75 years and above, the ratio changes, with 4% ready to buy these products under any circumstances and 17% intending to do so once they can. Meanwhile, the older group, 75 years and older, exhibits a growing reluctance towards buying new products, with 19% expressing a lack of understanding regarding new technologies and 8% feeling anxious about them.

When examining the willingness to adopt new household appliances and electronics, we have found the following. Of all the respondents, 7% in Tomsk, 8% in Seversk, 0% in small towns, and 10% in rural areas are eager to embrace new technology due to its potential to enhance their quality of life. The “I will buy if possible” sentiment is more prevalent in Seversk (38%), compared to Tomsk (32%), small towns (33%), and rural areas (26%).

Considering the regional needs of the older generation, who are viewed as a group capable of modifying and even creating technologies, we should also note that 17% of respondents in Tomsk region and 2.7% in Vietnam reported having experience in developing technical innovations for personal use more than five years ago. Additionally, 6% of respondents in Tomsk region have improved technical devices, while 3% have recently created new technical devices. In Vietnam, these figures stand at 23% and 3.3%, respectively.

Innovative activity is more common among men in Tomsk region, with 6% creating new devices and 8% improving existing ones. Conversely, among women, these percentages are 1% and 5%, respectively. In the 60–64 age group, individuals more frequently report having experience in improving technical devices (10% of respondents in this age group, compared to 6% in the 65–74 age group and 2% in the group aged 75 and above). In the oldest age group, 19% of respondents have experience in creating new devices or improving technical means, exceeding the group aged 60–64 and surpassing the group aged 65–74 (14%).

Among the respondents' motivations for engaging in innovative activities for personal use, the most frequently mentioned were the perceived high cost of devices (25% of the overall sample in Tomsk region), the desire to engage in hands-on creation (13%), and a scarcity of such devices (7%).

In Tomsk region, respondents who reported creating new devices or technical means were predominantly individuals with secondary specialized education (66.7%), followed by those with higher education (33.3%). Among those who reported improving existing technical means, 44.4% held higher education, while the second-largest group, at 40.7%, had secondary specialized education.

In the case of Vietnam, respondents who engaged in creating new technical devices mostly had secondary vocational education (50%), while those who reported enhancing existing technical devices were more likely to have secondary general education (41%).

Empirical Analysis of the Survey Data in Russia

Table 1 presents statistical data on individuals' self-assessment of the key elements of technological space and subjective indicators of life satisfaction.

Table 1

Sampling Description for Tomsk Region (N = 234)

Indicator	Average	Median	Standard deviation	Minimum	Maximum
Quality assessment of drinking water	3.156	3.000	0.880	1	5
Quality assessment of the air	3.449	3.000	0.793	1	5
Quality assessment of household appliances	3.013	3.000	0.319	1	4
Quality assessment of electronic technologies	2.987	3.000	0.256	1	4
Quality assessment of the cell-phone	2.977	3.000	0.381	1	4
Quality assessment of mobile connection	2.907	3.000	0.443	1	4
Quality assessment of the personal vehicle	2.907	3.000	0.500	1	4
Life satisfaction	7.680	8.000	2.703	1	11
Happiness level	7.103	8.000	2.555	0	10
Age	69.56	68.00	7.615	60	93
Average income	2.777	3.000	0.892	1	6

Our analysis shows that the respondents' levels of life satisfaction (7.680) and happiness rating (7.103) are above the average. Conversely, the quality of amenities, including household appliances (3.013), electronic technologies (2.987), cell phones (2.977), and personal vehicles (2.907), all received average ratings. To further investigate, we conducted correlation analysis between life satisfaction indicators and the quality assessment of the regional technological space to ascertain the relationship between these indicators and its nature (whether it is positive or negative) (see Table 2).

Table 2

Correlation Matrix for Tomsk Region

Indicators	1	2	3	4	5	6	7	8	9	10
Quality assessment of air	1.000									
Quality assessment of drinking water	.193	1.000								
Quality assessment of household appliances	.012	–.056	1.000							
Quality assessment of electronic technologies	–.036	.009	.392	1.000						
Quality assessment of the cell phone	.081	.117	.122	.237	1.000					
Quality assessment of mobile connection	.037	.128	.079	.148	.278	1.000				
Quality assessment of the personal vehicle	.131	.244	.328	.572	.055	.111	1.000			
Life satisfaction	.165	.141	.228	.154	.088	.063	.511	1.000		
Happiness level	.176	–.014	.136	.043	–.008	.078	.173	.505	1.000	
Average monthly income per household member	–.012	.122	.090	.145	.148	.027	.236	.222	.141	1.000

The correlation analysis demonstrated a moderate correlation ($.5 < r < .7$) between the life satisfaction index and the quality assessment of personal vehicles (.511) for the 60 years and older age group. Conversely, when considering the remaining indicators for the quality assessment of the technological space, respondents in this group exhibited a low level of correlation (weak correlation $.1 < r < .3$) with life satisfaction. Despite the observed weak relationships between these indicators, their continued use in the ongoing analysis remains viable (Andreeva & Volkov, 2013).

To assess the impact (+/–) of individual elements of the technological space on the life satisfaction of older adults, we conducted a regression analysis.

Table 3
Linear Regressions (Ordinal and Interval Variables) With Dependent Variable, Life Satisfaction

Independent variables	Life satisfaction
Quality assessment of the personal vehicle	$B = 2.456$, $p < .01$, $SE = .45$, $R = .261$
Quality assessment of household appliances	$B = 1.915$, $p < .01$, $SE = .55$, $R = .05$
Average income	$B = 0.660$, $p < .01$, $SE = .20$, $R = .048$
Quality assessment of the air	$B = 0.556$, $p < .01$, $SE = .22$, $R = .027$
Quality assessment of electronic technologies	$B = 1.605$, $p < .01$, $SE = .69$, $R = .023$
Quality assessment of drinking water	$B = 0.431$, $p < .01$, $SE = .20$, $R = .02$

Note: The following values are available for linear models: *B* = non-standardized factor; *SE* = standard errors; 95% confidence interval; *R* = *R*-squared.

As depicted in Table 3, the quality of personal vehicles has the most substantial positive impact on the life satisfaction of older adults ($B = 2.456$, $p < .01$, $R = .261$). This finding implies that as the quality of personal vehicles increases, there is a noteworthy 2.5-point improvement in life satisfaction. In contrast, the impact of other independent variables is either less significant or characterized by a lower *R*-squared level.

Empirical Analysis of Vietnam Survey Data

From the survey conducted in Vietnam, we obtained the following results: 14.2% of respondents do not perceive a need for new household appliances and electronics; 56.2% express reservations or are hesitant about technical innovations; 0.8% hold a negative view of technical innovations. Table 4 provides a description of the sample in Vietnam.

Table 4
Sampling Description for Vietnam

Indicator	Average	Median	Standard deviation	Minimum	Maximum
Quality assessment of drinking water	3.55	4.00	0.723	1	5
Quality assessment of the air	3.43	3.00	0.872	1	5
Quality assessment of household appliances	3.66	4.00	0.549	1	4
Quality assessment of electronic technologies	3.61	4.00	0.548	1	4
Quality assessment of the cell-phone	3.45	4.00	0.633	1	4
Quality assessment of mobile connection	3.46	4.00	0.638	1	4
Quality assessment of the personal vehicle	2.94	3.00	0.911	1	4
Life satisfaction	6.33	6.78	1.85	0	10
Happiness level	7.78	8.0	1.55	1	10
Age	70.8	70.0	8.12	60	96
Average income	5.47	6.00	2.32	0	10

Our analysis shows that the respondents assess their life satisfaction (6.33) and level of happiness (7.78) above the average.

Table 5

Correlation Matrix for Vietnam

Indicators	1	2	3	4	5	6	7	8	9
Quality assessment of air	1.000								
Quality assessment of drinking water	.398	1.000							
Quality assessment of household appliances	–.009	.159	1.000						
Quality assessment of electronic technologies	.057	.126	.498	1.000					
Quality assessment of the cell phone	–.073	.032	.365	.543	1.000				
Quality assessment of mobile connection	.009	.079	.334	.498	.540	1.000			
Quality assessment of the personal vehicle	.051	.036	.167	.270	.322	.318	1.000		
Life satisfaction	.198	.262	.229	.299	.264	.269	.258	1.000	
Happiness level	.139	.294	.141	.232	.203	.212	.251	.525	1.000

The correlation analysis demonstrates a low level of correlation (weak correlation $.1 < r < .3$) between the indicators of life satisfaction and the quality assessment of technological space.

Table 6

Linear Regressions (Ordinal and Interval Variables) With Dependent Variable, Life Satisfaction Based on Data From Vietnam

Independent variables	Life satisfaction
Quality assessment of electronic technologies	$B = 1.039$, $p < .01$, $SE = .19$, $R = .089$
Quality assessment of mobile connection	$B = 0.803$, $p < .01$, $SE = .17$, $R = .073$
Quality assessment of the cell phone	$B = 0.788$, $p < .01$, $SE = .17$, $R = .07$
Quality assessment of the personal vehicle	$B = 0.551$, $p < .01$, $SE = .13$, $R = .067$
Quality assessment of household appliances	B = 0.783, $p < .01$, $SE = .19$, $R = .052$
Quality assessment of drinking water	$B = 0.663$, $p < .01$, $SE = .13$, $R = .07$
Quality assessment of the air	$B = 0.421$, $p < .01$, $SE = .11$, $R = .039$

Note: The following values are available for linear models: *B* = non-standardized factor; *SE* = standard errors; 95% confidence interval; *R* = *R*-squared.

The outcomes of the analysis conducted through linear regression show that the quality of electronic equipment ($B = 1.039$) has the most substantial positive impact on life satisfaction concerning the regional technological space ($B = 1.039$) in Vietnam, reaching statistical significance at $p < .01$, and explaining a variance of $R = .089$. In contrast, the other independent variables exhibit lower effect sizes or result in a lower *R*-squared value.

Conclusion

The development of technological space occurs in response to challenges in the digital economy and is a major trend in today's society, impacting people of all ages and backgrounds. Older individuals are no exception to this overarching trend: they clearly have a keen interest in embracing high-tech products and services and demonstrate a preference for innovative food products and technological advancements. Nevertheless, our research has revealed that the appeal of new household appliances and electronic technologies diminishes with age, even though the need for technological enhancements becomes increasingly vital as individuals grow older, contributing to their overall well-being. Consequently, society recognizes the necessity for older individuals to adopt new technologies as a means of integrating into the technological landscape. Sociological studies, however, indicate that older individuals exhibit minimal demand for this integration.

We found a striking contrast among small towns, regional centers, and rural areas, further amplified by the digital transformation of daily life. This divergence may largely stem from the relatively lower value assigned to technological goods or the challenges associated with adopting new technical solutions in advanced age. Older individuals may choose not to actively engage in social activities, opting for an alternative path (Manuilskaya et al., 2021, p. 13) and thereby retaining their autonomy from technologies as they age. Consequently, the mere existence of innovative technologies and the conditions for their use does not inherently boost life satisfaction unless they offer fresh opportunities to enhance the daily lives of older individuals and provide alternative choices in using new products and services. Additionally, financial constraints may hinder their access to technological innovations.

Our analysis showed a weak positive correlation between the elements of technological space and life satisfaction. This correlation is observed in relation to the functionality of social infrastructure, environmental factors, as well as the quality of technical appliances and electronics.

The link between subjective well-being, as measured through individuals' responses regarding their life satisfaction in Tomsk region, becomes evident when we examine the use of personal as an example. Our survey revealed that the evaluation of cars by the average older age citizen in this Russian region exhibits a much wider range of variations compared to the evaluation of services or electronic gadgets. Conversely, for Vietnamese citizens included in our research, electronic goods are the technological element most strongly correlated with life satisfaction.

Our research results show a significant disparity in older people's inclination to adopt innovative technologies, indicating their willingness to adapt and embrace these technologies under specific circumstances. Moreover, these findings demonstrate the low and heterogeneous level of older generations' engagement with the contemporary regional technological space, along with the limited impact of innovative technology usage on their life satisfaction.

Thus, the research hypothesis we initially proposed for the given regional technological spaces remains unconfirmed. This conclusion aligns with the results

obtained through a correlation-regression analysis of the national data for Russia (Klemasheva & Kashapova, 2022). It sheds light on the reasons behind the relative "detachment" of older individuals from digital products and the lack of value they perceive in certain technological offerings (Karapetyan et al., 2021, p. 317). Despite the revealed disparities, especially against the backdrop of limited older adult involvement in the regional technological space, these findings can be interpreted as evidence that there is an opportunity to enhance the quality of life for older individuals. Therefore, our findings can be used to formulate effective regional policies based on older adults' active participation in the region's technological landscape.

This finding prompts us to explore some important questions, for instance, why many technological products hold little value for the older generation (Karapetyan et al., 2021, p. 317). In the upcoming research involving different age groups in the region, including older individuals, it would be essential to consider the hypothesis that understanding of how new technology works and having experience of using it are key to people's integration into the technological space.

The results of our research carry practical significance in assessing and advancing the rapidly expanding regional market of digital goods and services, particularly in the Age-Tech segment tailored for older individuals. We anticipate that the number of users of digital services and technologies will increase from the current 4% to 10–15% by 2025 (Age-tech: Odna iz samykh, 2019).

Modern technological advancements play a crucial role in enhancing the life satisfaction and quality of life for older adults and are instrumental in shaping effective regional policies. In the face of ongoing demographic and socio-economic challenges, the integration of innovative technologies into daily life has become imperative. The adoption of information and communication technologies in daily routines has the potential to make life more comfortable, safer, healthier, engaging, and emotionally fulfilling for individuals in the older demographic. These technological solutions also enable older adults to maintain and extend their economic and personal activities, promoting independence, improving communication quality, and fostering greater community engagement.

References

Abdrakhmanova, G. I., Vasil'kovskii, S. A., Vishnevskiy, K. O., Gokhberg, L. M., Demidkina, O. V., Demianova, A. V., Kovaleva, G. G., Kotsemir, M. N., Kuznetsova, I. A., Ozerova, O. K., Polyakova, V. V., Ratay, T. V., Ryzhikova, Z. A., Strel'tsova, E. A., Utyatina, K. E., Fridlyanova, S. Iu., & Schugal, N. B. (2022). *Tsifrovaia ekonomika: 2022: kratkii statisticheskii sbornik* [The digital economy: 2022: a statistical brief]. National Research University Higher School of Economics.

Abdrakhmanova, G. I., Vishnevskiy, K. O., Zinina, T. S., Kovaleva, G. G., Polyakova, V. V., Privorotskaya, S. G., Rudnik, P. B., Suslov, A. B., & Fursov, K. S. (2021). Trendy tsifrovizatsii—postpandemiia [Digitalization trends—post-pandemic]. In S. M. Plaksin, A. B. Zhulin, & S. A. Farizova (Eds.), *"Chernyi lebed" v beloi maske. Analiticheskii doklad NIU VShE k godovshchine pandemii COVID-19* [Black swan in a

white mask: Analytical report by HSE University on the anniversary of the COVID-19 pandemic] (pp. 194–218). National Research University Higher School of Economics. https://doi.org/10.17323/978-5-7598-2500-5

Age-tech: Odna iz samykh bystrorastushchikh nish tsifrovoi ekonomiki [Age-tech: A fastest-growing niche of the digital economy]. (2019, October 25). MNIAP. https://xn--80aplem.xn--p1ai/analytics/Age-tech-odna-iz-samyh-bystrorastusih-nis-cifrovoj-ekonomiki/

Andone, I., Popescu, C., Spinu, A., Daia, C., Stoica, S., Onose, L., Anghel, I., & Onose, G. (2020). Current aspects regarding "smart homes"/ambient assisted living (AAL) including rehabilitation specific devices, for people with disabilities/special needs. *Balneo Research Journal*, *11*(4), 444–449. https://doi.org/10.12680/balneo.2020.376

Andreeva, M. M., & Volkov, V. R. (2013). Korreliatsionnyi analiz v sotsiologicheskikh issledovaniiakh [Correlation analysis in sociological research]. *Vestnik Kazanskogo tekhnologicheskogo universiteta*, *16*(7), 271–274.

Averin, Yu. P., & Sushko, V. A. (2019). Kontseptsiia kachestva zhizni v sovremennykh sotsiologicheskikh teoriiakh [The concept of quality of life in modern sociological theories]. *Izvestiya of Saratov University. Sociology. Politology*, *19*(1), 4–11.

Barysheva, G. A., Klemasheva, E. I., Nedospasova, O. P., Ngoc, T. T. B., & Thang, N. C. (2022). Vovlechennost' pozhilykh liudei v protsessy sovremennykh tsifrovykh transformatsii [Involvement of older adults in the processes of modern digital transformations]. *Advances in Gerontology*, *35*(1), 68–75. https://doi.org/10.34922/AE.2022.35.1.007

Bashkireva, A. S. (2016). Innovatsionnye gerontotekhnologii v razvitii strategii deistvii v interesakh grazhdan starshego pokoleniia v RF [Innovative gerontotechnologies in the strategy for action development for the elderly persons in Russia]. *Vestnik Roszdravnadzora*, *4*, 19–24.

Biniok, P., Menke, I., & Selke, S. (2016). Social inclusion of elderly people in rural areas by social and technological mechanisms. In E. Domínguez-Rué & L. Nierling (Eds.), *Ageing and technology: Perspectives from the social sciences* (pp. 93–118). Transcript.

Borgmann, A. (2010). Orientation in technological space. *First Monday*, *15*(6–7). https://doi.org/10.5210/fm.v15i6.3037

Casati, F., Anikina, E. A., Ivankina, L. I., Klemasheva, E. I., Kashapova, E. R., Malanina, V. A., Taran, E. A., Frolova, E. A., & Shavlokhova, A. A. (2021). *Kompleksnaia sistema otsenki neravenstva pozhilykh liudei i proektirovanie instrumentov ukrepleniia ikh zhiznestoikosti* [Comprehensive system for assessing the inequalities of adult people and designing tools for strengthening their resilience]. STT.

Chen, Y.-R. R., & Schulz, P. J. (2016). The effect of information communication technology interventions on reducing social isolation in the elderly: A systematic review. *Journal of Medical Internet Research*, *18*(1), Article e18. https://doi.org/10.2196/jmir.4596

Christiansen, L., Lindberg, C., Berglund, J. S., Anderberg, P., & Skär, L. (2020). Using mobile health and the impact on health-related quality of life: Perceptions of older adults with cognitive impairment. *International Journal of Environmental Research and Public Health*, *17*(8), Article 2650. https://doi.org/10.3390/ijerph17082650

Danilova, I. V., & Kilina, I. P. (2019). Innovatsionnoe prostranstvo: Teoreticheskie i metodicheskie aspekty [Innovation space: Theoretical and methodological aspects]. *Upravlenie ekonomicheskimi sistemami*, *7*, Article 4.

Didino, D., Taran, E. A., Gorodetski, K., Melikyan, Z. A., Nikitina, S., Gumennikov, I., Korovina, O., & Casati, F. (2018). Exploring predictors of life satisfaction and happiness among Siberian older adults living in Tomsk Region. *European Journal of Ageing*, *15*(2), 175–187. https://doi.org/10.1007/s10433-017-0447-y

de Oliveira Silva, D., Marquine Raymundo, T., & da Silva Santana, C. (2012). Use of electronic devices in homes by elderly. *Gerontechnology*, *11*(2), 192. https://doi.org/10.4017/gt.2012.11.02.602.00

George, L. K. (2006). Perceived quality of life. In R. H. Binstock, L. K. George, S. J. Cutler, J. Hendricks, & J. H. Schulz (Eds.), *Handbook of aging and the social sciences* (6th ed., pp. 320–336). Academic Press. https://doi.org/10.1016/B978-012088388-2/50021-3

Ghahramani, F., & Wang, J. (2020). Impact of smartphones on quality of life: A health information behavior perspective. *Information Systems Frontiers*, *22*(6), 1275–1290. https://doi.org/10.1007/s10796-019-09931-z

Gomes, I. D., Sobreira, L. S., da Cruz, H. D. T., Almeida, I., de Souza, M. C. M. R., & Souto, R. Q. (2022). Teleconsultation script for intervention on frail older person to promote the care-of-the-self: A gerontotechnology tool in a pandemic context. In J. García-Alonso & C. Fonseca (Eds.), *Gerontechnology IV: Contributions to the Fourth International Workshop on Gerontechnology, IWoG 2021, Évora, Portugal, November 23–24, 2021* (pp. 133–145). Springer. https://doi.org/10.1007/978-3-030-97524-1_13

Grasland, L. (1992). The search for an international position in the creation of a regional technological space: The example of Montpellier. *Urban Studies*, *29*(6), 1003–1010. https://doi.org/10.1080/00420989220080931

Grigoryeva, I. A., Ukhanova, Yu. V., & Smoleva, E. O. (2019). Transformatsiia sotsial'noi politiki v Rossii v kontekste stareniia naseleniia [Transformation of social policy in Russia in the context of population aging]. *Economic and Social Changes: Facts, Trends, Forecast*, *12*(5), 124–140. https://doi.org/10.15838/esc.2019.5.65.8

Iancu, I., & Iancu, B. (2020). Designing mobile technology for elderly. A theoretical overview. *Technological Forecasting and Social Change*, *155*, Article 119977. https://doi.org/10.1016/j.techfore.2020.119977

Ivanov, V. V. (2011). Tekhnologicheskoe prostranstvo i ekologiia tekhnologii [Technological space and technology ecology]. *Vestnik Rossiiskoi akademii nauk*, *81*(5), 414–418.

Kalinkova, M., & Orlikova, M. (2017). Kachestvo zhizni pozhilykh liudei [Quality of life of elderly people]. *Historical and Social-Educational Idea*, *9*(3/2), 108–119. https://doi.org/10.17748/2075-9908-2017-9-3/2-108-119

Karapetyan, R. V., Lebedeva, E. V., & Titarenko, L. G. (2021). Tekhnoeidzhizm I tekhnopovedenie pozhilykh gorozhan: Rezul'taty rossiiskikh i belorusskikh issledovanii [Technoagism and technical behavior of the elderly citizens: Results of Russian and Belarusian researches]. *Advances in Gerontology*, *34*(2), 311–318. https://doi.org/10.34922/AE.2021.34.2.019

Klemasheva, E. I., & Kashapova, E. R. (2022). Model' sub'ektivnykh otsenok vliianiia elementov tekhnologicheskogo prostranstva na uroven' zhizni pozhilykh liudei [Subjective assessments model of the influence of the technological space elements on the standard of living of the elderly]. *Journal of Wellbeing Technologies*, *46*(3), 118–127. https://doi.org/10.18799/26584956/2022/3/1195

Kurtev, I., Bézivin, J., & Aksit, M. (2002, October). *Technological spaces: An initial appraisal* [Paper presentation]. The 4th International Symposium on Distributed Objects and Applications, DOA 2002, Irvine, California, USA.

Kuvshinova, O. A. (2012). Problemy sotsial'nogo konstrukta pozhilogo vozrasta [Problems of the social construct of old age]. *Tomsk State University Journal of Philosophy, Sociology and Political Science*, *1*, 24–30.

Manuilskaya, K. M., Rogozin, D. M., Gryaznova, O. S., Ipatova, A. A., & Vyugovskaya, E. V. (2021). *Zhizn' vne izoliatsii. Kontseptsiia novogo sotsial'nogo doma* [Life outside of isolation. The concept of a new social home]. Delo.

Mathiyazhagan, S. (2022). Field practice, emerging technologies, and human rights: The emergence of tech social workers. *Journal of Human Rights and Social Work*, *7*(4), 441–448. https://doi.org/10.1007/s41134-021-00190-0

Mazilov, E. A., & Sakhanevich, D. Yu. (2020). Struktura i elementy nauchno-tekhnologicheskogo prostranstva [Structure and elements of scientific and technological space]. *Corporate Economics*, *2*, 4–13.

Mishra, K. N., & Chakraborty, C. (2020). A novel approach toward enhancing the quality of life in smart cities using clouds and IoT-based technologies. In M. Farsi, A. Daneshkhah, A. Hosseinian-Far, & H. Jahankhani (Eds.), *Digital twin technologies and smart cities* (pp. 19–35). Springer. https://doi.org/10.1007/978-3-030-18732-3_2

Nekhoda, E. V., Roshchina, I. V., & Pak, V. D. (2018). Kachestvo zhizni: Problemy izmereniia [Quality of life: Problems of measurement]. *Tomsk State University Journal of Economics*, *43*, 107–125. https://doi.org/10.17223/19988648/43/7

Östlund, B. (2021). Digitalization of later life: What prevents the care sector from meeting the rapid digitalization of older populations? Advances in human factors and ergonomics in healthcare and medical devices. In J. Kalra, N. J. Lightner, & R. Taiar (Eds.), *Advances in human factors and ergonomics in healthcare and medical devices: Proceedings of the AHFE 2021 Virtual Conference on Human Factors and Ergonomics in Healthcare and Medical Devices, USA, July 25–29, 2021* (pp. 287–298). Springer. https://doi.org/10.1007/978-3-030-80744-3_36

Papa, F., Cornacchia, M., Sapio, B., & Nicolò, E. (2017). Engaging technology-resistant elderly people: Empirical evidence from an ICT-enabled social environment. *Informatics for Health and Social Care*, *42*(1), 43–60. https://doi.org/10.3109/17538157.2016.1153477

Pavlova, I. A., Nedospasova, O. P., Barysheva, G. A., & Rozhdestvenskaia, E. M. (2021). *Resursnyi potentsial starshego pokoleniia* [Resource potential of the older generation]. STT.

Peine, A., & Neven, L. (2019). From intervention to co-constitution: New directions in theorizing about aging and technology. *The Gerontologist*, *59*(1), 15–21. https://doi.org/10.1093/geront/gny050

Polyakova, V., & Iudin, I. (2022, March 24). *Kak za 25 let izmenilos' mnenie rossiian o nauke i tekhnologiiakh?* [How has Russian opinion about science and technology changed in 25 years?]. HSE Institute for Statistical Studies and Economics of Knowledge. https://issek.hse.ru/news/578560514.html

Rebko, A. A., & Semutenko, K. M. (2016). Osobennosti vnedreniia sovremennykh informatsionno-kommunikatsionnykh tekhnologii v sfere mediko-sotsial'nogo obespecheniia i profilaktiki zabolevanii sredi lits pozhilogo vozrasta [Main features of implementation of modern information and communication technologies in the sphere of medical and social welfare and disease prevention among elderly persons]. *Health and Ecology Issues*, *4*, 73–80.

Rybakova, E. V., Sultanova, R. M, & Gayazova, G. A. (2019). Vliianie tsifrovykh sredstv kommunikatsii na kachestvo zhiznedeiatel'nosti, udovletvorennost' zhizn'iu i oshchushchenie vkliuchennosti pozhilykh liudei [The impact of digital communications on quality of life, life satisfaction and a sense of inclusion of older people]. *International Culture & Technology Studies*, *4*(1), 30–34. https://doi.org/10.17586/2587-800X-2019-4-1-30-34

Sayed Umar, S. M. R. Y., Mohd Arshad, M. N., & Ariffin, M. I. (2021). COVID-19 pandemic and addressing digital divide in Malaysia. *Journal of Information Systems and Digital Technologies*, *3*(2), 29–49.

Shchekotin, E. V. (2022). *Kontseptsiia kachestva zhizni v usloviiakh tsifrovizatsii obshchestva: Sotsiologo-upravlencheskie aspekty* [Digital transformation of the quality of life: Sociological and managerial aspects] (Unpublished doctoral dissertation). Pacific National University.

Simakina, M. A. (2012). Transformatsiia kachestva zhizni v informatsionnom obshchestve [Transformation of the quality of life in the information society]. *Russian Journal of Education and Psychology*, *3*, Article 14.

Sinyavskaya, O. V., Cherviakova, A. A., & Gorvat, E. S. (2022). Analiz faktorov vykhoda s rynka truda v vozraste 45 let i starshe v Rossii: Rol' kharakteristik zaniatosti, smeny raboty i polucheniia obrazovaniia [Factors that lead to leaving the labor market at the age of 45 and up in Russia: Role of job characteristics, labor mobility and life-long learning]. *Sotsiologicheskiy Zhurnal=Sociological Journal*, *28*(2), 50–72. https://doi.org/10.19181/socjour.2022.28.2.8986

Sushko, V. A. (2021). Oshchushchaemoe kachestvo zhizni i tsennostnaia struktura rossiiskogo naseleniia [The feeling quality of life and the value structure of the Russian population]. *Sotsiologiia*, *1*, 61–74.

Tarasenko, E. A., & Ryzhkova, T. B. (2019). Gerontechnology: Faktory, vliiaiushchie na vybor pozhilykh potrebitelei na rynke meditsinskikh tekhnologii i uslug [Gerontechnology: Factors influencing the choice of older consumers in the market of medical technologies and services]. In *Proceedings of the 5th International Scientific and Practical Conference "Management Sciences in the Modern World", Moscow, November 7–9, 2018* (pp. 161–164).

Varlamova, Yu. A. (2022). Mezhpokolencheskii tsifrovoi razryv v Rossii [The Intergenerational digital divide in Russia]. *Universe of Russia, 31*(2), 51–74. https://doi.org/10.17323/1811-038X-2022-31-2-51-74

Vasileva, E. N., & Mosina, O. A. (2014). Resursnyi potentsial "pozhilykh": Tekhnologii realizatsii [Resource potential of the "elderly": Implementation technologies]. *Modern Problems of Science and Education*, *1*.

Vidiasova, L. A., Kuznetsova, E. M., & Grigoryeva, I. A. (2022). Integratsiia pozhilykh liudei v informatsionnoe prostranstvo: Issledovatel'skii keis Sankt-Peterburga [Integration of the olderly into the information space: Research case of Saint Petersburg]. *Advances in Gerontology*, *35*(5), 668–678. https://doi.org/10.34922/AE.2022.35.5.002

Wright, D. (2009). *Report on good practices in e-inclusion, ethical guidance and designing a dialogue roadmap* (Senior Deliverable D4.1). Senior Project. http://erdc.fm.uniba.sk/Report%20on%20good%20practices%20ethical%20guidance%2015%20Nov%2009.pdf

Zubova, O. G. (2022). Tsifrovizatsiia i kachestvo zhizni pozhilykh liudei v sovremennom rossiiskom obshchestve [Digitalization and the quality of life of the elderly in modern Russian society]. *Sotsiologiia*, *5*, 55–64.