

Analysis of the Impact of Technological Innovations in Social Security on the Quality of Life of Older Persons

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Abstract: As technological innovations continue to be promoted and the problem of population ageing intensifies, the role of the social security sector in enhancing the quality of life of older people is becoming increasingly evident. The aim of this paper is to explore how technological innovations in social security affect the daily lives of older people and their quality of life. A quantitative research methodology was adopted and combined with questionnaire surveys and data analysis techniques to analyse the sample data in depth. It is found that technological innovations play an important role in improving the effectiveness and convenience of social security services, especially in health monitoring, smart services and information access, which significantly enhance the life experience of older people. Further, these innovations have a positive impact on older people's social participation and mental health. Accordingly, this paper argues that strengthening technological innovations in social security is a key way to improve the quality of life of older persons and provides a strong basis for the formulation of relevant policies and development strategies.

Keywords: technological innovations in social security, quality of life in old age, data analysis, smart services, social participation

1. Introduction

With the aggravation of the trend of population aging, the proportion of the elderly group in the social structure is increasing, and the issue of their quality of life has gradually become the focus of attention of all sectors of society. Technological innovation is an important driving force for the development of modern society, and its application in the field of social security is particularly important[1][2]. In recent years, with the improvement of information technology and intelligence, social security technological innovation has shown great potential in improving the living conditions and quality of life of the elderly. This study explores the impact of social security technological innovations on the quality of life of the elderly, aiming to clarify the specific mechanism of technological innovations on the improvement of the quality of life of the elderly through in-depth analyses of technological innovations and their current applications.

The study first reviews and evaluates the application of existing technological innovations in social security, and analyses their effectiveness in improving the efficiency and convenience of services. Subsequently, by constructing a quality of life evaluation index system for the elderly, this study endeavours to reveal the positive impacts of technological innovations on the quality of life of

the elderly in terms of health monitoring, intelligent services and access to information, as well as to explore the promotion of mental health and social participation of the elderly.

The positive impact of social security technology innovation on the quality of life of the elderly not only helps to address the increasingly prominent needs of the elderly group, but also provides new perspectives and ideas for the optimisation of the social security system[3]. Therefore, this study is of great sociological significance, not only enriching the theoretical research in the field of social security and gerontological sociology, but also providing a scientific basis for policy makers to guide the technological innovation and development of the social security system, to further improve the quality of life of China's elderly population, and to create a more harmonious social atmosphere.

2. Overview of technological innovations in social security

2.1. Current status of technological innovation in the field of social security

In the process of exploring the impact of social security technological innovation on the quality of life of the elderly, it is first necessary to analyse the current status of the application of technological innovation in the field of social security. With the rapid development of science and technology, a large number of modern technologies have been integrated into the social security system, such as cloud computing, big data, the Internet of Things, artificial intelligence, etc., which play a positive role in improving the efficiency and quality of services.

The application of cloud computing and big data technologies has significantly improved the efficiency and accuracy of social security data processing[4]. Through these technologies, government departments are able to realise real-time monitoring of the flow of social security funds to ensure the transparency and safety of the funds. In addition, big data analyses can help policymakers identify potential risks and provide data support for policy formulation[5]. For example, by analysing the data of elderly people's medical consultations and drug purchases, the trend of certain diseases can be effectively predicted, and the allocation of medical resources can be adjusted accordingly.

IoT technology is widely used in home care services for the elderly. Many elderly care institutions and homes have installed smart monitoring devices, such as wearable devices and home automation systems. These devices can monitor the health status of the elderly in real time, including heart rate, blood pressure, sleep quality, etc., and are able to send abnormal alarms to healthcare personnel in a timely manner, thus realising real-time monitoring and rapid response to the health status of the elderly.

The introduction of artificial intelligence technology provides more personalised services for the elderly. Taking intelligent voice assistants as an example, it can help the elderly carry out daily life operations such as consulting the weather, setting reminders, and online shopping, which greatly enhances the convenience of their lives[7]. At the same time, some social security service platforms have begun to make use of chatbots to provide 24-hour online counselling services for the elderly, answering questions they encounter when enjoying social security benefits.

Technological innovations have also improved access to and dissemination of social security information. Through the establishment of online social security service platforms, older persons can access their social security information and learn about the latest social security policies and claiming procedures anytime, anywhere. These platforms usually have good user experience design, taking into account the operating habits and vision limitations of older persons, with simple and intuitive interfaces that are easy to understand.

Although technological innovation has made some progress in the social security field, there are some problems and challenges. For example, the rapid pace of technological upgrading requires

regular maintenance and upgrading of hardware equipment and software systems, which is a major burden for social security organisations with limited resources. At the same time, the digital divide among the elderly should not be ignored, as many elderly people are less capable of accepting and learning from new technologies, and therefore need to be provided with appropriate education, training and technical support in the process of technology application.

Technological innovation has been widely applied in the field of social security, effectively improving the efficiency and quality of services and the life experience of the elderly, which is of great significance in enhancing their quality of life. However, how to solve the problems of high cost of updating and maintaining technology and the digital divide among the elderly requires further thinking and efforts from all sectors of society. In the future, innovations in social security technology should pay more attention to humane design in order to achieve better integration between technology and the lives of older persons.

2.2. Ways in which technological innovation can enhance the efficiency of social security

In analysing the impact of social security technological innovation on the quality of life of the elderly, exploring the ways in which technological innovation improves the efficiency of social security becomes the focus of this paper[8][9]. Enhancing the efficiency of the social security system is not only crucial to improving the living conditions of the elderly, but also an important guarantee for the sustainable development of society. The following will elaborate on the application of technological innovation in the field of social security.

The use of information technology has greatly improved the coverage and accessibility of social security services. By establishing a nationwide social security information platform and realising centralised management and sharing of data, information silos can be effectively reduced and data processing efficiency improved. For example, the use of cloud computing and big data technology to analyse information on insured persons can provide policymakers with precise data support, thus enabling policies to serve the elderly more accurately.

The popularity of mobile Internet has made social security services more convenient. Older people can check their social security information, including pension status and medical insurance reimbursement, anytime and anywhere through smartphones or other mobile terminal devices. The rise of mobile payment has also provided the elderly with more choices for making contributions and receiving social security benefits, reducing their inconvenience due to transport or physical reasons.

Further, smart services provide new solutions for the convenience and relevance of social security. Through smart terminals, such as smart watches and health monitoring devices, the health conditions of the elderly can be monitored in real time, and in the event of an emergency, the system can respond quickly and notify medical institutions and family members. This not only improves the timeliness of emergency medical assistance, but also greatly reduces possible health risks.

The application of artificial intelligence technology plays an important role in improving the intelligence of social security decision-making. By analysing a large amount of social security data through deep learning algorithms, it is possible to predict future pension payment trends and provide a scientific basis for formulating a reasonable pension adjustment plan[10]. The assisted decision-making system of artificial intelligence can also optimise the allocation of resources and ensure the effective use of social security funds.

Further, the development of e-government has led to enhanced transparency of social security services. The government can publish key information such as social security policies and the operating status of funds through online platforms to enhance public trust in social security work. For the elderly, transparent information not only helps them better understand their rights and

interests, but also facilitates them to put forward reasonable suggestions or demands when necessary.

The model of cross-sectoral co-operation is gradually being promoted, resulting in a diversified social security network. The Government, enterprises and social organisations are collaborating with each other to promote the application of technological innovations in the field of social security. For example, the co-operation of several sectors, including medical, pension and insurance, can provide a one-stop service experience for the elderly, making it easier and quicker for them to enjoy social security services.

Technological innovation has effectively improved the quality of life of the elderly by enhancing the efficiency, convenience and transparency of social security services. In the future, with the emergence of new technologies, the social security system will become smarter and more humanised to better serve the elderly, thus laying a solid foundation for achieving the harmonious development of the whole society.

3. Analysis of the impact on quality of life in old age

3.1. Indicators for evaluating the quality of life of older persons

Indicators for evaluating the quality of life of older persons are important tools for measuring their living conditions and well-being. In this study, the evaluation indicators of the quality of life of older persons mainly include material living conditions, health status, social participation, psychological well-being and self-realisation.

Material living conditions are the basic indicators for evaluating the quality of life of the elderly, which are mainly related to the level of income, housing conditions, nutritional status and whether the basic needs of the elderly in their daily lives are met. The level of income is directly related to whether older persons can have stable financial resources to maintain a basic living, while housing conditions are the key to determining whether their living environment is safe and comfortable. Nutritional status reflects whether the elderly have access to an adequate and balanced diet, which is an important guarantee for a healthy life.

Health status is the core indicator in the evaluation of the quality of life of the elderly, which not only includes the dimensions of physiological health, such as the incidence of diseases and the maintenance of physical functions, but also covers the elements of psychological health, such as the ability to regulate emotions and the mechanism for coping with stress, and so on[11]. Physiological health directly affects the mobility and degree of self-care of the elderly, while good psychological health helps the elderly to maintain a positive and optimistic mindset, thus enhancing life satisfaction.

Social participation refers to the extent and quality of older people's participation in family, community and wider social activities. This indicator is important because active social participation helps older persons to remain socially connected, avoid loneliness and social isolation, and facilitate access to mental health and emotional support.

Psychological well-being is an important psychological indicator for evaluating the quality of life of older persons, which focuses on an individual's emotional state, life satisfaction, happiness and psychological resilience. Older adults with high psychological well-being tend to be better able to cope with the challenges of aging and maintain a high quality of life.

Self-actualisation refers to the extent to which older people realise their personal potential and pursue the fulfilment of their personal interests and values. This indicator emphasises the importance of individual development and growth, especially after retirement, and the ability of older persons to continue to develop their interests and skills and realise their personal values has a significant impact on their quality of life[12].

In conducting the evaluation of the quality of life of the elderly, in addition to the indicators mentioned above, it is also necessary to take into account the impact of factors such as the gender, educational background, cultural level and area of residence of the elderly. This is because these factors will, to varying degrees, affect the perception and evaluation of the quality of life of the elderly.

The evaluation of the quality of life of the elderly is a multi-dimensional and multi-level comprehensive assessment process. Through the comprehensive evaluation of the above indicators, a more comprehensive understanding of the living conditions of the elderly can be achieved, providing a targeted direction of improvement for social security technological innovation, and thus effectively enhancing the quality of life of the elderly. In subsequent studies, we will further explore how social security technological innovations specifically contribute to these evaluation indicators and the extent to which these innovations have a specific impact on the quality of life of older persons.

3.2. Positive effects of technological innovation on the quality of life of older persons

In current society, technological innovation has become an important driving force for social development, especially in the field of social security, with far-reaching implications for improving the quality of life of the elderly. With the arrival of an ageing society, the quality of life of the elderly has received widespread attention, and technological innovation has made it possible to solve the various problems faced by the elderly.

Firstly, technological innovation has significantly improved the effectiveness of social security services. Traditional social security services often fail to meet the needs of the elderly due to problems such as uneven distribution of resources and inefficient services. Through technological means, such as the Internet of Things (IoT), big data analysis and cloud computing, it is possible to achieve optimal allocation of resources and precise placement of services. For example, health data collected through smart wearable devices can help medical institutions more accurately assess the health status of the elderly and provide personalised health management services.

Second, technological innovation has brought great convenience to the elderly in terms of convenience. With the popularity of smartphones and apps, older people can have easier access to a variety of social services. For example, mobile payment and online shopping enable older people to complete payment and shopping conveniently at home, reducing the frequency and intensity of going out. Meanwhile, the intelligence of community services allows older persons to access life support through simple operations, such as online medical appointments and distance education and learning.

Further, innovations in health monitoring technology have a significant role in enhancing the living experience of the elderly. Using sensor technology and telemedicine services, the physiological indicators of the elderly can be monitored in real time, and timely alerts can be given when abnormalities occur, or even medical institutions can be automatically contacted for intervention, greatly enhancing the sense of health security of the elderly. In addition, the application of devices such as smart pill boxes also simplifies the daily medication management of the elderly and reduces the risk of medication errors[13].

In addition to the physical level effects mentioned above, technological innovations have also had a positive impact on the social engagement of older people. Technologies such as social media, online education and virtual reality provide older people with diverse channels of social interaction and learning opportunities. These technologies enable older persons to stay connected to the outside world and participate in social activities even at home, satisfying their need for social interaction and helping to reduce loneliness and social isolation.

Technological innovations also play an important role in enhancing the mental health of older persons. Studies have shown that the use of smart devices and the Internet can effectively alleviate depression and anxiety among older persons. For example, through video call technology, older persons can keep in touch with their family members who are far away and reduce the sense of emotional distance. Smart applications such as music therapy and games and entertainment also provide ways for older persons to release psychological pressure.

Technological innovation has played an important role in improving the effectiveness and convenience of social security services, especially in health monitoring, intelligent services and access to information, which have significantly enhanced the living experience of older persons. In addition, technological innovation has also had a positive impact on the social participation and mental health of the elderly. Therefore, it can be concluded that technological innovation is a key way to improve the quality of life of older persons, and society should further promote the application of technological innovation in the field of social security so as to bring more well-being to older persons.

4. Case studies and empirical research

4.1. Case studies of technological innovations in social security for the elderly at home and abroad

Social security technological innovation has been a hot issue in the field of public management in recent years, especially in the field of social security for the elderly, technological innovation has become a key factor in improving the efficiency and quality of services. In order to deeply understand the impact of social security technological innovation on the quality of life of the elderly, this section will combine domestic and foreign cases to analyse its performance and effect in practical application.

Among the foreign cases of technological innovation in social security for the elderly, the Nordic countries are particularly prominent. Taking Sweden as an example, the country has launched a series of social security services based on the Internet and mobile applications, which not only make it easier for the elderly to access social security information, but also enhance the safety and comfort of the elderly in their homes through smart home technology. For example, the Swedish government-supported "e-Health" project enables real-time monitoring of the health status of older persons through remote sensing monitoring equipment, and the system will automatically notify medical service providers in the event of health problems, thus realising proactive prevention and timely intervention in the health of older persons[14].

In the United States, technological innovation in social security is also advancing. The "SmartSenior" programme, developed by the Government in collaboration with the private sector, is a case in point. The programme makes use of smart wearable devices and mobile applications to help the elderly with health management, social interaction and daily life assistance. Through these technological means, the elderly can manage their lives more independently, while reducing the burden of care on their families and society.

Back at home, with the implementation of China's smart aging strategy, there have been numerous cases of technological innovation in social security for the elderly. Zhejiang Province, for example, has launched an "Internet+Elderly" service platform, which provides a one-stop solution for the elderly by integrating online and offline resources. Older people can make appointments for on-site services, health consultation and psychological counselling through mobile phone applications, which has greatly improved the accessibility and personalisation of elderly services.

In addition, certain cities in China are also trying to provide personalised social security services for the elderly using big data and AI technology. For example, Shanghai's "Smart Elderly" platform

collects the health data and living habits of the elderly, and uses big data analysis technology to recommend customised solutions for each elderly person, which not only improves service satisfaction, but also helps to prevent and manage diseases in old age.

After analysing the cases of social security technological innovations at home and abroad, it can be seen that technological innovations have continued to promote the innovation of social security services for the elderly, both in developed countries and in China. These technological innovations have played a significant role in improving service efficiency, enhancing service personalisation and optimising resource allocation. However, while bringing convenience, technological innovations also have certain limitations. For example, the acceptance of new technologies and the learning ability of older persons may become constraints, and privacy protection and information security also need to be given due attention.

In order to give full play to social security technological innovation, relevant policymakers and practitioners need to consider how to lower the technological threshold and increase the willingness and ability of older persons to use it. At the same time, technological innovation in social security should not be limited to the provision of traditional services electronically, but should pay more attention to the actual needs of older persons and provide more comprehensive and detailed care services through innovative means, so as to improve the quality of life of older persons in all aspects.

4.2. Empirical research: methods of data collection and analysis

Before conducting an empirical study on the impact of technological innovations in social security on the quality of life of the elderly, we first established a specific methodology for data collection and analysis. The research design aims to explore and validate in depth the effects of technological innovations in the lives of older people and their actual impact on quality of life through quantitative analyses.

Data collection was mainly in the form of a questionnaire survey, which aimed to collect primary data on the frequency of use, satisfaction, and perceived effects of the application of social security technological innovations among the elderly. The questionnaire design contained basic demographic information (e.g., age, gender, educational background, and economic status) and specific questions related to social security technology innovations. These questions cover a wide range of dimensions such as health monitoring, smart services, and access to information, and aim to comprehensively assess the impact of technological innovations on the quality of life of older people.

The respondents were randomly selected older people living in both urban and rural areas to ensure the representativeness and generalisability of the findings. During the questionnaire distribution process, we adopted a combination of online and offline methods to increase the recall rate and ensure the breadth and diversity of the data. To improve data quality, we provided brief training to participants, explaining how to complete the questionnaire and the significance of the study to ensure that they could accurately understand the meaning of each question and participate in the study voluntarily on a fully informed basis[15].

In terms of data analysis methods, we first carried out data cleaning to exclude invalid questionnaires and outliers to ensure the accuracy of the analyses. Subsequently, descriptive statistical analyses were used to outline the basic characteristics of the sample, such as basic demographic information about the elderly and their overall perception of technological innovations in social security. The data obtained from the questionnaire were then analysed for reliability and validity, and statistical tools such as Cronbach's alpha coefficient and factor analysis were used to test the consistency and reliability of the scale.

Further, in order to explore the differences in perceived social security technological innovations among older adults in different contexts, we applied analysis of variance (ANOVA) to compare the differences in frequency of use, satisfaction, and so on, among older adults with different demographic characteristics. In addition, through multiple regression analyses, we examined the relationship between multiple dimensions of Social Security technological innovations and the quality of life of older adults to identify which specific technological applications have a significant impact on enhancing quality of life.

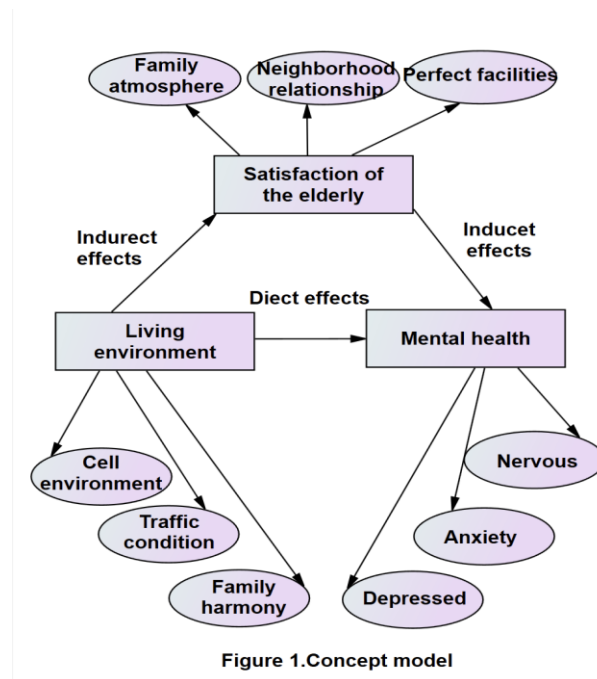


Figure 1: Concept model

In applying structural equation modelling (SEM), As shown above Figure 1, we developed comprehensive models that included social security technological innovation applications, social participation, mental health, and quality of life of older adults, and explored the potential relationships between these variables. Through path analyses, we further validated the direct and indirect effects between the variables in the hypothesised model, thus revealing how social security technology innovations can enhance the quality of life of older people by affecting their social participation and mental health.

The results of the study are presented in a combination of tables and graphs to visualise the impact of technological innovations in social security on the quality of life of older people. Through comparative analyses, a series of strong conclusions are drawn and constructive suggestions are made for the future development of social security technological innovations.

In conclusion, this study ensures the credibility and validity of the findings through scientific data collection and analysis methods. Through a comprehensive analysis of the quality of life of the elderly, we provide valuable references for policy makers and social security service providers to facilitate the further development and optimisation of social security technological innovation.

5. Conclusions

This study highlights the potential of scientific and technological advances in enhancing the well-being of older persons through an in-depth analysis of social security technological innovations and their impact on the quality of life of older persons. The findings point to the fact

that innovations in social security technology, such as smart health monitoring systems and online service platforms, have significantly enhanced the convenience of life and health management capabilities of older people, thereby strengthening their social participation and mental health status. Based on these findings, this paper supports policy makers and social security organisations to strengthen the investment and application of technological innovation as an effective way to enhance the quality of life of the elderly.

Limited to the survey sample and the scope of the study, the findings of this paper may not be able to fully reflect the variability among different groups of older people with different regions, incomes and educational backgrounds. Future research should broaden the scope of the sample to compare the differential effects of technological innovation application across different populations and focus on the impact of socio-economic changes on this relationship. Further research also needs to explore the long-term trends in the relationship between technological innovation and the quality of life of older adults, and the moderating role of policy and other social support factors in this context. These efforts will not only help to improve current research, but also provide more in-depth and specific strategic recommendations for the optimisation and future development of social security systems for older persons.

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