ASSESSMENT OF DIGITAL RISK OF SENIOR CARE IN SHANDONG PROVINCE: A FOCUS ON THE DIGITAL DIVIDE

Abstract

Aging of the population has implications for the elderly, family care, social welfare and labor, and government financesin China. Moreover, there is a gap between the elderly and others in the use of digital tools. It is difficult and inconvenient to obtain digital information and use digital information, thus forming the phenomenon of digital divide. Under the background of digital divide, the elderly is faced with many digital risk problems, and how to deal with these problems has become a very important research topic. The purpose of this study is to explore the use of digital tools by the elderly, to analyze the digital risks they faced, and to provide the research suggestions. The data were obtained through in-depth interviews with 17 respondents and 332 valid questionnaires.The results show that elderly is more likely to own smartphones and use them to make calls and pay for daily purchases. In addition, common digital risks for the elderly include online shopping risk, time risk, privacy risk, financial risk and psychological risk. The study suggested that the government should strengthen publicity on online shopping precautions and cooperate with universities or research institutions to raise and prevent digital risk awareness among the elderly.

Key words: digital divide; digital risk; senior care; privacy risk

1.Introduction

In 2020, China conducted the seventh census, and the census data show that China's population above 60 years old and the working population ratio (old-age dependency ratio; ODR has increased rapidly from 18.94% in 2010 to 29.53% in 2020, and the population is aging [1,2]. This phenomenon of population aging will bring many impacts to the elderly themselves, their families and society, including impacts on personal physical and mental health, family support and maintenance, social welfare and financial and economic aspects [1, 3,4,5]. How to resolve the impact of aging on family, society and economy has become an important issue for the elderly.

Furthermore, the use of digital tools (such as smart phones, smart bracelets, computers, etc.) is a very important key issue in the aging of the population. Due to the rapid development of information technology in our country, we have entered the era of digitalization, learning to use digital tools, through digital information can

make the established way of life and work simpler and more efficient [1,6]. These daily activities of the elderly life, including pension management, medical treatment, daily shopping, travel to visit friends, leisure and entertainment, learning and financial management, are related to the use of smart tools. Research also points out that intelligent services are widely used in various fields such as transportation, education, medical care and entertainment, and most people in society can enjoy the convenience of life brought by digital tools and digital technologies [7]. Therefore, the elderly learns to use digital tools will be conducive to the development of elderly care activities.

However, some elderly people do not use the Internet, or use it only singly, or focus on online social networking, news browsing, online entertainment, etc., and rarely use it for business consumption or old-age life affairs [8,9,10,11]. The reason is that they are not familiar with digital tools and technologies due to the influence of important other factors such as individual psychological endowments, peers and family members, the lack of adequate consideration of appropriate aging due to the positioning of the Internet, and the influence of social evaluation of the Internet [11]. Compared with those who are good at using digital tools, their differences in digital life are gradually widening, forming the phenomenon of digital divide [1].

This digital divide phenomenon will not only affect the elderly's willingness to use digital tools, but also affect their retirement life. In view of this, existing studies have explored the influencing factors of elderly people's use of digital tools, but the research on the risk of senior care in the context of digital gap is still insufficient. In the context of the digital divide, what risks the elderly perceive may be the factors that affect their willingness to use, and it is also a key to break through the digital divide. Therefore, the purpose of this study is to explore the digital risk perceived by the elderly in the context of the digital divide, the categories of perceived digital risk, and put forward relevant suggestions.

Based on the research topic, this study adopts both qualitative and quantitative research design. The first study is to confirm the research questions by interviewing the elderly within the research scope, and then to summarize and summarize. In the second study, a questionnaire survey was conducted to investigate the views of the elderly on the digital risk of the elderly in Shandong Province, and to explore its classification. In terms of the definition of digital risk for the elderly, the concept comes from perceived risk, which originally means the perceived uncertainty faced by decisions or actions [12,22]. In the field of information and communication technology, the sources of changes in risks and uncertainties in the use of information technology vary widely [22]and their impacts cannot be mitigated [13,14,15]. Secondly, the literature shows that perceived risk contributes to the expectation of

adverse consequences and thus negatively affects the intention to use [16,17]. In addition, research on online shopping also points out that different ethnic groups' perceived risks will affect their willingness to shop online [18]. The literature on elderly care research also shows that the digital risk perceived by the elderly will affect their willingness to use digital tools [19]. Therefore, this study defines the digital risk of senior care as the uncertainty assessment that elderly people face when using digital tools in senior care activities.

Study 1: The digital risk of senior care in Qingdao City

Method and Results

(1) Research base selection

Based on feasibility and budget considerations, this study took Chengyang District of Qingdao City, Shandong Province as the research scope, and interviewed the elderly living in the area as the mother. Chengyang District of Qingdao City, Shandong Province has a population of 1.169 million, and the elderly population (over 60 years old) accounts for 14.3%, about 16,366 people [19].

(2) Sampling design of the interview

In the interview of the elderly, the method of intentional sampling was used to sample. The interview questions included the use of smart phones (usage, Internet access, views on SMS and phone calls, and views on pension risks of using smart phones, etc.); The survey was conducted from March 2023 to April 2023. The survey sites were Guoxue Park, Jiajiale shopping mall and civic activity Center resting area and elderly gathering place, Zhengyang Middle Road, Chengyang District; With the consent of the interviewees, photos and pen and paper records were taken. The interview results show that among the 23 interviewees, 17 were successfully interviewed, with a success rate of about 73.9%. Therefore, the samples obtained from interviews in this study should be representative.

(3) Sample characteristics of respondents

The interview results showed that there were 8 males and 9 females, in line with the basic gender ratio; All of them are over 60 years old and meet the definition of elderly persons; Among the 17 respondents, only one person has not retired, and the rest are in the retirement stage; The main sources of average monthly income are pension and work income (one person). Except for 4 respondents who did not disclose it, the basic monthly income of the respondents is less than 1000 yuan (RMB), 7 people from 1000 to 1999 yuan, 3 people from 2000 to 2999 yuan, 1 person from 3000 yuan or more, and most of them have retirement income below 3000 yuan. In terms of living conditions, there is one person living alone and one person living in nursing homes for the aged, 5 people cohabiting with the couple, and more people

cohabiting with their children 10, indicating that the elderly people prefer to support themselves at home (home care or dispersed care). The basic data of the respondents are shown in Table 1.

Table 1 Basic data of respondents (Interview method)

Respondent	gender	Age	Retirement	AMI	Living situation
1	M	74	Retired	NA	With children
2	F	61	Retired	NA	With children
3	M	66	Retired	1000-1999	Alone
4	M	60	Not Retired	3400	Couple
5	F	72	Retired	NA	Nursing home
6	F	67	Retired	NA	With children
7	M	68	Retired	1000-1999	With children
8	F	62	Retired	1000-1999	With children
9	M	70	Retired	<1000	Couple
10	M	73	Retired	1000-1999	Couple
11	F	65	Retired	<1000	With children
12	M	62	Retired	2000-2999	With children
13	M	60	Retired	2000-2999	With children
14	M	61	Retired	2000-2999	Couple
15	F	62	Retired	<1000	Couple
16	F	63	Retired	1000-1999	With children
17	F	60	Retired	1000-1999	With children

M: Male; F: Female; Age: years old; AMI: Average monthly income (yuan/RMB); NA: Not available

(4) Respondents' use of digital tools

Secondly, in terms of the use of digital tools, digital tools make the situation as shown in Table 2. Among the 17 respondents, only one person did not own a smartphone, most of them used smartphones to make phone calls (16 people), 10 people used smartphones to buy payment in general markets (WeChat and Alipay), only 3 people could shop online (online shopping), and 12 people used smartphones for leisure and entertainment activities (playing Tiktok, watching videos, news, playing cards, etc.). Only one person uses a smartphone for medical activities. In addition, 6 respondents operate app downloads on their own, and 3 use desktop computers, tablets or laptops to surf the Internet. Overall, respondents use digital tools for phone calls and entertainment. Only 3 people (17.6%) had higher skills in using digital tools than the average elderly, and the ratio of using digital tools and skills needed to be improved.

Table 2 Respondents' use of data tools (interview method)

Respondents	Smart phone	Make phone calls	Pay	Online shopping	Leisure	Medi-cine
1	V	V				
2	V	V	V		V	
3	V	V	V		V	
4	V	V	V		V	V
5	X					
6	V	V				
7	V	V	V		V	
8	V	V	V			
9	V	V			V	
10	V	V			V	
11	V	V	V	V	V	
12	V	V				
13	V	V	V	V	V	
14	V	V			V	
15	V	V	V	V	V	
16	V	V	V		V	
17	V	V	V		V	

(5) Digital risks perceived by respondents

Finally, in terms of the digital risk of the elderly, most of the elderly did not investigate the backward era we imagined before, and more of the smart devices are to maintain a psychological expectation and fear, hoping that smart devices can give them a more convenient and carefree life. At the same time, they are also worried about being defrauded by criminals during use, improperly damaged equipment during use, and disturbing others or delaying things when traveling because they will not operate.

For example, the sixth interviewee, from Weifang, lives with his daughter, used to be a farmer and enjoys pension benefits. Alert heart is strong, do not believe in winning activities, do not lend mobile phones. In the process of using a smartphone, the sixth person will also receive fraudulent calls or text messages. Among them, the response to fraud calls is not to answer, will not answer unknown calls. This case shows that elderly people may face the risk of financial fraud, loss of money and time, and mental exhaustion in their retirement life.

Moreover, the study found that when using smart tools for retirement, only 1 of

the respondents will take the initiative to protect their digital security, such as regularly changing passwords, using anti-virus software and so on. The rest of the respondents said they were not particularly aware of digital security issues, or lacked practical experience with how to protect digital security. This shows that elderly people may face the risk of information privacy in pension activities.

In addition, when it comes to fraud, respondents said they had heard of online shopping fraud, impersonating public security law telecommunications fraud, impersonating relatives and friend's fraud, online free medicine seeking medical fraud, or friends cheated by the network. This shows that elderly people may face the risk of online shopping or the use of smartphones in their retirement life.

3. Study 2: The study on digital risk of senior care in Shandong Province

Method and Results

(1) To investigate the definition of the maternal body

Based on the feasibility and budget of the study, this study chooses Shandong Province as the scope of investigation, and the elderly people in Shandong province as the investigation objects. The population of Shandong Province is 102 million (by the end of 2022), and the elderly above 60 years old are 21.22 million, accounting for 20.9% of the total population [20,21].

(2) Sample size and sampling method

In terms of questionnaire survey, quota sampling was adopted in this study, and the sample size of sampling survey was set according to the population and sex ratio of prefecture-level cities, and then sampling was conducted according to the sex ratio. In terms of sample selection, considering feasibility and budget, this study recruited students from different places of residence in prefecture-level cities to be trained as investigators through the school counselor system to conduct questionnaire survey. The 56 visitors basically covered all prefecture-level cities and important counties and cities in Shandong Province. Through these investigators, they were asked to conduct a quota sampling survey in their respective regions, screen respondents who met the research needs through observation, and complete a questionnaire survey.

(3) Investigation tools

In terms of survey tools, we refer to existing studies [22,23,18]. In this study, perceived risk was defined as the perceived assessment of uncertainty before and after the use of digital tools by elderly people. In addition to the basic data, the questionnaire includes 15 questions about perceived risk, including financial risk, time risk, psychological risk, information privacy risk, online shopping risk, etc., such as the use of digital tools (e.g. mobile phone) will waste my time. Specifically,

questionnaire items of this study were from existing literature [22,23,18,19]and after expert inspection, indicating that it contented a good theoretical basis. The survey tool should have surface validity and content validity.

(4) Conduct of investigation

The survey was conducted in May 2023; The survey sites were parks, shopping malls, civic activity centers, resting areas and elderly gathering places in prefecture-level cities. According to the on-site observation and quota, the investigators selected eligible respondents and asked for their consent to conduct a questionnaire survey. In this study, the question-and-answer mode was adopted. The investigator explained the topic of the survey, read the questions in order for the respondents to answer, and input them into the system immediately after answering. Each person spent about 10-15 minutes to complete the questionnaire. Some respondents had good reading and comprehension skills, and the investigators allowed them to complete the questionnaire by themselves. Each person spent about 10 minutes to complete the questionnaire. The survey results showed that a total of 400 people were investigated, 64 were rejected, and 336 effective questionnaires were valid, with an effective questionnaire rate of 84%.

(5) Sample characteristics

The sample characteristics are shown in Table 3. In terms of gender, women (51.5%) were more than men (48.5%), which basically matched the population proportion of Shandong Province. In terms of education level, 33.1% of the respondents only received primary education, 26.5% graduated from junior high school, 16.9% from senior high school (vocational), and 23.5% from junior college or above, which basically conforms to the background of The Times. In terms of pre-retirement occupations, soldiers, civil servants, teachers, police officers and firefighters accounted for 5.1 percent, state-owned enterprises 14.8 percent, private enterprises 18.1 percent, farmers 37.0 percent, and freelance workers 25.0 percent.

In terms of average monthly retirement income, 0-500 yuan (RMB, the same as the following) accounted for 22.3%, 501-1000 yuan accounted for 18.4%, 1001-2000 yuan accounted for 25.6%, 2001-5000 yuan accounted for 22.3%, 5001-8000 yuan accounted for 7.8%, and more than 8001 yuan accounted for 3.6%. The monthly income of less than 2000 yuan accounted for 66%, which was roughly consistent with the interview survey results. Frequent use accounts for 23.5%, frequent use accounts for 28.6%, occasional use accounts for 31.9%, rarely use accounts for 7.5%, infrequent use accounts for 8.4%, more than half of the respondents are often or often use mobile phones, showing that more and more elderly people can accept mobile phones as digital tools. However, in terms of the use of digital tools (mobile phone for example), phone calls accounted for 73.5%, general payment accounted for 9.3%,

leisure and entertainment accounted for 8.4%, travel and taxi accounted for 2.4%, online shopping accounted for 1.5%, other accounts for 2.4%, learning accounted for 1.2%, mobile phone use and mobile phone and payment, elderly care and business use ratio is still low.

Table 3 Sample characteristics(n=332)

Items	Freq.	%	Items	Freq.	%
Gender			Monthly income(yuan/RMB)		
Male	171	51.5	0-500	74	22.3
Female	161	48.5	501-1000	61	18.4
Educational level			1001-2000	85	25.6
Elementary	110	33.1	2001-5000	74	22.3
Junior high school	88	26.5	5001-8000	26	7.8
Senior high School	56	16.9	>8001	12	3.6
College	28	8.4	Frequency of mobile phone use		
University	50	15.1	Always	78	23.5
Occupation before Retired			Usually		
Civil servant	17	5.1	Often	106	31.9
State own enterprise	49	14.8	Sometime	25	7.5
Private enterprise	60	18.1	Seldom	28	8.4
Farmer	123	37.0			
Free enterprise	83	25.0			

(6) Descriptive statistics of digital risks

The descriptive statistics of digital risks are summarized in Table 4. All questions have a minimum value of 1 and a maximum value of 5. In terms of average, the minimum score was 2.78(using digital tools such as mobile phone services would waste my time), the maximum was 3.28(there is a lot of uncertainty in online shopping), and a total of six questions scored below 3 points. This shows that respondents agree on average on digital risks from somewhat disagree to average. Overall, respondents perceived digital risk as moderate to low.

Second, in terms of standard deviation, the minimum value is 1.051(shopping online causes money loss) and the maximum value is 1.135(using digital tools to search for information takes a long time, and using digital tools to do business/transactions affects my mood). This shows that among respondents' views on digital risks, the difference in the view that "shopping online will cause money loss" is the smallest, which may be related to more fraud cases; The use of digital tools to search for information takes a long time and affects the mood of the big difference, may show that not every old person needs information search, or the mood of using

mobile phones will be affected.

Finally, the absolute value of skewness value (-0.225~0.217) is less than 2, and the absolute value of kurtosis value (-0.714~-0.420) is less than 7, indicating that the data obtained in this study basically conforms to normal distribution (Curran, West, & Finch, 1996). Accordingly, this study can carry on the follow-up analysis.

Table 4 Descriptive statistics of digital risks (n=332)

Items	M	SD	SK	KU
pr1. Using digital tools (such as mobile phones) for services wastes my time.	2.78	1.126	.090	-.615
pr2. Using digital tools (such as mobile phones) to search for information takes a long time.	2.87	1.135	.176	-.714
pr3. The process of using digital tools (such as mobile phones) to communicate takes a long time.	2.86	1.121	.120	-.645
pr4. Use of digital tools (such as mobile phones) can cause mental distress (such as inability to operate them).	2.89	1.119	.124	-.634
pr5. Using digital tools (such as mobile phones) to do things (transactions) affects my mood.	2.82	1.135	.217	-.608
pr6. The use of digital tools (such as mobile phones) can cause monetary loss.	2.89	1.087	.097	-.645
pr7. The use of digital tools (such as mobile phones) can create many uncertain results (such as fraud).	3.19	1.122	-.225	-.636
pr8. The use of digital tools (such as mobile phones) can reveal personal information.	3.26	1.123	-.144	-.622
pr9. The use of digital tools (such as mobile phones) can allow bank cards to be stolen.	3.05	1.080	-.088	-.549
pr10. There are many uncertainties when shopping online.	3.28	1.108	-.176	-.665
pr11.Shopping online can have unexpected results.	3.22	1.094	-.147	-.543
pr12. Money is lost when shopping online.	3.06	1.051	-.001	-.551
pr13. Providing personal information to mini programs (such as MeituanDouyin) is dangerous.	3.15	1.076	-.060	-.539
pr14. Providing my personal information to mini programs (such as MeituanDouyin) can involve many unexpected problems.	3.13	1.087	-.018	-.675
pr15. Disclosing my personal information to mini programs (such as MeituanDouyin) will incur greater potential losses.	3.16	1.055	-.090	-.420

(7) Validity and reliability analysis

In this study, the principal component method was used to extract the measured factors. At the same time, the maximum variation method is used as the rotating axis method to analyze the factors. In addition, in order to find a relatively reasonable digital risk dimension, this study specified the number of factors as 2(mode 1), the

number of factors as 3(mode 2), and the number of factors as 4(mode 3) in sequence. The analysis results are described as follows.

In model 1 (Table 5), KMO and Bartlett verification results showed that the data were suitable for factor analysis (KMO=0.915, Bartlett chi-square =2549, p=0.000). Secondly, Communalities show that the capture value of all questions is greater than 0.4, indicating that 15 questions may have a good intersection. Third, the sum of extraction squares and loading of the two factors is 57.6%, showing that the extraction of two factors in 15 questions can explain 57.6% of the total variation. Fourth, the first factor after the pivot covering questions 6 to 15 is named financial risk, and the second factor covering questions 1 to 5 is named time risk.

Table 5 Two-factor factor analysis

Items	F1(financial risk)	F2(time risk)	Communalities
pr6	**.534**	.418	.460
pr7	**.752**	.247	.627
pr8	**.748**	.192	.596
pr9	**.640**	.401	.571
pr10	**.777**	.173	.633
pr11	**.775**	.100	.611
pr12	**.687**	.282	.551
pr13	**.682**	.171	.494
pr14	**.767**	.154	.612
pr15	**.756**	.174	.601
pr1	.107	**.760**	.589
pr2	.217	**.784**	.662
pr3	.202	**.725**	.567
pr4	.208	**.684**	.511
pr5	.206	**.717**	.556
Cronbach's Alpha	0.913	0.822	
Eigenvalue	5.306	3.336	
KMO	KMO=0.915,		
Bartlett	Bartlett χ^2=2549,p=0.000		
Variance extracted %	57.6%		

In model 2 (Table 6), KMO and Bartlett verification results showed that the data were suitable for factor analysis (KMO=0.915, Bartlett chi-square =2549,p=0.000). Secondly, Communalities show that the capture value of all questions is greater than 0.4, indicating that 15 questions may have a good intersection. Thirdly, the

eigenvalues of the three factors were 3.727, 3.239 and 2.540, respectively. The capture squares and loading accumulated 63.4%, showing that 15 questions extracted three factors that could explain 63.4% of the total variation. Fourth, the first factor after the pivot covers questions 7 to 12 named financial risk, the second factor covers questions 1 to 5 named time risk, and the third factor covers questions 13 to 15 named privacy risk. It is worth noting that the factor load of question 6 after rotating the shaft does not exceed 0.5, and it is not classified into any group. The reliability coefficients of the three risks are 0.884, 0.822 and 0.831, which are all greater than 0.7.

Table 6 Three-factor factor analysis

Items	F1(financial risk)	F2(time risk)	F3(privacy risk)	Communalities
pr7	**.785**	.227	.223	.641
pr8	**.760**	.172	.246	.665
pr9	**.559**	.386	.338	.568
pr10	**.808**	.153	.231	.517
pr11	**.710**	.081	.352	.610
pr12	**.545**	.267	.428	.460
pr1	-.037	**.760**	.250	.718
pr2	.157	**.780**	.179	.668
pr3	.154	**.721**	.156	.576
pr4	.228	**.678**	.070	.730
pr5	.321	**.710**	-.054	.635
pr13	.274	.161	**.766**	.551
pr14	.425	.141	**.709**	.687
pr15	.346	.163	**.793**	.704
pr6	.432	.406	.330	.775
Cronbach's Alpha	0.884	0.822	0.831	
Eigenvalue	3.727	3.239	2.540	
KMO	KMO=0.915,			
Bartlett	Bartlettχ^2=2549,p=0.000			
Variance extracted %	63.4%			

In model 3 (Table 7), KMO and Bartlett verification results showed that the data were suitable for factor analysis (KMO=0.915, Bartlett chi-square =2549,p=0.000). Secondly, Communalities show that the capture value of all questions is greater than 0.4, indicating that 15 questions may have a good intersection. Thirdly, the eigenvalues of the four factors were 3.072, 2.994, 2.226 and 2.037, respectively. The sum of captured squares and loading was 68.9%, indicating that three factors extracted from 15 questions could explain 68.9% of the total variation. Fourth, the

first factor after rotating the axis covers questions 7, 8, 11 and 12 named online shopping risk, the second factor covers questions 1 to 5 named time risk, the third factor covers questions 13 to 15 named privacy risk, and the fourth factor covers questions 6, 9 and 12 named financial risk. The reliability coefficients of the four risks were 0.884, 0.822, 0.831 and 0.79, which were all greater than 0.7.

Table 7 Four-factor factor analysis

Items	F1 (shopping risk)	F2 (time risk)	F3 (privacy risk)	F4 (financial risk)	Communalities
pr7	**.715**	.197	.179	.369	.718
pr8	**.712**	.156	.212	.309	.671
pr10	**.810**	.169	.213	.197	.770
pr11	**.784**	.143	.361	.017	.766
pr1	-.022	**.779**	.239	.055	.667
pr2	.159	**.792**	.161	.119	.692
pr3	.150	**.729**	.137	.124	.588
pr4	.202	**.671**	.044	.177	.524
pr5	.212	**.650**	-.111	.379	.623
pr13	.178	.115	**.720**	.383	.710
pr14	.408	.146	**.689**	.221	.711
pr15	.380	.200	**.791**	.096	.819
pr6	.164	.250	.220	**.789**	.760
pr9	.356	.272	.249	**.661**	.700
pr12	.391	.185	.358	**.543**	.610
Cronbach's Alpha	0.868	0.822	0.831	0.795	
Eigenvalue	3.072	2.994	2.226	2.037	
KMO	KMO=0.915,				
Bartlett	Bartlett χ^2=2549,p=0.000				
Variance extracted %	68.9%				

In model 4 (Table 8), KMO and Bartlett verification results showed that the data were suitable for factor analysis (KMO=0.915, Bartlett chi-square =2549,p=0.000). Secondly, Communalities show that the capture value of all questions is greater than 0.4, indicating that 15 questions may have a good intersection. Thirdly, the eigenvalues of the five factors were 3.032, 2.261, 2.202, 2.030 and 1.551, respectively. The sum of captured squares and loading was 73.8%, showing that 15 questions extracted five factors that could explain 73.8% of the total variation. Fourth, the first factor after rotating the axis covers questions 7, 8, 11 and 12 named online shopping risk; The second factor covers questions 1 to 3 and is named time risk; The third

factor covers questions 13 to 15 and is named privacy risk, while the fourth factor covers questions 6, 9 and 12 and is named financial risk. The fifth factor covers questions 4 and 5 and is named psychological risk. The reliability coefficients of the five risks were 0.868, 0.785, 0.831, 0.795 and 0.518, respectively. The reliability coefficients of the first four factors were all greater than 0.7, and the reliability coefficients of psychological risks were only medium, indicating that the reliability of the model classification had been reduced.

Table 8 Five-factor factor analysis

Items	F1 (shopping risk)	F2 (time risk)	F3 (privacy risk)	F4 (financial risk)	F5 (psychological risk)	Commu-nalities
pr7	**.694**	.068	.214	.337	.281	.725
pr8	**.704**	.083	.221	.301	.174	.671
pr10	**.818**	.153	.191	.216	.081	.782
pr11	**.798**	.176	.330	.050	-.010	.779
pr1	-.001	**.767**	.186	.095	.237	.688
pr2	.191	**.804**	.082	.178	.202	.762
pr3	.186	**.760**	.050	.189	.151	.674
pr13	.170	.102	**.726**	.385	.066	.719
pr14	.378	.050	**.745**	.183	.212	.779
pr15	.381	.222	**.784**	.114	.029	.823
pr6	.168	.201	.192	**.802**	.164	.775
pr9	.360	.223	.224	**.674**	.171	.713
pr12	.406	.201	.312	**.578**	.036	.638
pr4	.128	.302	.192	.044	**.806**	.797
pr5	.154	.314	.002	.270	**.746**	.752
Cronbach's Alpha	0.868	0.785	0.831	0.795	0.518	
Eigenvalue	3.032	2.261	2.202	2.030	1.551	
KMO	KMO=0.915,					
Bartlett	Bartlett $\chi 2$=2549,p=0.000					
Variance extracted %	73.8%					

4.Discussion

Based on the above analysis, it is found in the qualitative research that respondents have a vague concept of digital risk, but they are more alert to telephone and telecom fraud. In the quantitative study, the average perceived digital risk of the overall respondents is low, and the standard deviation is not large. Compared with the qualitative research results, the average perceived risk of the respondents in the

quantitative research for the uncertain results brought by the use of digital tools (such as fraud), leakage of personal information, online shopping problems and information leakage using small programs is indeed relatively high, and the results of the two surveys are echoed.

Secondly, in terms of the classification of digital risks, the results of qualitative research summarize financial risks, time risks, privacy risks and online shopping risks. The quantitative research results show that five factors have the highest explanatory power (73.8%), that is, online shopping risk, time risk, privacy risk, financial risk and psychological risk. Among them, psychological risk is close to consuming mental risk in quality research. Therefore, the results of the two surveys are close.

Thirdly, the survey results of quantitative research show that there is a high deducibility among three factors (financial risk, time risk, privacy risk), four factors (online shopping risk, time risk, privacy risk, financial risk) and five factors (online shopping risk, time risk, privacy risk, financial risk and psychological risk). In other words, the four-factor model splits the online shopping risk from the three-factor model; The five-factor model cleaved psychological risk from the four-factor model, and the three models had high deductibility. However, this study found that the predictive power of five factors (73.8%) was higher than that of four factors (68.9%) and three factors (63.4%), but the reliability of psychological risk was only 0.518, indicating that the reliability of the fifth factor was insufficient, and the stability of the model remained to be tested.

Fourth, existing literature divides perceived risk into six categories, namely performance, financial, social, psychological, security, social, and opportunity/time [15]. Online service research divides perceived risk into seven categories: time, performance, financial, social, physiological, privacy, and overall risk [22,24,25,26]; Online shopping divides perceived risks into four categories: product, time, finance and privacy [18]These studies all have their own applicable industries or situations. This study divides digital risks into five categories: online shopping, time, privacy, finance and psychology, which opens a new page for the elderly care industry. After all, the digital age requires more digital tools to handle the things of life, taking into account both the context of online shopping and online services, and the psychological state of users.

5.Conclusions and Suggestions

(1) Conclusion

Aging is an established fact that no one can stop or resist. The phenomenon of the digital divide is also a fait accompli, exposing older people to many of the problems of the digital age, with digital risk being a key issue. Fortunately, through a

two-stage survey and analysis, this study has clarified the current situation of digital tool use and digital risks faced by the elderly. Accordingly, this study or the following conclusions.

- Overview of the use of smart phones by elderly people in Shandong Province

The survey results show that more than 90% of elderly people in Chengyang District of Qingdao, Shandong province, own smart phones (16/17). In terms of the use of smart phones, it is mainly to make phone calls, generally pay to watch videos for leisure, and to engage in medical treatment and learning.

- Digital risks perceived by the elderly in Shandong Province

The survey results show that the average degree of digital risk perceived by the elderly in Shandong Province is low, focusing on the uncertain results brought by digital tools (such as fraud), leakage of personal information, online shopping problems and information leakage using small programs, and there is little difference in the perception of digital risk among the respondents.

- Types of digital risks perceived by the elderly in Shandong Province

The survey results show that the digital risk perceived by the elderly in Shandong Province includes five categories: online shopping risk, time risk, privacy risk, financial risk and psychological risk, which can effectively predict 73.8% of the variation of digital risk.

(2) Suggestions

According to the above conclusions, the use of digital tools by the elderly in Shandong Province focuses on telephone calls and general payment. If this situation can be improved, there may be great business opportunities in addition to improving the life of the elderly. In view of this, it is suggested that government agencies and old-age life related industries carry out relevant activities to improve the elderly people's willingness to use digital tools. Among them, government departments can compile special projects and cooperate with universities or research institutions to enhance the digital knowledge and ability of the elderly. Elderly care providers can cooperate with universities or scientific research institutions to carry out projects to improve the efficiency of digital elderly care services.

The average degree of digital risk perceived by the elderly in Shandong Province is low, indicating that their risk awareness needs to be strengthened and improved. Therefore, the party and government departments should sort out the high digital risk groups and low digital risk groups, and propose corresponding countermeasures to better take care of the elderly. When dealing with elderly care affairs, the first stage should be to find out the digital knowledge and ability of the elderly, so as to prepare for providing high-quality digital elderly care services in the future. Secondly, elderly

care providers should establish a digital risk assessment system to strengthen advocacy and management of high digital risk groups.

The digital risks perceived by the elderly in Shandong Province are divided into five categories according to their importance: online shopping risk, time risk, privacy risk, financial risk and psychological risk. In addition to strengthening the research and development of online shopping policies and supervision, the Party and government departments should strengthen the advocacy of online shopping for the elderly and reduce the risk of online shopping. Second, privacy risks are key to note. In addition to developing protection measures, government departments should also develop more rigorous and effective management measures for the privacy of the elderly in the use of digital tools, so as to effectively reduce privacy risks. Specifically, government departments and digital tool platform operators can start from the aspects of password protection and information protection, and strengthen publicity and spot checks and counseling are feasible directions.

Finally, this study has sorted out the current situation of digital tool use and digital risk of the elderly in Shandong Province, and future research can expand the scope of investigation and improve the applicability of the study. Secondly, in the classification of five factors, the reliability of psychological risk in this study is only medium. Future studies can explore the reasons and propose countermeasures. Third, this study only takes the use of mobile phones by the elderly as an example to explore the digital risks of the elderly. In the future, more causal variables can be added to enrich the research content, which will be more conducive to responding to and mitigating the problem of digital divide.

Consent

As per international standards or university standards, respondents' written consent has been collected and preserved by the author(s).

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