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Abstract: The county science and technology workers are critical components of Chinese science and technology workers, playing an important role in science and technology application and popularization. Improving the skills for Internet use of Chinese county science and technology workers can promote the level of science and technology in our counties and towns and expand the way of transformation of advance scientific and technological achievements. This paper analyzes county science and technology worker Internet use and the determinants based on the Second National Survey data of county science and technology workers. The results show that, among all Chinese science and technology workers in counties, there are only 51% were proficient in Internet use while computer configuration, education, age, length of service are the crucial factors affecting their proficiency . Hence, three recommendations are proposed to improve the skills for internet use of county science and technology workers.

Keywords: county; science and technology workers; internet use; determinants

1 Introduction

Science and technology workers are those who are engaged in generation, development, dissemination and application of systematic scientific and technical

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knowledge, with corresponding scientific and technological work as their occupation in modern society. From the perspective of occupation, science and technology include scientific researchers, engineering technicians, agricultural technicians, health technicians and natural science teachers. Science and technology workers in our country are characterized by its large size and significant impact. With the increasing impact of science and technology innovation on the development of China, science and technology workers are also paid more and more attention by the public and also different talents projects are launched endlessly.

County science and technology workers are the main component of Chinese science and technology workers, the main force in application and promotion of science and technology, and the important power of promoting the progress of science and technology, the development of regional economy and the construction of new socialist countryside. Counties consist of more than 90% of China's land area and more than 80% of China's population.

With the advancement of science and technology, computers and internets become popular. As to science and technology workers, under the background of knowledge "explosion" and information "flood", computer and Internet provide a vast information space and dramatically reduce science and technology workers' workload. The powerful search feature of the Internet facilitates retrieving literature, and greatly improves the efficiency of scientific research.

Currently, research on science and technology workers are all based on census data or survey data, involving all aspects of science and technology workers. According to the "Second National Survey of scientists " data, science and technology workers' job satisfaction, views on academic misconduct, and status of participation in science activities were analyzed by Zhang Jian [1], Zhao Yandong[2], Xue Shu [3]et al. Based on questionnaire data, Lu Genshu [4] summarized the characteristics of social responsibilities of scientists, He Guangxi [5] analyzed the public evaluation and attitudes to science and technology workers.

In the existing literature, Internet use and behavior have been studied mainly through descriptive statistics, nonparametric statistics and Logistic regression and other methods. Cao Rongrui [6] analyzed the purpose, behavior, and obsession status of Shanghai college students' Internet use via the questionnaire data. The determinants of Beijing residents' Internet use were studied by Xu Meng [7] using hierarchical linear model. Research about determinants, consequence variables, and intervening or regulatory mechanism on Internet use were summarized by Wang Jinliang [8].Previous

studies indicate that socio-demographic factors, family factors, regional factors, psychological factors, and other factors can affect personal Internet use behavior significantly.

There are also many related research abroad. Education, gender, age, income, place of residence, broadband applications, and so on are consider as the most important factors of internet use in the study of Sciadas (2002) [9]、Singh (2004) [10]、Whitacre and Mills (2006) [11]. Larry McKeown（2007）[12]analyzed the factors associated with internet use in rural and small town of Canada. In 2005, only 58% of residents living in rural and small town areas accessed the Internet, well below the national average. Individuals that are older, those with lower levels of education and those living in households with lower incomes were less likely to have used the Internet. Research has got deeply with the population of internet. Ohbyung Kwon(2010) [13] make an empirical analysis on the factors affecting social network service use, individual characteristics and psychological factors have been considered in.

There are many studies on science and technology workers but research about Internet use has not been studied. Although there are many studies on Internet use, the observations in those studies use the Internet for both work and entertainment. A few observations use the Internet mainly for entertainment, especially the college students in the study of Internet use behavior. As for science and technology workers, their purpose of using the Internet is to facilitate work and to improve productivity. Therefore, the study about Internet use and determinants of county science and technology workers is very necessary.

2 Data Source and Methodology

2.1 Data source

Data used in this study are the research data from the "Second National Survey of county science and technology workers". In order to understand the difficulties in work and life of county science and technology workers, the China Association for Science implemented and led the Second National Survey of work conditions of county science and technology workers in 2011, which involves 206 Counties of 31 provinces (autonomous regions and municipalities) in total. 12360 copies of

questionnaires were issued and 18913 valid copies were returned.

In this study, the county agricultural science and technology workers are divided into 5 groups, such as agro-technicians, health workers, engineering technicians, science teaching staff and student village officials.

Agro-technicians: refers to those who are engaged in agriculture technology in companies or institutions, including senior agronomists (veterinarians, livestock engineers), agronomists (veterinarians, livestock engineers), assistant agronomists (veterinarians, livestock engineers), technicians and technical staffs without professional titles.

Health technicians: refers to those who are engaged in medical work in companies or institutions, including licensed doctors, assistant practicing doctors，registered nurses, pharmacists，inspection technicians，imaging technicians，health supervisors and doctors (pharmacists, nurses, technicians) on probation and other health professionals and technical personnel without professional titles.

Engineering technicians: refers to those who are engaged in engineering technology in companies or institutions, including senior engineers, engineers, assistant engineers, technicians and other technical personnel without professional titles.

Natural Science teachers: refers to those who teach mathematics, physics, chemistry, biology, information technology, labor and technical and physical geography for primary education and secondary education (junior and senior); teachers who are engaged in science, engineering, agriculture, medicine and other disciplines in educational institutions for vocational education (secondary, tertiary), higher education.

Student village officials: refers to the fresh or previous college graduates, who served as the village party branch secretary, deputy secretary, committee director and assistant, or other positions of the village "two committees" in the rural areas (including community), or who engaged in secretarial, finance and accounting for rural credit cooperatives, science parks and other public service institutions.

2.2 Analytical Method

The analyses of Internet use of county scientific and technical workers mainly uses comparative analysis and proportion analysis. The analysis of determinants is conducted by constructing Probit model and processing data via Stata 12.0.

According to existing research, socio-demographic factors affect Internet use behavior significantly. Based on the previous studies and the data obtained in this survey, variables such as gender, age, length of service, education degree, job title, industry, nature of the enterprise/institution are considered as major factors affecting Internet use of county science and technology workers. Internet use is the dependent variable which is classified into two types, skilled and unskilled. Value is assigned to other variables. Table 1 shows the setting of the Probit model of every variable.

Table 1 Probit model variable setting and definition

Variable Name	Value	Definition
dependent variable:		
Internet use	0，1	Skilled = 1, unskilled = 0, no = 0
Explanatory variables：		
worker to computer ratio	0，1	”one worker to one computer” = 1, one worker to multiple computers”= 1, no computer = 0
gender	0，1	Male = 1, Female = 0
age	1-6	Before 1950 =1，1950-1959= 2，1960-1969 =3，1970-1979 =4，1980-1989 =5，After 1990 =6
length of service	1-7	Less than 3 years =1，.3～5 years=2，6～10 years =3，11～20 years =4，21～30 years =5，31～40 years =6，more than 41 years=7
education degree	1-6	Junior high school and below = 1, senior high school / Higher vocational education/ technical secondary school= 2, junior college = 3，, undergraduate=4, master = 5 ，Dr.= 6
Job title	1-5	senior = 1, sub-senior = 2, intermediate = 3, primary = 4, no title = 5
Industry	1-5	agricultural technicians = 1，engineering technicians= 2, health technicians = 3, natural sciences teachers= 4，student village officials= 5
nature of the enterprise/institution	1-7	government offices at low level = 1, fiscal funding institutions = 2, non-fiscal funding institutions = 3，state-owned enterprises= 4, private enterprises = 5，

private non-enterprise= 6, social groups = 7

3 Empirical analyses

3.1Basic characteristics of science and technology workers

In the observations, 18,913 county science and technology workers, males and women accounted for 56% and 44%, respectively. As for age, in all observations, 31～50 age people accounted for 66%; 18～30 age people accounted for 27%; only 7% of people are over the age of 50. Corresponding to age, 34% of respondents' length of service is from 11 to 20 years; 26% of the respondents' length of service is from 21 to 30 years; and11% is from 6 to 10 years and under 3 years. It is observed that most of science and technology workers engaged in the same profession from the beginning of their career, since the proportion of 30 to 50 years old worker and the proportion of the workers with10 to 30 years length of service is similar.

From view of the education background, 49% of the respondents are with undergraduate degree; 36% of the respondents are with junior college degree; only 2% of the respondents are with graduate or higher degree. In terms of the job title, most of the titles of respondents are intermediate and primary. The proportion of these two titles were 36% and 28%, respectively and the proportion of sub-senior and senior were 10% and 4%, respectively.

According to the industry, the proportion of agricultural science, health technicians, natural sciences teaching staff, engineering technicians and student village officials among the respondents were 26%, 24%, 23%, 21% and 5%, respectively. Except the student village officials, the proportion of science and technology workers in other industry personnel is closer.

In the survey, the proportion of institutions is 79%, ranking top; the proportion of government departments is 12%, ranking second; the third is private enterprise, accounting for 5%; private non-enterprise, state-owned enterprises, community groups, and other units account for 4%.

3.2 Internet use of science and technology workers

Equipped with computer and Internet is precondition for using the Internet.

Although computers and the Internet have been popularized in urban areas, some of science and technology workers in some rural areas cannot use the Internet due to the absence of computers and the Internet. Survey data indicate that 90% of science and technology workers are equipped with computers in the units, in which 88% have access to the Internet, that is 88% of the science and technology workers may use computer to surf the Internet.

There are 63% of the respondents that share computes with others. Their work condition is poor. There are only 27% of respondents that are equipped with their own computers. For the access to the Internet, there are only 55% of respondents whose Internet use is unrestricted. In this case, among the investigated county science and technology workers, those who can access the Internet freely accounted for 49.5%.

In spite of poor work conditions and infrastructure, among all the investigated county science and technology workers, 51% of them believe that they are proficient in sending and receiving e-mail and searching information and data; only 7% are unable to access the Internet. Even though the popularity of the Internet technique of county science and technology workers is quite low, it will be improved with the further promotion of Internet technology.

With regard to the person using the Internet skillfully, the proficiency is significantly different in gender. The proportion of female county science and technology workers who can use the Internet skillfully is higher than that of male. Female choosing "quite skilled" account for 51% of all female; male choosing "quite skilled" account for 50% of all male, while the proportion of male choosing "no" is 8%, 2% higher than that of female.

The proportion of sciences and technology workers who can use the Internet skillfully in different industries varies. Specific conditions are shown in Table 2.We can observe that Internet use of engineering technicians and natural sciences teacher is better than that of agricultural technicians and health technicians, which is related to the characteristics of their industries. The proportion of persons using the Internet expertly among the student village officials is very high, mainly because the student village officials are mostly the generation after 80s and familiar with the Internet in school.

Table 2 the computer configuration and Internet use of county science and technology workers in different industries

Industry	Agricultural technicians	Engineering technicians	Health technicians	Science teachers	Student village officials	Average
skilled user proportion	47%	57%	37%	54%	85%	51%
unskilled user proportion	9%	5%	11%	6%	2%	7%

3.3 Analysis of Determinants

The Probit model was estimated via maximum likelihood estimation. The results are shown in Table 3. As we can see, influence of every variable on the dependent variable is significant except nature of the enterprise/institution. If one is male and equipped with computer, younger and with high degree and short work years, the more likely to access internet.

Whether computers are equipped in enterprises/institutions is the most influential factor of county science and technology worker proficiency in Internet use. Increasing 1% of the worker to computer ratio can increase the Internet utilization rate 0.67%. The financial difficulty and the fact that leaders overlook the importance of equipping computer result in that science and technology workers have no access to computers. Hence, the possibility of using the Internet proficiently dramatically reduced. Increasing the worker to computer ratio is the most important factor of promoting Internet use of scientific and technology workers.

Age is also an important factor affecting the Internet skill of county science and technology workers. The younger one has the higher possibility of using the Internet skillfully. The number of observation born before 1950 and born in 1950-1959 is small. In addition, behavior of two age groups is similar, so the simulated result is not significant. Because the rise of computer and internet is in the late 1990s and technology is changing rapidly, many technology workers, especially mid-aged, learn

new things slowly. Also, since training of Internet technology in enterprises/institutuions and society is limited, some county science and technology workers are not proficient in using the Internet or unable to access the Internet by the limitation of their own internet skills, even equipped with computers and the Internet.

The effect of work age and real age are similar, but directions are opposite. The longer one works, the lower possibility one is able to use the Internet. The one with long length of service learns new technology about the Internet slowly and inactively. Probably because the number of observation worked under 3 years and worked between 3-5 years is small and their behavior is similar, the results of two variables above are insignificant.

Education degree affects the Internet use of county science and technology workers markedly. The higher one's degree is, the higher possibility of one's ability to use the Internet will be. Among 6 dummy variables of education degree, the variables of undergraduate and master degree have significant differences from junior high school and below and the other 3 variables are adverse. Generally, those who are able to obtain higher degree are those with strong desire of knowledge and ability of learning. If this person has experience in using computers and the Internet after having a job, his desire of knowledge will be significantly stronger and speed of learning the Internet will be faster than the others. If the person has experience in using computer and the Internet in school, the higher his degree, the higher possibility of using the Internet skillfully will br. Requirement for Internet skills in school education is increasing in degree.

Table 3 probit model estimation results

variable name	Coefficient	Std. Err.	P>z
PC configuration-1	0.6796	0.0500	0.0000
Gender-1	0.0991	0.0288	0.0010
Age			
2	0.1691	0.2808	0.5470
3	0.5740	0.2765	0.0380
4	1.0022	0.2784	0.0000
5	1.3393	0.2831	0.0000
6	1.2809	0.3452	0.0000
Length of service			

2	-0.1081	0.0711	0.1290
3	-0.1922	0.0698	0.0060
4	-0.3618	0.0754	0.0000
5	-0.3164	0.0839	0.0000
6	-0.4838	0.1002	0.0000
7	-0.5645	0.1330	0.0000
Education degree			
2	-0.1453	0.1723	0.3990
3	0.1892	0.1679	0.2600
4	0.6238	0.1681	0.0000
5	1.2816	0.2093	0.0000
6	0.4764	0.4919	0.3330
Job title			
2	0.0830	0.0436	0.0570
3	-0.3513	0.0420	0.0000
4	-0.1130	0.0407	0.0060
5	0.0822	0.1495	0.5820
6	0.2551	0.0945	0.0070
Industry			
2	-0.0022	0.0791	0.9780
3	-0.1924	0.0720	0.0080
4	-0.3123	0.0766	0.0000
5	-0.3149	0.0815	0.0000
Nature of the enterprise/institution			
2	-0.0816	0.0536	0.1280
3	-0.1674	0.0663	0.0120
4	-0.2436	0.0955	0.0110
5	0.0959	0.0825	0.2450
6	0.2896	0.1950	0.1370
7	-0.0576	0.1707	0.7360
constant	-1.2825	0.3404	
Log likelihood = -5582.7732		Prob > chi2 =	0.0000
LR chi2(33) = 2167.90		Pseudo R2 =	0.1626

4 Conclusion and recommendations

As an important mean of communication and research, Internet technology is an important skill which technical personnel need to have when science and technology becomes more and more important and changes rapidly. However, among the numerous county science and technology workers who make significant contributions, there is still a portion of them who are unable to use the Internet or to know little about Internet use and 51% of them think they can use the Internet skillfully. To improve the Internet skill of China's county science and technology workers is to enhance the level of science and technology in county and to advance the expanding way of achievements transformation. So, it is necessary to progressively enhance the Internet skills of county scientific and technical workers by effective means.

Based on the analysis of determinants, the following suggestions are offered:

（1）To better the work conditions for county science and technology workers, to increase worker to computers ratio, to achieve everyone has an access to a computer or one people per computer if possible. As long as appropriate hardware is sufficiently provided, science and technology workers will have the motivation and possibility of improving their Internet use skills.

（2）To strengthen on-the-job training of county science and technology workers , to train them regularly and especially to train middle-aged and older ones about Internet use skills. Since the Internet emerges in a short time and develops rapidly, many people know about the Internet after having their first job. Mutual learning between colleagues is inconvenient but Internet related training organized by enterprises/institutions can work more effectively.

（3）To improve the compensation incentive mechanism in order to encourage science and technology workers to make progress and to make more contribution. For some science and technology workers with longer length of services, who have made certain achievements, got some job titles and have little learning motivation, we can stimulate their learning enthusiasm so as to improve their Internet use skills by such methods as setting job grading, examining regularly, grading division results, and awarding the staff who got great achievement and so on.

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