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An Empirical Study on Data Reuse Intention among Social Science Researchers in Chengdu, Sichuan Province, China

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Abstract

This study investigates the influencing factors of social science researchers' intention to reuse data in Chengdu, Sichuan Province, China. The conceptual framework includes information quality, service quality, subjective norms, data repository, perceived effort, and intention to reuse data. The researchers conducted a quantitative method to distribute the online questionnaire to 500 social science researchers. The sample techniques were purposive, quota, and convenience sampling. Confirmatory Factor Analysis (CFA) and Structural Equation Model (SEM) were used to analyze the data and examine the research hypotheses. The findings show that information quality, service quality, subjective norms, perceived usefulness, perceived ease of use, and attitudes to data reuse significantly impact social science researchers' intention to reuse data. In contrast, data repository has no significant impact on social science researchers' intention to reuse data influences. It can effectively support the cycle between data sharing and reuse in the humanities and social sciences to promote the formation of ecology and provide references and suggestions for data management in this field.

Keywords : data reuse, information quality, service quality, social science researchers

Introduction

The data generated in scientific research activities are the link and cornerstone of scientific research heritage (Zimmerman, 2008). Under the paradigm of data-intensive scientific research, data must be fully shared and reused to maximize their data value. The data in this study refers to the original data created by researchers for specific research purposes in scientific research activities, including observational data, survey data, and experimental and simulation data. Data reuse is collecting, reanalyzing, and using existing (created by others) data to solve new problems (Law, 2006). The process of data reuse mainly includes the stages of data discovery, selection, acquisition and understanding, verification, and use. Data reuse can improve data citation specifications, data supervision, and management.

More and more researchers have found the value and significance of data reuse (Joo et al., 2017; Joo & Kim, 2017;). This research aims to contribute by offering evidence that should speed up the use of data for various research projects rather than a single one, as is the case with current process research. In the past, data from social science research has been used for a specific framework model, which shares certain data in common. The output of this work has the potential to be applied on a national and international scale to guarantee the entire chain of services for social science data reuse, to clarify and enhance quality control and evaluation indicators for social science data, and to assist the social science community in developing target specifications for data reuse that will actively direct reuse behavior.

Literature Review

Service Quality

Wang and Lin (2012) found that service quality positively impacted the perceived usefulness and perceived ease of use of mobile value-added services. Lin (2015) pointed out that service quality positively impacts perceived usefulness and perceived ease of use recruitment sites. Rui-Hsin and Lin (2018) emphasized that trainees recognized that service quality positively affected perceived usefulness and perceived ease of use of police education and training e-learning. Better service quality increases user confidence in a product or system, reduces the time and effort users spend studying or working, and leads to higher acceptance (Tanasapsakul & Vongurai, 2018). Therefore, service quality affects users' perceived ease of use and perceived usefulness per stated in following hypotheses:

Hypothesis 1a: Service quality has a significant effect on perceived usefulness

Hypothesis 1b: Service quality has a significant effect on perceived ease of use

Information Quality

It mainly includes the accuracy, completeness, authority, reliability, timeliness, and relevance of the data (Zhou, 2011). Wang and Lin (2012) found that information quality positively affected perceived usefulness and perceived ease of use of mobile value-added services. Faniel et al. (2016) focused on factors such as the availability of data, the quality of data sources, and reputation when exploring the behavior of sociologists in data reuse. When researchers use public data, they need to process the data into data suitable for their research projects. The completer and more authoritative the data, the stronger the correlation, the less time and effort it takes to identify the quality of the data, and the more available and valuable the data will be to researchers. Therefore, the hypothesis of this study is as follows:

Hypothesis 2a: Information quality has a significant effect on perceived usefulness

Hypothesis 2b: Information quality has a significant effect on perceived ease of use

Perceived Ease of Use

It refers to the degree to which an individual considers a system or technology effortless and easy to use (Davis, 1989). Yan et al. (2016) found that among the factors affecting the adoption intention of Chinese digital library information service mashup, perceived ease of use positively impacted perceived usefulness. Lin (2007) emphasized that perceived ease of use positively affected the perceived usefulness of virtual communities in the empirical test of

information quality, system quality, and service quality on the continuous use of virtual communities. Consequently, the hypothesis is developed as below:

Hypothesis 3: Perceived ease of use has a significant effect on perceived usefulness.

Perceived Usefulness

It refers to the extent to which social science researchers can benefit from reusing other researchers' data (Park et al., 2009). In TAM, individuals' perceived usefulness positively and significantly affects their attitudes. Joo and Kim (2017) found that perceived usefulness motivated engineering researchers to reuse other researchers' data. Joo et al. (2017) explored the influence of health scientists' data reused behavior and concluded that perceived usefulness positively impacted data reuse attitudes. Yoon and Kim (2017) argued that perceived usefulness had a robust positive effect on the attitude of social scientists to reuse data. Hence, a hypothesis of this study is indicated:

Hypothesis 4: Perceived usefulness has a significant effect on attitude toward data reuse.

Perceived Effort

It refers to the effort and effort to search for data and obtain permission to access and process data (Harper & Kim, 2018). In the research on the data reuse behavior of researchers, perceived effort mainly examines the time and energy spent by researchers in identifying, acquiring, and processing data in data reuse (Yoon & Kim, 2020). Faniel et al. (2013) showed that when data users spend less time or effort acquiring and analyzing data, their satisfaction with data reuse increases. Based on the above assumptions, this study hypothesizes that:

Hypothesis 5: Perceived effort has a significant effect on attitudes toward data reuse.

Hypothesis 6: Perceived effort has a significant effect on intention to data.

Subjective Norm

It refers to the influence of essential persons in social relations, such as peer friends and scientific research collaborators, on the intention of researchers to reuse data (Kim & Stanton, 2016). Data reuse will affect their attitude toward data reuse and intention to reuse data (Curty & Qin, 2014). Melero and Navarro-Molina (2020) pointed out that encouraging and rewarding researchers to participate in the reuse of data was often related to the ingrained habits of research and the standard practices of those around them. Veeravalli et al. (2019) found that researchers' subjective norm for knowledge-seeking positively affected knowledge-seeking intention. Yoon and Kim (2017) emphasized that the stronger the subjective norm of data reuse among social science researchers, the greater their attitude and intention to reuse data. Therefore, subjective norm affects researchers' judgment of the value of data reuse and their attitude and intention to reuse data:

Hypothesis 7: Subjective norms has a significant effect on attitudes toward data reuse.

Hypothesis 8: Subjective norm has a significant effect on intention to reuse data.

Attitude Toward Data Reuse

It refers to the general belief that an individual likes or dislikes a particular behavior (Ajzen & Fishbein, 1980). The TPB theory shows that an individual's attitude toward a

behavior dramatically affects his or her intention to do so. Curty et al. (2017) found that attitudes had a more significant positive impact on researchers' data reuse behavior. Based on previous studies, the hypothesis of this study is as follows.

Hypothesis 9: Attitude toward data reuse has a significant effect on intention to reuse data.

Data Repository

It mainly includes accessibility, usability, reliability, authority, and subject relevance of data sources (Fear & Donaldson, 2012). Kim and Yoon (2017) found that the availability of data repositories significantly affects the intention to reuse data. Daniels et al. (2012) pointed out that data-sharing platforms and databases supported data sharing. Curty and Qin (2014) found that the data reuse behavior of researchers was affected by conditions such as the accessibility of the repository. Thus, a hypothesis is proposed.

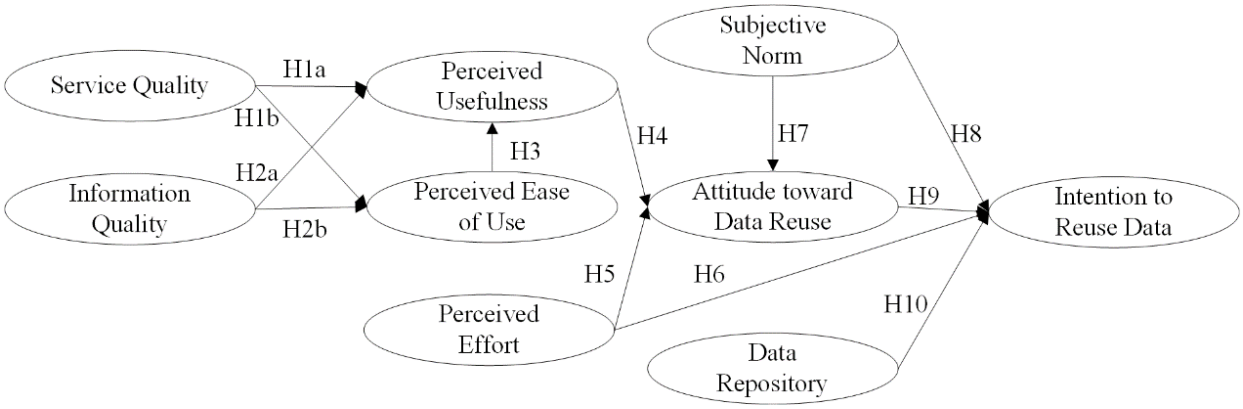
Hypothesis 10: Data repository has a significant effect on intention to reuse data.

Conceptual Framework

According to the research framework in the previous studies, the theoretical model is constructed as shown in Figure 1. The proposed framework and hypotheses of this study are constructed based on the theory of planned behavior (TPB) by Ajzen (1991), technology acceptance model (TAM), and extended technology acceptance model (ETAM) by Davis (1989). The propose hypotheses and built models are around eight aspects, and explore the factors that influence social science researchers' intention to reuse data.

Figure 1

Conceptual Framework



Note. Adapted from Ajzen (1991) and Davis (1989)

Research Methodology

Research Design

This study used a questionnaire to conduct empirical research to verify whether the proposed hypothesis and theoretical model are biased. The questionnaire has three parts. The

first part is screening questions and filtering invalid users and answer sheets. The second part is a survey of the influencing factors of social science researchers' intention to reuse data. They are using the Likert-5 scale design. The third part is demographic information. The index of Item–Objective Congruence (IOC) of six PhD and pilot test of 50 participants were used to verify content validity and construct reliability. Confirmatory Factor Analysis (CFA), and Structural Equation Model (SEM) were used to analyze the data and examine the research hypotheses.

Research Population and Sample

The target population are 500 researchers in the field of social sciences who are Master's degree or above and have experienced in conducting research in Chengdu, Sichuan Province, China. (Lv & Peng, 2019). The minimum sample size in SEM is recommended to be at least 200 (Kline, 2011). This quantitative study employs sample techniques, using purposive, quota and convenience sampling. For purposive sampling, the top 10 social science research institutions in the comprehensive evaluation of social science research institutions were selected as sampling units. These ten organizations are Sichuan University, Sichuan Normal University, Southwest University of Finance and Economics, Southwest University for Nationalities, Sichuan Academy of Social Sciences, Southwest Jiaotong University, University of Electronic Science and Technology of China, Chengdu University, Chengdu University of Technology and Xihua University. There are five vital national universities and four provincial undergraduate universities. Therefore, these ten institutions represent researchers engaged in Social Sciences in Chengdu, Sichuan Province.

Quota sampling were used to generalize 50 participants per each institution. For convenience sampling, the questionnaire is mainly distributed using network questionnaires and paper questionnaires. The online questionnaire is distributed through the Questionnaire Star platform (https://www.wjx.cn/). The paper questionnaire was directly distributed by visiting some colleges and universities in Chengdu or attending an academic conference. The questionnaire is sent by door-to-door interview. A total of 553 questionnaires were recovered, including 402 online and 151 paper questionnaires. Excluding 53 discarded questionnaires, such as the identity of the respondents did not meet the requirements, the scale was scored regularly, the filling time was too short, or the options were too uniform, there were 500 valid questionnaires, and the recovery rate was 90.42%.

Data Analysis

In this study, structural equation modeling (SEM) was used as the primary method of data analysis to verify the relationship between the research model and the hypotheses. The scales were assessed and tested for reliability using Cronbach's alpha, skewness, and kurtosis in normality analysis. Conduct confirmatory factor analysis (CFA) to judge the validity of the measurement model and verify the construct validity (including convergent and discriminant validity) by checking the values of the factor loading, p-value, t-value, composite reliability (CR), average variance extracted (AVE), the square root of each AVE, and the inter-construct correlations. Jamovi, IBM SPSS, and AMOS were the primary data analysis tools.

Demographics of Participants

The male-to-female ratio of the collected questionnaires is about 2:3, with 38.8% for males and 61.2% for females. The ages are mainly between 25 and 45 years old. Most participants have engaged in scientific research. The majority of respondents have the title of lecturer/instructor or above, with 32.6% of associate professors and 10.6% of full professors. The subjects that the survey participants are engaged in are from different social sciences, with management accounting for 39.4%, followed by law (14.8%), education (12.8%), and Economics (10.6%).

Table 1

The demographic data

Demographic and General Data (N=500)		Frequency	Percentage
Gender	Male	194	38.8%
	Female	306	61.2%
Age	Under 24	31	6.2%
	25-35	194	38.8%
	36-45	168	33.6%
	46-55	87	17.4%
	56+	20	4.0%
Time Engaged in Scientific Research	Less than 5	163	32.6%
	6-10	131	26.2%
	11-15	94	18.8%
	16-20	53	10.6%
	20+	59	11.8%
Position	Assistant	72	14.4%
	Lecturer/instructor	178	35.6%
	Associate professor	163	32.6%
	Full professor	53	10.6%
	Others	34	6.8%
Subject area	Philosophy	17	3.4%
	Economics	53	10.6%
	Law	74	14.8%
	Education	64	12.8%
	Literature	50	10.0%
	History	14	2.8%
	Management	197	39.4%
	Arts	31	6.2%

Results and Discussion

The measurement model is evaluated to check the validity of the structure, including convergence and discriminant. The square root of the AVE extracted for each construct is greater than the inter-construct correlation, indicating reliable convergent and discriminant validity. Table 2 shows the square root of the AVE and the correlation matrix, indicating that the survey measurements are reliable and valid for structural model evaluation**.**

Table 2

Square roots of AVEs and correlation matrix

	PEOU	PU	SN	PE	SQ	IQ	DR	ADR	IRD
PEOU	**0.756**								
PU	0.371	**0.815**							
SN	0.252	0.304	**0.75**						
PE	-0.163	-0.382	-0.292	**0.819**					
SQ	0.324	0.488	0.288	-0.443	**0.833**				
IQ	0.26	0.429	0.295	-0.369	0.494	**0.826**			
DR	0.156	0.423	0.293	-0.389	0.41	0.476	**0.806**		
ADR	0.168	0.405	0.296	-0.359	0.367	0.379	0.405	**0.804**	
IRD	0.194	0.346	0.393	-0.468	0.384	0.396	0.383	0.477	**0.825**

Note: The diagonally listed value is the AVE square roots of the variable

Reliability and Validity

In this study, the reliability and validity of the questionnaire were analyzed using Jamovi, SPSS, and AMOS software. The value of Cronbach a ranges from 0.791 (subjective norm) to 0.928 (information quality), all above 0.70, indicating good reliability. Composite Reliability (CR) and Average Variance Extracted (AVE) can be used as convergent validity indicators for testing latent variables. If the CR of the latent variable is more significant than 0.60 and the AVE is greater than 0.50, the model has good validity (Chin, 1998). The data in Table 3 showed that each latent variable's CR and AVE values are within the appropriate range, with good convergent validity.

Table 3

Scale reliability and validity measures

Latent Variables	Cronbach's Alpha	CR	AVE
Perceived Ease of Use (PEOU)	0.887	0.888	0.571
Perceived Usefulness (PU)	0.887	0.888	0.665
Subjective Norm (SN)	0.791	0.794	0.563
Perceived Effort (PE)	0.857	0.859	0.670
Service Quality (SQ)	0.900	0.901	0.694
Information Quality (IQ)	0.928	0.928	0.683
Data Repository (DR)	0.847	0.848	0.650
Attitude toward Data Reuse (ADR)	0.846	0.846	0.647
Intention to Reuse Data (IRD)	0.863	0.864	0.680

Structural Equation Modeling (SEM)

In this study, AMOS was used to test the fitness of the model hypothesis. The model test standards and test results are shown in Table 4. The outcome shows that the model fitting indicators meet the specified fair values, so the hypothetical model constructed is valid.

Table 4

Summary of model fit measures

Index	Acceptable Criterion	Statistical Values Before Adjustment	Statistical Values After Adjustment
CMIN/DF	< 3.00 (Hair et al., 2006)	1455.042/548 or 2.655	1169.024/544 or 2.149
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.845	0.891
AGFI	≥ 0.85 (Schermelleh-Engel & Moosbrugger, 2003)	0.821	0.874
NFI	≥ 0.85 (Hair et al., 2006)	0.869	0.895
CFI	≥ 0.90 (Hair et al., 2006)	0.914	0.940
TLI	≥ 0.90 (Hair et al., 2006)	0.906	0.935
RMSEA	<0.05 (Hu & Bentler, 1999)	0.058	0.048
Model Summary		**Unacceptable Model Fit**	**Acceptable Model Fit**

Hypothesis Outcomes

The analysis results of a structural model present factors affecting social science researchers' intention to reuse data. The results in Table 5 and Figure 2 show the hypotheses testing results, indicated by C.R. and p-value.

Table 5

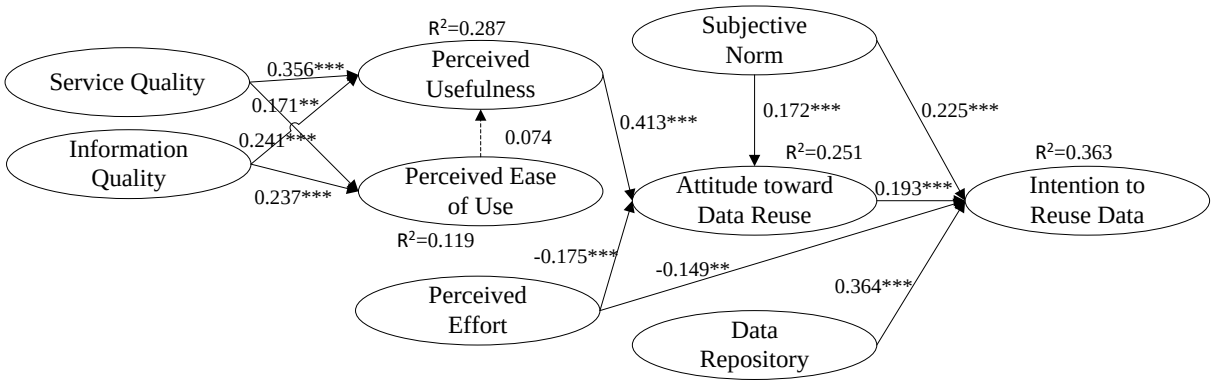
Summary of hypothesis tests

Hypothesis	C.R.	Beta(p)	Result
H1a: SQ →PU	6.278	0.345***	Supported
H1b: SQ → PEOU	4.856	0.288***	Supported
H2a: IQ → PU	4.396	0.225***	Supported
H2b: IQ → PEOU	2.377	0.136*	Supported
H3: PEOU → PU	4.743	0.222***	Supported
H4: PU → ADR	7.016	0.352***	Supported
H5: PE → ADR	-4.467	-0.238***	Supported
H6: PE → IRD	-5.340	-0.288***	Supported
H7: SN → ADR	3.376	0.186***	Supported
H8: SN → IRD	4.411	0.232***	Supported
H9: ADR → IRD	6.464	0.317***	Supported
H10: DR → IRD	1.923	0.100	Not Supported

Note: ***p<.001, *p<.05.

Figure 2

Hypotheses Testing Results



Discussion

It can be seen from Table 5 and Figure 2 that except for H10 with P>0.05, which is not significant, the remaining 11 hypotheses H1a, H1b, H2a, H2b, H3, H4, H5, H6, H7, H8, and H9 are all supported. Data analysis shows that service quality has a significant effect on the perceived usefulness ($\beta = 0.345$, $p < 0.001$) and perceived ease of use ($\beta = 0.288$, $p < 0.001$) of data reuse. Information quality has a significant effect on the perceived usefulness ($\beta = 0.225$, $p < 0.001$) and perceived ease of use ($\beta = 0.136$, $p < 0.001$) of data reuse. The perceived ease of use of data reuse has a significant effect on the perceived usefulness of data reuse ($\beta = 0.222$,

$p < 0.001$). Service quality and information quality explain 14.44% of the total variance in perceived ease of use when social science researchers reuse data ($R2 = 0.144$). The three variables, service quality, information quality, and perceived ease of use, accounted for 38.7% of the total variance in perceived usefulness ($R2=0.387$).

In terms of attitudes, perceived usefulness has a significant effect on social science researchers' attitude toward data reuse ($\beta = 0.352$, $p < 0.001$) and indirectly impacts the intention to reuse data through the impact on data reuse attitude. Perceived effort has a significant effect on attitude toward data reuse ($\beta = -0.238$, $p < 0.001$). Subjective norm has a significant effect on social science researchers' attitude toward data reuse ($\beta = 0.186$, $p < 0.001$). Perceived usefulness, perceived effort, and subjective norm factors are accounted for 24.5% of the total variance of attitude toward data reuse ($R2 = 0.245$).

Subjective norm of data reuse among social science researchers has a significant effect on intention to reuse data ($\beta = 0.232$, $p < 0.001$). Attitude toward data reuse has a significant impact on intention to reuse data ($\beta = 0.317$, $p < 0.001$). Perceived effort significantly affects intention to reuse data ($\beta = -0.288$, $p < 0.001$). However, data repository has no significant effect on social scientists' intention to reuse data ($\beta = 0.100$, $p > 0.05$). The subjective norm, attitude, and perceived effort of data reuse accounted for 44.1% of the total variance of data reuse intention ($R2 = 0.441$).

Conclusion

The findings show that information quality, service quality, subjective norms, perceived usefulness, perceived ease of use, and attitudes to data reuse significantly impact social science researchers' intention to reuse data. In contrast, data repository has no significant impact on social science researchers' intention to reuse data influences. The following conclusions are drawn. Information quality and service quality positively and directly impact the perceived ease of use of data reuse by social science researchers. This result is because social science researchers value the data's relevance, completeness, accuracy, and up-to-date. Their operability, vision requirements, and specialized services for the system are constantly improving. At the same time, the concern about whether the system storing the data can provide real-time services, quick response services, and better response results.

Information quality, service quality, and perceived ease of use of data reuse have a positive and direct impact on social science researchers' perceived usefulness of data reuse. This is because of the professional nature of scientific data. The requirements for quality are more stringent. When social science researchers reuse data, they have a more assertive attitude and intention to reuse data that are easy to use, highly relevant to their research, and highly reputable.

Perceived effort negatively affects social science researchers' attitudes and intentions to reuse data. The reason may be that in social science research, secondary data analysis requires much work (Faniel et al., 2016). It takes time and effort to locate, access, and process datasets. When researchers believe that reusing other people's data is too expensive to learn, they do not want to continue learning and are less likely to reuse data.

Perceived usefulness has a direct positive impact on social science researchers' attitude toward data reuse and an indirect impact on their intention to reuse data. Subjective norm

positively and directly affects social science researchers' attitudes and intentions to reuse data. This may be because social science researchers prefer a standardized, clear, complete, and mature reuse rule when reusing data. When the reuse rules are more complete, their attitude toward data reuse is stronger.

Attitude toward data reuse of social science researchers has a positive and direct impact on the intention to reuse data. As can be seen from the findings, data repositories have no significant impact on social science researchers' intention to reuse data.

Recommendations

From the perspective of national and international organizations, the construction process of national and international social science data-sharing projects should be accelerated. The government adopts policies to encourage data sharing and reuse, expand the distribution of social science data sharing platforms, release data sharing and reuse initiatives, hold academic exchange activities on data reuse, set a typical example of data reuse, and publicize the benefits of social science data to improve social science researchers' emotional cognition and value cognition on data reuse. At the same time, the state and social funding institutions shall clarify the scope of social science data opening and reuse permission at the stage of social science researchers applying for scientific research projects and concluding projects.

This study recommends to guarantee the whole chain of social science data reuse services and improve the service quality of data reuse to provide a variety of download methods to carry out data acquisition services. For example, it can be a download of attachments in journal papers or place them on the data platform for researchers to retrieve and download. Carry out data presentation services through advocacy and the establishment of collaborative networks are necessary. For example, academic leaders and renowned scholars in the social sciences are encouraged to share more of the data they generate in their academic research, from the construction of consulting channels and consulting fields to carrying out data consulting services. To provide data reuse training services, research centers should play the data librarian role in academic libraries, provides lectures and training on improving retrieval ability. Data reuse cases simulate the data reuse process of social science researchers.

In the stages of data review, confirmation, and verification, managers of research institutes, colleges and universities, and enterprises should establish a quality control system for social science data to ensure data availability, timeliness, normative, understandable, verifiable and reusable to improve data quality. Strengthen data peer review and citation policies are to ensure data accuracy and trustworthiness. At the same time, the data are classified and reviewed for different social science disciplines, derived from building a strict review mechanism for social science data to ensure the sharing and reuse of high-quality data. Data sharing and publishing platforms are such as social science data repositories and journals review to evaluate data quality according to clear and unified standards, strengthen the screening of content and formats, reduce the doubts of data users, and improve the quality and reusability of data set. Another example is the creation of data identifiers, which facilitates data location and management and simplifies the data reuse process.

The social science community needs more robust data to reuse target specifications to actively guide researchers' data reuse behavior. The library takes the lead in building a data-

sharing platform community. In the user center of the platform, interactive games, knowledge quizzes, answering questions, and feedback mechanisms related to data are set up to promote the formation of data communities. To encourage researchers to participate in or initiate activities spontaneously, data community managers should promote team cooperation, and expand team influence.

Limitations and Further Study

The research questions and contents of this study cover the main aspects of research on the data reuse intention of social science researchers. However, there are still limitations. First, the research method is a quantitative method which cannot completely and accurately reflect the actual intention of social science researchers to reuse data. Second, there is an unproven relationship between some variables, such as data repository, and social science researchers' intention to reuse data. This paper believes in-depth interviews will be added to future research on data reuse in social sciences. Information that cannot be obtained through questionnaires will be analyzed through interviews. Last, the future study should inspect the indirect effect of the research model.

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