



Civic Utilisation based on meta-ethnography willingness of government to open data Modeling of Influential factors

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ARTICLE INFO

Keywords:

open government data
Participation behavior intention
Meta ethnography
Influence factors model
Qualitative research

ABSTRACT

[Purpose/Significance] Government open data has been in China for 10 years, however, the actual use of it has been criticised. This study analyses citizens' willingness to use government open data from their perspectives and constructs a model, aiming to promote in-depth research on citizens' use of government open data. [Methodology/Process] Meta-ethnographic qualitative research method was adopted to synthesise and integrate the 25 original studies. [Results/Conclusions] The study finally constructed a model of factors influencing citizens' willingness to use government open data, and identified four dimensions: "citizen", "platform", "government" and "environment". The four dimensions of "citizen", "platform", "government" and "environment" were identified, of which "citizen" involves "intrinsic motivation", "behavioural attitude", "information attitude" and "information security". The four dimensions of "Citizen" include "Intrinsic Motivation", "Behavioural Attitude", "Information Literacy", and "Demographic Characteristics", while the four dimensions of "Platform" include "Data Quality", "Information Literacy", and "Demographic Characteristics". platform involves the sub-dimensions of "data quality" and "platform quality", "government" involves the sub-dimensions of "organisational conditions" and "policies and regulations", and "government" involves the sub-dimensions of "organisational conditions" and "policies and regulations". government involves two sub-dimensions, "organisational conditions" and "policies and regulations", and "environment" involves two sub-dimensions, "social environment" and "type of context", with each sub-dimension having a different impact on the use of open government data by citizens. The different factors under each sub-dimension have different degrees of influence on citizens' use of open government data. Finally, suggestions are made to enhance citizens' willingness to use open government data.

1. Introduction

Today, there is a global trend to accelerate the opening up of government public data. Since 2009 when the "Open Government Initiative" was proposed by Obama, then president of the United States, with the aim to promote the openness of government data to an unprecedented level, the wave of open government data has been sweeping the globe and governments worldwide have gradually made non-personal and non-confidential data available in their portals [1]. To establish open government partnerships, eight countries including Mexico, the United Kingdom, and Brazil signed the Open Data Statement in 2011. In 2015, the General Office of the State

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<https://doi.org/10.1016/j.heliyon.2023.e23778>

Received 16 March 2023; Received in revised form 30 November 2023; Accepted 13 December 2023

Available online 20 December 2023

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Council of the People's Republic of China issued the Action Plan for Promoting the Development of Big Data, specifying the need to build unified governmental platforms for open government data and to make data pertaining to vital areas, such as transportation, healthcare, and education, available to the public in a reasonable and appropriate manner. As of August 2023, 226 local governments at the provincial and city levels in China have gone online with open government data platforms, of which 22 are provincial platforms and 204 are city platforms, making the construction efforts effective [2].

The value-generating mechanism of open government data is a multi-linked open data value chain, as well as the participation of various stakeholders in the value realisation process. Although some studies have confirmed the positive impacts of open government data, such as increasing transparency stimulating citizens' attitudes and participation in government [3], enhancing the legitimacy of policy implementation [4] and boosting citizens' trust in government [5]. However, from the point of view of the actual situation of China's open government data platform, there are problems of insufficient active use by the society and the market, and the data benefits are not well utilised [6], and the current problem facing open government data is not whether it is open or not, but rather the utilisation of the data. Related studies have been conducted from the government's point of view to supply-driven promotion of open data, based on the needs of citizens is still insufficient research. Citizens, as the direct recipients of open government data, play an important role in the value realisation system of open government data, and the mismatch between government supply and citizens' demand not only leads to a waste of resources, but also makes it difficult to realise the value of massive data. Therefore, it is of great significance to clarify the experience and perception in the process of using the open government data platform from the perspective of citizens to improve the open government data platform and give full play to the value of data.

2. Current status of the research

Throughout the existing research, the academic community on government open data mainly involves three aspects, the first is data-oriented, stressing that the government open data is of public use value [7–9], under the premise of fully complying with the open standards, open to all kinds of data demanders in a standardised format, whose demand subjects include, but are not limited to, members of the public, scientific researchers, social organisations, enterprises and so on. The second is process-oriented, which emphasizes the complete process of open government data [10], i.e., the process in which the government opens up the data it generates, collects and owns under the Creative Commons licence, and various subjects share, distribute, modify, and even commercially use the data. The third is behavioural orientation, which emphasizes the government's act of opening up data in the above process [11–14], where government departments open up the raw data they obtain in the course of exercising their duties and performing their functions to citizens of the society permanently and free of charge through digital platforms.

Whether it is international organisations, national governments or researchers on the conceptual definition of government open data, there are varying degrees of crossover, but basically there is a common understanding of the subjects and characteristics involved: non-proprietary, freely available free of charge, and in line with open standards.

Academics are currently conducting the following three aspects of research on government open data: first of all, it is the research on government open data construction, including the composition of open data construction, construction path, policies and regulations, privacy protection and mechanism institutional safeguard research [15–19]; with the improvement of government open data construction, scholars have begun to carry out the research on the application of government open data, including the value of the use of open data, the impact of factors, safeguard measures and value creation. Factors, safeguards and value creation mechanisms [20–23], the process of realising the application of government open data involves many stakeholders, and is a process in which multiple subjects participate and cover multiple fields, but because the public's use of the data only covers a few fields such as traffic and travel, health and hygiene, education, science and technology, and housing, the amount of output results and the coverage are at a relatively low level, which leads to low utilisation rates of government open data and failure to realise the value of the data. However, because the public's use of data only covers a few areas such as transport and travel, health and hygiene, education and technology, and housing, the volume and coverage of outputs are at a low level, resulting in low utilisation of government open data and the failure to realise the value of the data [24]. In response to the application of open data, scholars have conducted research related to the evaluation and improvement of government open data, and the research hotspots focus more on the evaluation of the quality of open data and the construction of open platforms [25,26].

Citizen participation is an important link in the realisation of the value of open government data, and current research on citizen participation in open government data mainly focuses on the three aspects of participation mode, participation mechanism and influencing factors. Drawing on the ladder theory of citizen participation and combining it with the situational characteristics of open government data, Chen Chaobing [27] summarised four modes of citizen participation: informative, consultative, cooperative and empowering. While Guo Jiao Yang [28] proposed the optimisation of the public participation mechanism for the real problems of platform construction and legal protection, and specifically analysed the internal guarantee system and external support system of public participation. Huang [29] found through empirical analysis that the design of a user-centred open government data platform should include the two main aspects of user requirements and functional requirements. By conducting a survey covering six European countries, Toots [30] focused on the impact of individual stakeholder factors on their participation in open government data, including participants' personal characteristics and values, motivation to participate, and awareness of participation opportunities.

In summary, in the existing research on open government data, the research perspectives are diverse, the methods are varied, and richer research results have been achieved. Existing studies have analysed the connotation of open government data from the three levels of data, process and behaviour, and sorted out the citizens' participation mode, participation mechanism and influencing factors in the process of open government data based on the theories of technological innovation and adoption and ecosystem, as well as qualitative and quantitative research methods. Existing research lacks the analysis and explanation of citizens' participation behaviour

in terms of psychology, context and other aspects, and there is an urgent need to push forward in a more detailed and in-depth direction to comprehensively analyze citizens' participation behaviour.

3. Research methodology

In 1983, Noblit and Hare published *Meta-ethnography: Issues in the Synthesis and Replication of Qualitative Research*, which formalised meta-ethnography as an important method for qualitative research [31]. Rather than a narrative overview of existing research, the method is a comprehensive research approach that develops new integrated findings by extracting core concepts from the original research for rigorous comparative analyses.

Unlike quantitative meta-analyses and literature reviews, which summarise new frameworks and models with more explanatory power on the basis of a precise synthesis of the original literature, 'integration' involves the process of extracting data from individual studies and interpreting and representing them in a holistic form. It integrates more advanced theoretical frameworks through qualitative synthesis and exceeds the theoretical level of any individual empirical study [32]. Noblit and Hare [31] divided meta-ethnography into seven steps: identifying the integrative theme, defining the integrative theme, reading the original studies, identifying the relationships between studies, translating studies into each other, synthesising the translation, and presenting the results of the integration.

In subsequent studies, scholars have integrated based on the above steps; Zhou [33] integrated 12 original studies and constructed a panoramic model of information encounters based on the elements, processes, effects, and contexts in which the encounters occurred; Tian [34] used this method to compare, analyze, and integrate 21 original studies, and clarified the themes of research on health

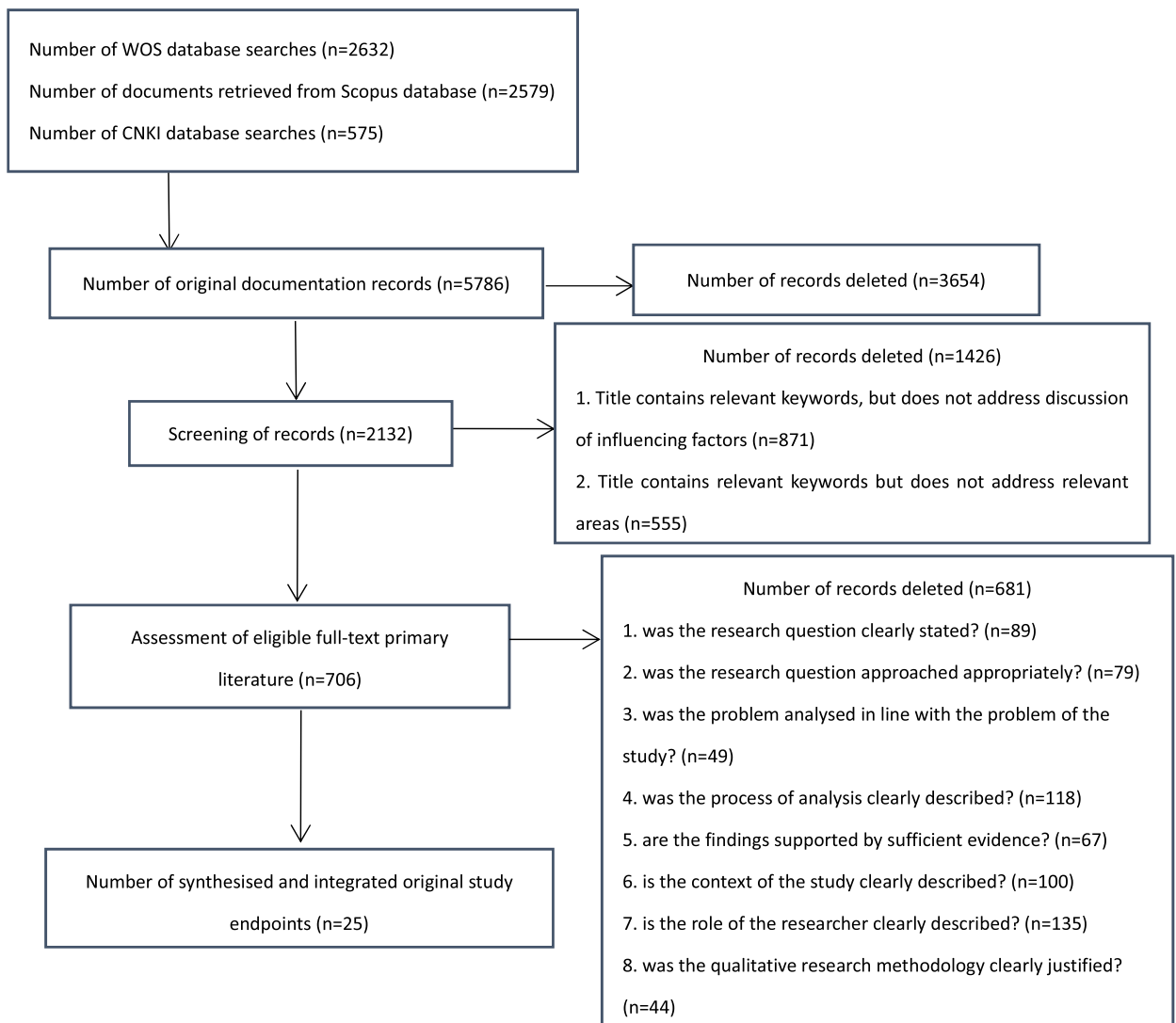


Fig. 1. PRISMA evaluation criteria and screening process.

Table 1
The summary of original literature.

Literature	Research questions	Research methods	Research results
Ran et al. (2022) [29]	Explored the behavioral logic of public participation in open data use.	Logical analysis method, theoretical analysis method.	Public participation is influenced by three major factors: individual perception, environmental influence, and guarantee mechanisms.
Wang and Wang (2020) [40]	Systematically analysed the characteristics and patterns of open government data users' participation and explored the factors hindering users' participation.	Investigated user training programs carried out in the United States, Italy, and Spain.	Proposes four user participation patterns: knowing data, using data, requesting data, and interactions between users and the government.
Dong (2017) [41]	How is citizen participation in open government data use going in China? Which factors affect citizen participation in open government data use? What is its action direction?	Those who had read news or information about open government data use were targeted, and 570 online questionnaires were distributed and analysed by using SPSS.	Among the demographic variables, genders, education levels, and occupations have significant effects on citizen participation in open government data use.
Chen (2018) [42]	Studied the factors affecting public concern for OGD.	Starting from a literature review and basic theories, they proposed hypotheses, collected data through questionnaires, and used SPSS and AMOS to analyze the models.	The technology acceptance model and information system success model are also applicable to the model of factors affecting public concern for OGD. Among them, perceived quality and information literacy affect public concern.
Yang (2019) [43]	Studied the dynamic process of OGD from the perspective of user acceptance.	Took Shanghai, Beijing, and Guiyang as typical examples to conduct studies.	The usefulness and usability of OGD will have a positive impact on user acceptance. The main factors affecting the usefulness and usability of OGD include the efforts that the government and users have put in and the government's timely response to users.
Sun (2021) [44]	Explored the factors affecting public satisfaction with the government's open data platforms.	243 questionnaires were distributed and the data were analysed by using SPSS.	They have found the problems affecting public satisfaction with the OGD platform of the Tianjin municipal government. For example, the platform does not open to an acceptable degree, its data can not be searched and accessed easily, and it does not interact well with users. The government, the platform, and the public all affect public satisfaction to varying degrees.
Zhang (2019) [45]	Studied the factors affecting public satisfaction with the OGD platforms.	They distributed 220 questionnaires and used SPSS to analyze the data.	The quality of the data, the usability of the data, the usability of the platforms' functions, the openness of the platforms, and the factors affecting the platforms' security have a positive impact on public satisfaction.
Cao (2021) [46]	Discussed the study on citizen participation in local government open data use in terms of the creation of the system of citizen participation, participation environment, and the platforms.	Questionnaires and interviews were combined to understand the current situation of citizen participation in open government data use in Y city.	Local government should increase citizen participation from the perspectives of the legal system, policy support, and the environment and platforms for user participation.
Jiang et al. (2022) [47]	Explored the factors influencing citizens' use of OGD.	Used web-based questionnaires to collect 296 pieces of data and used SPSS to analyze the data.	The usefulness and satisfaction perceived by citizens determined whether the public continued using open government data; Uses' expectations significantly influenced their satisfaction and perception of usefulness, thus indirectly determining whether they continued using OGD; uses' perception of usability significantly influenced their satisfaction, and their trust in government and the Internet significantly affect their expectations.
Zhang et al. (2022) [48]	Explored the major factors determining whether citizens continue using OGD.	Used the method of DANP and TOPSIS to distribute 14 questionnaires among experts from universities and research institutions.	Citizens' ability to use the data is the cause, their expectations and satisfaction are the results, and their ability to use the data influences their expectations and satisfaction.
Purwanto et al. (2020) [49]	Explored the requisites for citizen participation in open government data use and determined which factors stimulate such participation.	Systematically outlined the literature and built a conceptual model.	Five conditions for citizen participation in open government data use were determined: availability of legal and political provisions, mandate to make government data available, availability of feedback mechanisms for OGD, citizens' sense of participation, and active citizenship.

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Table 1 (continued)

Literature	Research questions	Research methods	Research results
Khurshid <i>et al.</i> (2022) [50]	Used information system theory to study factors influencing citizens' willingness to use OGD.	Invited 140 respondents to fill out a questionnaire and received 132 responses. Used Smart PLS to analyze the data.	Perception of usefulness, social acceptance, and enjoyment positively influence citizens' willingness, and citizens' willingness negatively affects the use of OGD.
Islam <i>et al.</i> (2021) [51]	Identified the factors that determined whether users continue using OGD.	After an empirical survey of 370 respondents in Bangladesh, they used structural equation modeling to conduct analyses.	Expected performance, expected effort, social influence, and convenience have a direct influence on users' satisfaction.
Dabbi <i>et al.</i> (2018) [52]	Explored the factors that influence citizens' use of OGD portals.	Combed a large number of existing studies, they have identified the major factors that may influence public use.	Proposed the "evaluation dimensions of OGD portals".
Schmidhuber <i>et al.</i> (2019) [53]	Studied citizen participation in the construction of local government-initiated platforms and investigated the motivations influencing the intensity of citizen participation.	They selected the Austrian local government platform meinlinz.at, distributed 169 questionnaires among users that had registered in autumn 2016, and received 169 responses.	Motivations for citizen participation in public administration vary considerably by the forms of participation. Intrinsic motivation is positively associated with the production and consumption of platform content, and external and internal regulation is negatively associated with positive individual contributions. Furthermore, external regulation is positively correlated with assessment behavior.
Jurisch <i>et al.</i> (2015) [54]	What factors influence citizens' use of open government services.	Their research model was based on TAM and UTAUT. They conducted the survey in six countries and received 6000 valid responses.	Uses' perception of usability, geographical intimacy of the subject, and political activities directly influence the users' willingness to use OGD. Users' trust in the Internet and their perception of risks do not seem to have a direct impact on their use of OGD.
Krismawati and Hidayanto (2021) [55]	Tried to examine what factors influence user participation in open government data use.	They distributed questionnaires via email and received 1237 responses. Then they processed data by using AMOS to conduct cb-sem analysis.	The factors that influence the participation of open data portals users are information quality, system quality, perceived usefulness, and trust in and satisfaction with open data.
Wang (2023) [56]	An empirical study of the information service quality of open government data platforms from the perspective of public perceived quality.	Shanghai Municipality, Shenzhen Municipality, and Guiyang Municipality's open government data platforms were selected as survey respondents, and 162 people with experience in using the platforms were selected.	Optimisation recommendations are made in terms of perceived data quality, data ease of use, data security, interactive feedback, tool utilisation, and user experience.
Chen (2023) [57]	To explore the user experience and generation mechanism in the process of using the open government data platform.	Users of open government data platforms in 187 cities were analysed using rootedness theory and text analysis tools.	Influenced by both the user and the platform. Factors such as the platform's data, functionality and interface influence user adoption.
Men (2023) [58]	How to promote users' data utilisation behaviours and enhance their willingness to continue to utilise it.	Regression analysis of 427 questionnaires based on a theoretical model of integration of technology adoption and utilisation.	Users' past utilisation behaviour towards open data is mainly influenced by input expectations, social influence and channel dependence, while their willingness to continue to utilise in the future is shaped by performance expectations, social influence and channel dependence, and utilisation behaviour plays a partly mediating role.
Wang [59] (2023)	To explore the impact of virtual assistants on users in open government data.	An experimental method was used to collect data from 160 participants divided into a control and experimental group.	Citizens had positive attitudes towards the provision of virtual assistants in open government data. There were no significant differences in citizens' acceptance, trustworthiness, and rapport with open government data with and without virtual assistants, and slightly higher accuracy in completing tasks using virtual assistants.
Simonofski [60] (2022)	How gamification ideas can stimulate citizens to use open government data.	Data was collected through 20 interviews with experts and citizens.	Compared to experts, average citizens expect open government data to have more interesting interfaces, useful content, customised visualisations, readable formats, and transparency-related datasets.
Abiola [61] (2022)	How dashboards can be designed and applied in an open government data environment.	108 participants were involved in the experiment to collect data.	The usefulness of dashboards in helping citizens use open government data suggests that managers follow design principles to make them easy to use and understand.

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Table 1 (continued)

Literature	Research questions	Research methods	Research results
Xiao [62] (2020)	To study the requirements and access behaviour of open government data users when interacting with web portals.	Three portals were selected and data was collected using transaction log analysis and web content mining.	Different channels have different impacts on users' success in finding the data they need. Users preferred browsing to searching.
Wirtz [63] (2017)	Explore the antecedents of citizens' use of open government data.	Based on technology acceptance and motivation theories, a research model is proposed and empirically tested, applying structural equation modelling to survey data collected from 210 citizens.	Ease of use, usefulness, intrinsic motivation, and Internet capability largely determine citizens' intentions to use open government data.

information behaviours in a social media context These include health information demand, health information search behaviour, health information sharing behaviour and health information adoption behaviour.

As the most frequently used method in qualitative integrative integration, meta-ethnography is a very powerful tool for synthesising original studies, suitable for model building and higher-order theoretical studies, and to some extent has become a template for other integrative methods to use [35].

4. Research process

4.1. Identifying the integration topics

This stage focuses on identifying the research theme, which provides the scope and direction for obtaining the original research for retrieval. Around the research theme, the direction of the search can be identified as studies related to citizens' willingness to utilise government open data.

4.2. Defining the meaning of the integration topics

In this stage, the search was mainly based on the research topic, and the English original literature was obtained mainly through WOS database and Scopus database, with $TS=(open\ government\ data\ OR\ government\ open\ data\ OR\ open\ data\ for\ government\ OR\ government\ data)\ AND\ TS=(user\ OR\ subscribers\ OR\ citizen\ OR\ residents\ OR\ public)$ as the search formula, the publication time is limited to 2010 to 2023, and the literature type is limited to thesis, and 2632 articles were obtained by WOS and 2579 articles were obtained by Scopus; the Chinese original literature was mainly obtained through CNKI database, and the title search was "government data". The Chinese original literature is mainly obtained through CNKI database, searching by title "*open government data + government data + open government data*" AND "*users + citizens + public + residents*", the publication time is limited to 2010 to 2023, the type of literature is limited to dissertation, and the source of literature is CSSCI. source journals and NU core journals, and 575 articles were retrieved.

After obtaining the relevant literature, we browsed the general content of the literature and deleted the literature that was not related to the main body of the study but contained search terms. In the in-depth screening process, PRISMA and CASP were followed for literature selection and quality evaluation. (screening, eligibility, and inclusion [36].CASP (Critical Appraisal Skills Programme) was developed by Amanda Burls and includes the following key elements: Is the research question clearly stated? Was the research question approached appropriately? Are the questions analysed consistent with the questions of the study? Is the analysis process clearly described? and other relevant assessment questions [37]. It is now widely used by researchers for quality assessment. For example, Mustapa [38], although it also discusses the influencing factors related to open data in government, the target audience is set in the public sector and not around citizens, which is not in line with the theme of this study, so it is excluded. Agrawal [39] aims to study the impact of information systems on open data applications, which is not in line with the perspective of this study around citizens, so it is excluded. The final selection is shown in Fig. 1.

4.3. Reading original studies

25 original studies were finalised, and the finalised primary literature was read in detail to summarise the research questions, research process, research methodology and findings of each study in detail, as shown in Table 1 below.

4.4. Determining the relationship between studies

25 original studies were finally identified, of which 11 were in Chinese and 14 were in foreign languages. Most of the original studies made hypotheses based on modelling, such as TAM and UTAUT, and then verified them by distributing questionnaires or interviews, and analysed them using tools such as SPSS, AMOS and Smart PLS. There are also some studies that use classic cases or research to explore, which not only involves open government data in several cities in China, but also includes many countries such as the United States, Italy, Spain, Bangladesh, Austria, and so on. Through repeated readings and discussions, the four core dimensions of this study are identified - "citizen", "platform", "government", and "environment".

4.5. Translation between studies

4.5.1. The citizenship dimension

Within the individual’s own dimension, the different intrinsic motivations at play trigger different behaviours, as reflected in the fourteen original studies [29,41,42,44,47,48,50,51,53–55,59,62,63]. Enjoyment, expectations are effective factors for citizens’ participation in open government data, which drive knowledge formation and sustained use by individuals in the process of participation. Citizens’ willingness to continue to use is a psychological state resulting from the fulfilment of pre-use expectations, and the satisfaction of prior use determines, to some extent, the frequency and duration of citizens’ access to the data, and the higher the level of citizens’ satisfaction with the data, the more likely they are to continue to use it. "I am personally interested in open government data in at least some ways" [41], suggesting that being "interested" is one of the factors that make citizens more likely to use open government data proactively. In addition, trust is necessary when there is risk, and higher levels of trust in the Internet can mitigate the risk of users using new technologies and services. When citizens believe that the government is truly looking out for people’s rights and interests in open data, the higher the level of trust in the government and the more likely they are to continue to use open government data. Thus, the five original core concepts of enjoyment, expectation, interest, trust and satisfaction can all be translated into intrinsic motivation.

Perceived risk is defined as the subjective expectation of a citizen to suffer a loss in pursuit of a desired outcome, which consists of behavioural and environmental uncertainty. This is reflected in the three [40,45,57] original studies. The risk of personal privacy and trade secret leakage can cause citizens to be hesitant about open data. The more secure the data platform is, the easier it is for citizens to use it. Citizens’ access to and use of open government data mostly does not stem from hobby, but is based on the need to satisfy some utilitarian purpose of their own, a drive that can effectively stimulate citizens’ intention to participate. Perceived ease of use is defined as the level of effort that an individual believes is required to use an information system, as captured in a study [63]. Defined in this study as the effort that citizens perceive is required to use open government data, it includes not only finding and understanding the

Table 2
The integration of citizenship dimension translation.

The integration of citizen-dimension translation	Identified factors	Examples of original core concepts	Original literature (author)
Intrinsic motivation	Enjoyment (great)	Enjoyment and pleasure seem to prompt individuals to acquire knowledge of OGD.	Khurshid, Schmidhuber
	Expectations (great)	Governments can increase the sustained use of OGD technologies by raising citizen expectations.	Zhang, Ran, Sun, Islam
	Interest (strong)	Citizens who are more interested in politics are more likely to use OGD.	Dong Jiao, Jurisch, Xiao, Wirtz
	Trust (great)	The more trust citizens have in government, the more likely they are to continue using OGD.	Jiang, Krismawati, Dong
	Satisfaction (great)	Decision makers should prioritize meeting the requirements of OGD users to ensure their satisfaction and encourage existing users to continue using OGD.	Jiang, Zhang, Islam, Krismawati, Chen, Sun
Behavioral attitudes	Perceived usefulness (great)	High perceived usefulness does influence citizens’ willingness to use OGD services and products.	Jiang, Purwanto, Khurshid, Krismawati, Ran, Dong, Chen, Chen, Men
	Perceived risks (low)	The risks of revealing personal privacy and trade secret can also lead the public to be hesitant about and take a wait-and-see attitude toward open data.	Wang, Zhang Lurui, Chen
	Perceived ease of use (great)	The higher citizens’ perceived ease of use of open government data, the greater their willingness to use it.	Wirtz
Information literacy	The ability to access data (great)	As people have stronger awareness of information, greater knowledge of information, and greater ability to access data, they perceive government data and open platforms more clearly.	Ran, Dong, Chen, Wang
	The ability to sort data (great)	As people have stronger awareness of information, greater knowledge of information, and greater ability to access data, they perceive government data and open platforms more clearly.	Ran, Chen, Wang
	The ability to utilise data (great)	As people have stronger awareness of information, greater knowledge of information, and greater ability to access data, they perceive government data and open platforms more clearly.	Ran, Chen, Wang
	Problem-solving awareness (great)	Individuals who have mathematics abilities are more willing to participate and more likely to display participation behaviors.	Ran, Dong, Chen
Demographic characteristics	Gender (male)	The mean scores of the males’ sample were higher than those of the females’, meaning that males are more likely to participate than females.	Dong
	Age (middle-aged and young)	Middle-aged and young people are more willing to participate.	Zhang
	Education levels (high)	The OGD platform is highly concerned by well-educated people.	Dong, Zhang
	Occupations (academic researcher)	The degree of participation of different occupations from highest to lowest is academic researchers, civil servants, corporate employees, students, freelancers, and self-employed entrepreneurs.	Dong, Chen

corresponding data, but also the usability of the data technology platform. The higher citizens' perceived ease of use of open government data, the greater their willingness to use it. Perceived usefulness, on the other hand, relates to an individual's expectation that use of the information system will enhance the individual's relevant reserves and capabilities. Citizens' perceived usefulness drives the intention to use open government data and has a significant positive impact on continued willingness to use, as demonstrated in nine original studies [29,41,42,47,49,50,55,57,58]. When the public perceives open government data as more useful, they are more satisfied with the data and thus more likely to use it. Thus, the three core concepts of perceived risk, perceived ease of use, and perceived usefulness can be translated into behavioural attitudes.

Six original studies have found information literacy to be an important factor influencing citizen participation in open government data [29,40,42,44,48,63]. Citizens need to have the appropriate skills and knowledge to access and use open government data platforms, and information literacy competencies are mainly expressed in this thematic study as the ability to record data, organise data, organise data and preserve data. Citizens with certain data utilisation skills have a higher perception of open government data, are quicker and more convenient in the process of using the data, and efficient access can prompt citizens to be more willing to use open government data. On the other hand, citizens who lack data acquisition and analysis skills will lack the awareness of using data to solve problems, thus reducing the intention to participate. Therefore, the four original core concepts of data awareness, data skills, ability to use data, and awareness of problem solving can all be translated into information literacy competencies.

Basic information such as an individual's gender, age, occupation, and education level are attributed to demographic characteristics. Different dimensions create different individuals and influence various behaviours of citizens. In the original study, three studies obtained demographic correlates [41,45,57]. The higher the level of education, the more active citizens' participation behaviour in open government data will be. The open government data platform is a channel that covers a variety of high technologies such as management, economics, and computers, and is popular with high-level talents, among which, academic researchers, government department personnel, and enterprise workers, three different professions, have a higher level of citizen participation. In terms of age, young and middle-aged people are the main users of the Open Government Data Platform. In addition, males are different than females in terms of the level of participation, with males being more involved.

Citizen dimensions are translated and integrated as shown in Table 2 below.

4.5.2. Platform dimension

Searching for and using data is the main purpose for citizens to use open government data, while data quality is an important assessment factor, as concluded by fourteen original studies [40,44–46,48–55,57,60]. Problems such as inconsistent data formats, untimely updating, low accuracy, unsatisfactory quantity, and unavailability of the data after accessing it can lead to citizens' inability to use the data efficiently. In addition, the proximity of data topics to citizens' daily lives is also an important factor. "Topics such as motorway or airport projects close to home will be more interesting to engage with" [54], and the focus should be firstly on local and regional topics, and secondly on national issues (e.g. national financial data). Improvements in data quality will increase citizens' perceived usefulness, stimulate citizen satisfaction and trust in the portal, which in turn enhances citizens' willingness to participate. Thus, the original core concepts of accessibility, richness, accuracy, usefulness, real-time, transparency and proximity can be translated into data quality.

Platform quality affects to some extent the citizens' sense of experience in using open government data, and thirteen original studies have obtained relevant findings [44–46,50,52–55,57,59–62]. Data platforms with more functionalities tend to attract more citizens; having offline accessibility, designing appropriate interactive features, and allowing citizens to perform quality assessment

Table 3
Platform dimension translation integration.

Platform Dimension	Identified factors	Examples of original core concepts	Original literature (author)
Translation Integration			
Data quality	Easy availability (great)	Should provide data that can be searched and accessed easily and efficiently.	Zhang, Khurshid, Dahbi, Sun
	Richness (great)	The government should publish a wide range of data that covers multiple domains and meets the needs of citizens in terms of information.	Wang, Dahbi
	Accuracy (great)	Accuracy is the most important indicator in the data dimension.	Zhang, Dahbi, Jurisch
	Usefulness (great)	Resource availability is conducive to citizen-led OGD participation.	Purwanto, Islam, Cao
	Timeliness (great)	A delay in updating data leads citizens to use data inefficiently.	Schmidthuber, Wei, Chen
Platform quality	Relevance (great)	Topics about highways or airports close to citizens' homes make them more interested in participating.	Jurisch
	Transparency (great)	Transparent data are more credible.	Simonofski
	The diversity in functionalities (great)	The direct correlation coefficient between the platforms' functionalities and citizen satisfaction is 0.123, which has a significant impact.	Khurshid, Dahbi, Jurisch, Sun, Zhang, Cao, Schmidthuber, Chen
	The usability of the platforms (great)	An OGD platform that is easy to use makes citizens download, upload, search, and process data quickly, and, as a result, helps them carry out daily operations, make better decisions, and closely follow government activities.	Dahbi, Krismawati, Zhang, Cao, Schmidthuber, Khurshid, Jurisch, Chen
	Platform interface (reasonable)	It is hoped that the front page of the platform will reflect local characteristics or have a dynamic feel.	Chen

functions all lead to enhanced willingness for continued use. In addition, the ease of use of the platform also affects citizens' willingness to use it, as easy-to-use tools and mechanisms for retrieving, accessing and obtaining data make it easy for citizens to obtain it without spending a lot of time, which encourages more frequent use. At the same time, data information and functional elements are arranged on the page in a way that is visually appealing and easy to access. Therefore, the two original core concepts of functional diversity, platform ease of use, and platform interface mentioned above can be translated into platform quality.

The platform dimensions are translated and integrated as shown in [Table 3](#) below.

4.5.3. The government dimension

The more adequately the government organisational conditions are secured, the fewer barriers citizens encounter when participating and the more positive their expectations of the participation process, as shown in the five original studies [29,43,46,49,53]. Arranging relevant awareness training, providing technical support, establishing a feedback mechanism to set up a dedicated department, and leadership support affect the usefulness and ease of use of open government data, which is a mechanism used by the government to increase the motivation of citizens to participate in its use. Therefore, the five original core concepts of technical support, dedicated department, leadership support, feedback mechanism, training and advocacy can be translated into organisational conditions.

In addition, policies and regulations are one of the factors affecting citizens' participation in open government data, which is mainly reflected in the four original studies [40,43,45,49]. The existence of relevant laws and regulations is an important guarantee for citizens' participation in open government data, and detailed and specific laws and regulations can make the data more operable and guarantee the use of data by citizens and the ultimate value realisation.

The integration of government dimension translation is shown in [Table 4](#) below.

4.5.4. Environment dimension

There is a subtle influence of social environment on citizens' willingness to participate, which is mainly reflected in the five original studies [29,49–51,58]. The positive publicity of government policies related to open data in various media and the popularization of knowledge related to the use of data can guide citizens to maintain the use of data. In addition, the endorsement of other social members has a significant role in citizen participation, and they can influence citizen participation behaviours by making statements through forums, postings, and other media. Most of the public tends to trust the opinions of their close circle, such as friends, relatives and colleagues, who can influence or change citizens' choices through their close relationships. Thus, the two original core concepts of media influence and social circle influence can be translated into social context.

When citizens are in different types of situations, they will operate with different behaviours according to their different needs. If there is a job requirement or in a more urgent situation, citizens will have a strong willingness to use open data, which is reflected in the five original studies [41,46,49,50,58]. However, if there is no demand for the work, then citizens will not consciously use it. Therefore, the original core concept of task context can be translated into context types.

The integration of the context dimension transcription is shown in [Table 5](#) below.

4.6. Synthetic translation

This stage is an optimisation and integration based on the previous step, where concepts with opposing nature are extracted from the original core concepts for secondary interpretation in order to reach an explanation of mutually exclusive concepts and optimise the factors influencing citizens' willingness to use government open data.

Table 4
Government dimension translation integration.

The integration of government dimensional translation	Identified factors	Examples of original core concepts	Original literature (author)
Organization conditions	Technical support (great)	The relevant technology provided by the government can stimulate or hinder citizen participation.	Purwanto, Schmidhuber
	Dedicated departments (great)	In terms of human resource support, a dedicated department should build a bridge between data developers, the government, and the public and analyze the datasets to feed back to the public understandable data.	Yang, Ran
	Leaders' support (great)	It will affect the usefulness and usability of OGD, and thus citizens' acceptance of open data.	Yang
	Feedback mechanisms (great)	The availability of feedback mechanisms between governments and citizens is another requisite for citizen participation.	Purwanto
	Training and publicity (frequent)	Providing training and relevant infrastructure to promote the use of OGD	Islam
Policies and regulations	Laws and regulations (detailed and specific)	Inadequate legal policies fail to safeguard citizens' use and eventual value realisation of data.	Purwanto, Yang, Wei,Zhang

Table 5
The integration of environment dimension translations.

The integration of environment dimension translations	Identified factors	Examples of original core concepts	Original literature (author)
Social environment	Media influence (great) Social circle influence (multiple)	Positive publicity for and the popularization of knowledge of the use of OGD have a latent influence on citizens' willingness to participate. Opinions shared by users' friends, relatives, and superiors on social media help to improve the user's recognition.	Ran Islam, Purwanto, Khurshid, Men
Context types	Task context (deterministic)	A sense of urgency is one of the important conditions for citizen-led participation.	Cao, Dong, Purwanto, Khurshid, Men

4.7. 1 Whether perceived risk factors influence citizens' willingness to utilise open government data

In the process of translating the original core concepts, the author found that different scholars hold different views on the "perceived risk" of the "behavioural attitude" factor in the "citizen" dimension. Two scholars, Wang Wei, Zhang Lurui, and Chen Mei, in their respective studies, found that if the use of open government data involves the risk of disclosure of personal privacy or business secrets, it will lead to citizens' hesitation to participate in open data. Jurisch, on the other hand, found that this argument did not hold true in his study. He found that citizens do not seem to perceive the use of open government data as risky. Citizens are often asked to fill in private information when conducting e-government transactions (e.g., filing tax returns online), and when disclosing personal information (e.g., bank account details), they are prompted to ensure that the government and third parties adequately protect and do not misuse or misappropriate the data. Open government data services are less likely to require personal information, and there is no risk factor based on trust in government.

The above concepts may be mutually exclusive because: in terms of research methodology, Wang Wei analysed the cases of open government data in the United States, Italy and Spain in depth; Zhang Lurui drew conclusions by distributing 220 questionnaires to the city of Jinan and analysing the data using SPSS; and Chen Mei used rootedness theory and textual analysis tools to analyze the user comments on the open government data platforms in 187 cities. analysed. And in Jurisch's study, 1000, 1000, 1001, 1007, 1010 and 1023 interviews were conducted in Germany, Switzerland, Austria, the United States, the United Kingdom and Sweden over a period of three years, respectively, and the results were obtained based on the TAM and UTAUT model bases. Jurisch's study involves several countries and the sample size is very large. Although the sample is rich, it is due to the large number of samples that there may be situations where the focus cannot be highlighted. The sample size of Wang Wei, Zhang Lurui and Chen Mei's study is more actionable compared to Jurisch, and in terms of the number of scholars, the three scholars, Wang Wei, Zhang Lurui and Chen Mei, are more persuasive in arriving at the same conclusion. In addition, although Jursch gets the conclusion that there is no impact of perceived risk, he points out in the discussion part that this finding should not lead to the wrong assumption that there is no need to involve open

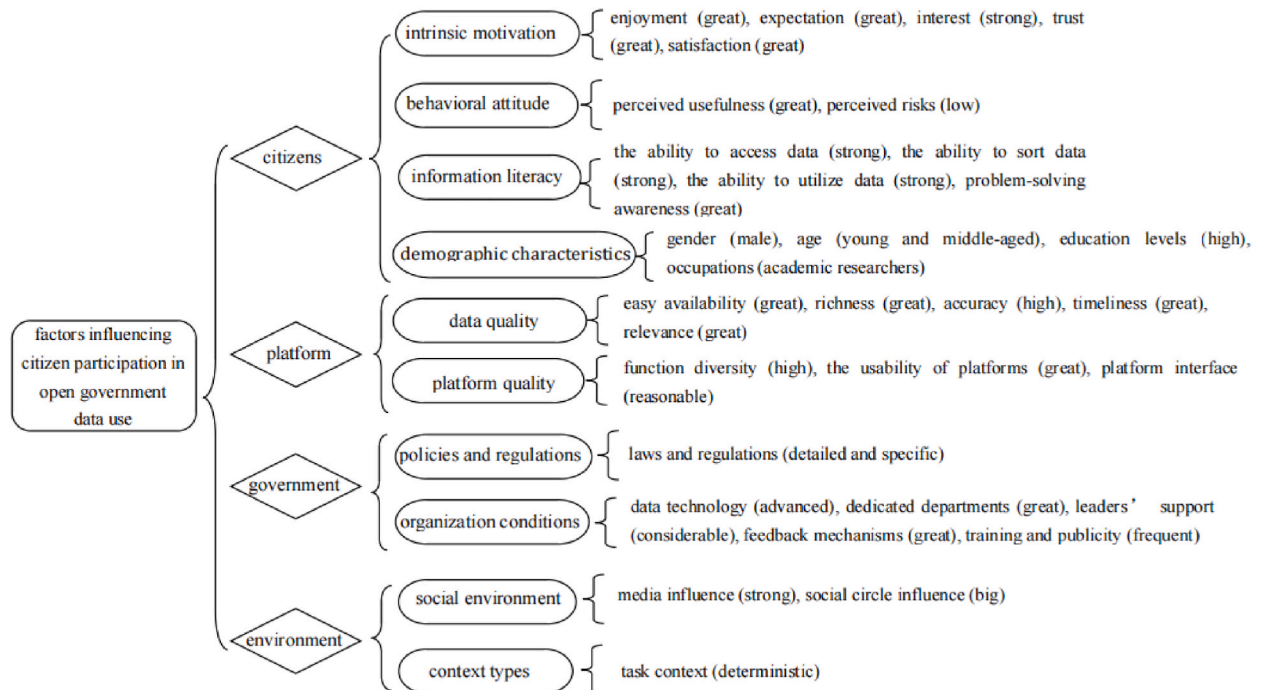


Fig. 2. A model of factors influencing citizens' willingness to use government open data.

government data platforms in a secure and trustworthy way, which also reflects his sceptical attitude towards this conclusion from the side.

In conclusion, this study finally integrates the findings of Wang Wei, Zhang Lurui, and Chen Mei, who concluded that "perceived risk" has an impact on citizens' participation in open government data in the "behavioural attitudes" factor of the "citizen" dimension. Open Government Data.

4.8. Demonstrating the integration results

Based on the steps of the meta-ethnographic approach, the results of the above translation and integration are organised as shown in Fig. 2 below.

5. Analysis of factors influencing citizens' willingness to use government open data

Using a meta-ethnographic qualitative research methodology, this study identifies core concepts and synthesises and integrates 25 original studies to identify four dimensions that influence citizen engagement with open government data: 'citizen', 'platform', 'Government', 'Environment', and different influencing factors under each dimension.

The "Citizen" dimension includes the following factors: intrinsic motivation, behavioural attitudes, information literacy, and personal statistical characteristics. Intentions to use open government data are stronger when citizens are in a situation of enjoyment, expectation, high interest, trust and high satisfaction with government data. Higher perceived usefulness and perceived ease of use influence citizens' intention to use, while higher perceived risk leads to stronger hesitation and wait-and-see attitudes, thus lowering intention to use. Additionally, a citizen with data access, organisational, utilisation and problem-solving awareness has a higher perceived quality of open government data and is more likely to engage with it. Among the demographic factors, young and middle-aged male citizens who are highly educated, engaged in academic research or government enterprises and institutions are characterised by a stronger intention to use open government data.

The "platform" dimension includes the following factors: data quality, platform quality, and organisational conditions. Data quality and platform quality have a direct impact on citizens' satisfaction during the use process, and may even determine whether or not citizens continue to use it in the subsequent process. Data with easy access, high richness, high accuracy, high usefulness, high real-time, high relevance, and high transparency, and data with the above quality characteristics can enhance citizens' trust in open government data and influence citizen participation. At the same time, the more diversified the functions of the platform, the higher the degree of ease of operation, and the more reasonable the platform interface, the more convenient it is for citizens to quickly query and process data, thus increasing the utilisation rate of the data and the platform.

The "government" dimension includes the following factors: organisational conditions, policies and regulations. The organisational conditions of government departments also affect the experience and satisfaction of citizens' participation. The stronger the technical support, the stronger the dedicated department, the stronger the feedback mechanism, the more training and publicity arrangements, and the stronger the leadership support, the stronger the bridge between the government and citizens. In addition, the more detailed and specific the laws and regulations are, the higher the acceptance of open government data by citizens.

The "environment" dimension includes the following factors: social environment, type of context. When the social media popularises and positively promotes the knowledge related to open government data, the more it can influence the citizens' willingness to participate in a subtle way. In addition, the opinions of social circles such as friends, colleagues, and relatives influence citizens' choices to a certain extent, and if they have a satisfactory and positive attitude towards the use of open government data, it helps to increase citizens' approval. Finally, citizens will have a strong willingness to use open government data when they are in a task situation, have a clear purpose or are in a more urgent state.

6. Strategies for optimising the quality of open government data services

Based on the integration results, this study concludes that the data platform, in addition to facilitating the use of citizens to download data, also plays the role of a bridge between the government and citizens to communicate and exchange information about the platform of open data, the data and its applications. Therefore, it is important to establish a sound data platform. It should not only focus on the quality of the data, but also remove the barriers in the process of citizens using the platform.

6.1. Continuous improvement of the open government data platform

At present, certain local government data in China is still in its infancy, and the management of data quality in the open government data platform is still imperfect, while the management of government data quality is the basic requirement for improving its governance efficiency, work quality and credibility. Therefore, the number of datasets and data quality of our data platform should be the focus of the platform to optimise data quality, and we can learn from the experience and results of the US Open Data Action Plan. In terms of data accuracy, append the source of each piece of data to ensure that the original content can be traced for confirmation. In terms of data comprehensiveness, cover both geographic and content areas, and provide information about the data in your region. In terms of data timeliness, data information should be released in a timely manner so that users can get the latest at the first time. In terms of data comprehensibility, we should strive to ensure that people from different industries can understand the meaning of the data. In terms of data authenticity, the data released should be reviewed at different levels to ensure that the data are authentic and

reliable. In terms of data adequacy, the data sources, co-operative platforms and data entries should be upgraded, and the number of data entries and data sets should be expanded. In terms of data usability, the platform's guidance function should be strengthened and upgraded to a more user-friendly platform guidance function to make the function more clear and specific. Equipped with clear and intuitive operation guides, more detailed usage instructions should be compiled for complex datasets and functions. For example, Open Data Engagement Guidance gives full-process guidance on the release and use of data in the network, enabling users to conveniently access and use data, which provides a good reference for the use of data in China. In terms of function setting, it should set up complete guidance functions for use, provide various filtering functions such as field name, scene application, and label classification so that users can quickly retrieve the target data, and carry out hierarchical downloads for unconditional open and non-open data.

At present, the quantity of government data and public data in China is increasing rapidly, and it is particularly important for the government data open platform to protect information security and privacy. It should promote the construction of data privacy and security-related systems, such as the General Data Protection Regulation, which focuses on the protection of user privacy, in which advanced data security and privacy security policies and systems are worthy of reference in China. In addition, the basic rules of information processing established by the data security protection system should be strictly followed, and platforms should have a perfect authorisation process when opening up data, and desensitise public data to avoid malicious incidents.

6.2. Open government data driven by user demand

Under the support of the government data opening policy, the degree of data openness of local governments in China has gradually increased, and the number of users of the platform is gradually increasing, and the one-way data service can no longer meet the complex public demand, and improving its user experience is an important means to improve the quality of information services.

The information feedback function should be improved, and the construction of user feedback function should be strengthened by adding artificial customer service or 24-h intelligent customer service. At the same time, data management training should be focused on relevant personnel to improve their data literacy and answer user questions at any time. In addition, the use of tools can enhance the convenience of users, should increase the quality of service in the use of tools dimension, drawing on the data ecosystem map, data ethics canvas, data open mapping and other cutting-edge technology tools, to increase the number of different conditions that can be set on the data set by the user in order to visually and figuratively view and use the data. At the same time, we provide training on the use of the corresponding tools so that users can make use of the data more quickly and improve their information literacy.

In addition, building user profiles and understanding user needs based on user access behaviours requires the platform to fully apply machine learning, artificial intelligence and other technologies when providing information services, and develop customizable scenario functions to provide personalized and customized services and increase user loyalty to the platform. At the same time, improvements should be made in all dimensions to develop information services from the user's perspective, establish and maintain a relationship of trust with users, minimise user-perceived risks, and increase the willingness to continue using and recommending the open government data platform.

6.3. Cultivate good utilisation ecology to form a demonstration effect

In view of the positive effect of social influence on citizens' behaviour and willingness to use, the government should actively broaden publicity channels and innovate publicity methods. Open government data started late in China, and the common publicity method is to carry out relevant competitions, which is narrower in terms of the target group and more limited in terms of the influence gained. Many users have never heard of open government data, and some of them have only a slight understanding of open government data. For example, many users confused the concept of open government data with open government information, and did not know how to search for data and use interfaces to download data. Therefore, in addition to producing platform user guides and tutorials in a user-friendly manner, the government should also strengthen publicity and education on open government data, emphasise the awareness of data openness and utilisation, improve users' willingness to use open data and their ability to grasp it, and enhance the community's support for and participation in data openness, e.g., by using social media platforms, news media and other communication channels to regularly release relevant knowledge on open government data, For example, by using social media platforms, news media and other communication channels, it regularly releases knowledge about the opening of government data, its significance and benefits, how to use it, and successful cases, so as to attract diversified subjects to participate in the process of opening up government data, enhance the interest of users in opening up data, and promote the participation of more members of the public in opening up government data.

7. Conclusion

Open government data has become a global trend, and citizen participation is an important way to promote the realisation of the value of open government data as a data user. This paper integrates different factors based on the four dimensions of "citizen", "platform", "government" and "environment" to construct a "model of factors influencing citizens' willingness to use open government data". This paper integrates different factors based on the four dimensions of "citizen", "platform", "government" and "environment", constructs a "model of factors influencing citizens' willingness to use government open data", and puts forward targeted suggestions based on the findings of the study, which is an exploratory study in deepening the research on citizens' participation in open government data in terms of content deepening and methodological innovation.

However, due to the limited level of research, three representative Chinese and foreign language databases were selected for

database searching, although the integration process was verified in accordance with theoretical saturation, and the absence of new original concepts in the original research up to 10 articles or more indicated that the research theory was saturated, and the failure to consider other databases reduced the completeness of the study. At the same time, the reality of open government data under the citizen's use of behaviour has a high degree of complexity, the future can be interviews, questionnaires, observations and other ways to obtain more qualitative information, from the practical aspects of the complementary and perfect, to enhance the completeness of the study and the scientific nature of the study.

Funding

This article is supported by the fund of "Research on Information Behaviour of Multiple Subjects under Open Government Data" (XN2340), an internal research project of Hubei Minzu University in 2023.

CRedit authorship contribution statement

Yuqi YANG: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper. **Bishuang XIANG:** Conceived and designed the experiments; Analyzed and interpreted the data. **Sailiu MIAO:** Contributed reagents, materials, analysis tools or data. **Hong TAN:** Conceived and designed the experiments; Analyzed and interpreted the data. **Zhenghong XIANG:** Contributed reagents, materials, analysis tools or data.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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