


# Analysis of the Influencing Factors of Citizens' Participation in Digital Government Affairs Under the Background of Big Data

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**Keywords:** Big Data, Local Government, Envelopment Analysis (DEA).

**Abstract:** The 20th National Congress of the Communist Party of China deeply understood the major decision-making and deployment of "accelerating the construction of a network power and digital China" proposed in the conference report, promoted the modernization of the government governance system and governance capacity with government informatization, and realized the high-quality development of digital transformation with big data empowerment. In this paper, SPSS24 software was used to analyze the reliability and validity of the collected sample data by distributing the questionnaire on citizen participation in public affairs in Harbin, Heilongjiang. The data envelopment analysis method was used to evaluate the performance of digital government in five provincial governments in China, which is of reference significance for promoting the progress of digital government in China.

## 1 INTRODUCTION

With the advent of the fourth industrial revolution, emerging technologies represented by big data, artificial intelligence, blockchain, and the Internet of Things have a profound impact on social development, and also provide new technical means for national governance. (Liu 2022) The Outline of the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Long-Range Goals for 2035 also clearly states that strengthening the construction of digital government is an important measure to innovate government governance concepts and methods, which is of great significance to accelerating the transformation of government functions and building a government ruled by law, a clean government and a service-oriented government. At present, in promoting the digital transformation of the government or implementing the digital reform of the government, how to give full play to the function of the digital platform and promote the innovation of government governance is particularly urgent.

## 2 STUDY DESIGN

The data in this paper was collected through questionnaires, designed on the Questionnaire Star platform, distributed through the WeChat platform and offline, a total of 207 questionnaires, of which 207 were valid. From the four dimensions of use intention, use awareness, use efficiency and information channel, the research model of the influencing factors of large citizens' participation in digital government affairs was constructed. The model examines the correlation between the above four dimensions and the participation of different segments of society in digital government public affairs online.

Willingness to use refers to the use of digital government by citizens through online participation, including online browsing of relevant information, online and offline participation in discussions, and the effect of providing online services to local governments.

Awareness of use refers to the degree of awareness and attention of citizens to the digital government online platform, including the attention to the precision of government governance by data service infrastructure, and the attention to the degree

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of information technology to local government governance.

Efficiency refers to the convenience of online platforms that citizens feel in the process of using government online platforms, such as the satisfaction of online platforms with online services.

Information channels refer to the degree of trust that citizens have in the information sources of online platforms, including government information, enterprise information, and Weibo and WeChat sources.

### 3 SAMPLE ANALYSIS AND EMPIRICAL RESULTS

#### 3.1 Variable Measurement

Located in northeast China, southwest of Heilongjiang Province, Harbin is the capital of Heilongjiang Province, a sub-provincial city, and the political, economic and cultural center of northeast

China. The special historical process and geographical location have created Harbin, an exotic and beautiful city, which not only gathers the history and culture of ethnic minorities in the north, but also integrates Chinese and foreign cultures, and is a famous historical and cultural city and tourist city in China, known as "Ice City", "Oriental Moscow" and "Oriental Little Paris". The survey randomly distributed questionnaires in Harbin City, Heilongjiang Province and other districts by anonymous method, and due to the impact of the epidemic and other factors, 207 questionnaires were distributed, 207 questionnaires were filled in and collected on the spot, and the samples were analyzed as follows.

#### 3.1.1 Sample Descriptive Analysis

First, the basic information of the 207 surveyed citizens was analyzed from several variables such as gender, age, education level, and place of residence, as shown in Table 1

Table 1: Frequency analysis of demographic variables.

variable	Options	frequency	percentage	average value	standard deviation
gender	man	104	50%	1.50	0.50
	woman	103	50%		
age	18-29	73	35%	2.47	1.38
	30-39	41	20%		
	40-49	37	18%		
	50-65	35	17%		
	Over 65	21	10%		
Educational level	High school or less	43	21%	2.98	1.34
	High school or secondary school	32	16%		
	college	46	22%		
	undergraduate	59	29%		
	graduate student	27	13%		
occupation	student	42	20%	2.84	1.44
	employee	64	31%		
	retire	28	14%		
	Unemployed	31	15%		
	Freelance staff	42	20%		
Place of residence	Resident in the city	103	50%	1.71	0.79
	Resident in the suburbs	62	30%		
	Temporary residence in the city	42	20%		

In Table 1, a series of data information analysis was carried out, from the perspective of overall gender, a random sample of 207 people were surveyed, and the frequency percentage and standard deviation were calculated respectively, according to the above analysis results, the numerical characteristics of demographic variables can be seen, reflecting the distribution of this survey. where the mean represents the central trend. The standard deviation represents fluctuations. According to the results of frequency analysis of each variable, it can be seen that the distribution basically meets the requirements of sampling survey. For example, the number of male samples in all samples was 104, accounting for 50.24% of the total sample, and the number of female samples was 103, accounting for 49.76% of the total sample. The proportion of men and women is almost equal, so it seems that men and women have basically the same level of demand for public services. Except for active sampling of people over 65 years of age, all other age groups are random. It can be seen that the results are biased towards the same. (Guo 2018)

From the age distribution point of view, the average value is 2.74, the standard deviation is 1.38, of which 18-29 years old accounts for the largest proportion, followed by 30-39 years old, people in these two age groups, formal thinking is active, the strongest acceptance, is the main target group of e-public services.

From the perspective of education level of the sample, the average is 2.98, the standard deviation is 1.34, of which 64% of the sample has higher education, of which 29% are undergraduates. The coverage and randomness of most of the questionnaires can be seen.

From the perspective of positions, the average value is 2.84, the standard deviation is 1.44, and there are 42 students, accounting for 20%; 64 employees, accounting for 31%; 59 retired unemployed, accounting for 29%; There are 42 freelance employees, accounting for 20%, and overall, the proportion of employees with jobs is the highest. In terms of place of residence, 50% of the population lives in the urban area, 30% live permanently in the suburbs, and only 20% live temporarily in the city.

### 3.2 Reliability and Validity Analysis

#### 3.2.1 Reliability Analysis

Usually, it is necessary to test the intrinsic reliability of the measurement scale, and the commonly used method is the Cronbachsalpha coefficient, which

judges the reliability of the scale according to the size of the a coefficient. In general,  $a \geq 0.7$  indicates good reliability; When  $0.6 < a < 0.7$ , the reliability is average and acceptable;  $a < 0.6$ , which means that the reliability is too low to accept. The Cologbach coefficient was analyzed from four dimensions: willingness to use, awareness of use, efficiency of use, and source of information. The results are shown in Table 2

Table 2: Reliability analysis results for each dimension.

	The number of items	Cronbach coefficient ( $\alpha$ )	Observed variables
Willingness to use	4	0.942	Questions 6-10
Use awareness	4	0.952	Questions 11-14
Efficiency of use	4	0.946	Questions 15-17
Access to information	3	0.946	Questions 18-20

According to Table 2, the Cronbach coefficients of participation intention, use awareness, use efficiency and information source were 0.942, 0.952, 0.946 and 0.946, respectively, and the results were greater than 0.7, indicating that each variable dimension passed the reliability test and had reliability.

The reliability and stability of the questionnaire comes from the reliability of the indicators. This paper uses the  $\alpha$  coefficient created by L.J. Cronbach. The  $\alpha$  coefficients can be derived from the Reliability Analysis in the Spss24.0 software, as shown in Table 3

Table 3: Analysis of overall reliability coefficients.

Reliability statistics		
Cronbach coefficient	Based on standardized Cronbach coefficients	Number of projects
0.882	0.882	15

The perceived quality of the scale was analyzed by SPSS 24.0 to calculate the questionnaire reliability value (i.e. a coefficient), and it can be seen from Table 3 that the Cronbach's Alpha of perceived service quality is 0.882, and the Cronbach's Alpha value of each dimension is greater than 0.7, indicating that the internal consistency of the index is good, the reliability of the questionnaire is acceptable, and the reliability of the sample is fully guaranteed.

#### 3.2.2 Validity Analysis

Validity is validity, which refers to the validity and correctness of the measured questionnaire, and the

closer the measurement result is to the one to be examined, the higher the validity; Conversely, the lower the validity. (Qiu 2019) However, because the true value is often unknown, it is impossible to have an absolutely positive answer to the evaluation of validity in a specific analysis, but it can be evaluated

by indicators, and validity is very important for a standard measurement. In order to ensure the high stability and reliability of the questionnaire, the validity analysis of the questionnaire results was carried out with SPSS 24.0 software.

Table 4: Exploratory factor analysis.

KMO value and Bartlett sphericity test		
Kaiser-Meyer-Olkin tests the number of sampling relevance measures		0.956
Bartlett's spherical test	The last read chi-square	4430.584
	df	105
	Saliency	0

According to the results of the exploratory factor analysis in Table 4, it can be seen that the sampling relevance scale of the Kaiser-Meyer-Olkin test is 0.956. The value range of the coefficients of the KMO test is generally between 0-1, and the closer to 1, the better the validity of the questionnaire. According to the significance of the spherical test, it can also be seen that the significance of this questionnaire is infinitely close to 0, indicating that the questionnaire data is reliable.

### 3.3.2 Data Acquisition

The sample data mainly comes from various statistical yearbooks and published reports, among which the data of the two indicators of economic level and education level are from the website of the National Bureau of Statistics; The popularization of the people comes from the 23rd statistical report on the development of China's Internet by the China Internet Network Information Center (CNNIC); The data on information disclosure, online affairs, and public participation are derived from the general report on the performance evaluation of the Chinese government's website.

### 3.3 Empirical Analysis

#### 3.3.1 Assessment Object

In this paper, six provincial government portals of Heilongjiang, Jilin, Liaoning, Hainan and Zhejiang were selected as research objects.

Table 5: Data score.

Provinces	Economic level	Educational level	Internet user popularity	Information Disclosure	Do things online	Public participation
Heilongjiang	0.028	0.064	0.162	0.544	0.306	0.553
Jilin	0.021	0.745	0.190	0.446	0.261	0.165
Liaoning	0.044	0.100	0.265	0.219	0.060	0.198
Hainan	0.005	0.063	0.256	0.628	0.299	0.631
chekiang	0.075	0.086	0.417	0.701	0.454	0.841

#### 3.3.3 Establishment of C<sup>2</sup>R Model and Calculation Results

Assuming that the j<sub>0</sub>th department to be evaluated is DMU<sub>j<sub>0</sub></sub>, then X<sub>0</sub> and Y<sub>0</sub> in the model represent matrices composed of input data and output data, respectively, V is the input indicator weight matrix, and U is the output metric weight matrix. h<sub>j<sub>0</sub></sub> is the relative efficiency of DMU<sub>j<sub>0</sub></sub>. (Deng 2020)

According to the DEA's C<sup>2</sup>R model (P), the following evaluation model can be obtained:

$$(P) \begin{cases} \max h_{j_0} = U^T Y_0 / V^T X_0 \\ \text{s.t. } (U^T Y_j / V^T X_j) \leq 1, j=1,2,\dots,3 \\ v \geq 0 \\ u \geq 0 \end{cases}$$

Where  $X_j = (x_{1j}, \dots, x_{mj})^T$ ,  $Y_j = (y_{1j}, \dots, y_{sj})^T$ ,  $j=1, 2, \dots, 5$ . For convenience, reduce the amount of calculation, and improve the calculation accuracy, you can use the computer for programming calculation. Here, programming is done using MATLAB 6.5 mathematical software. MATLAB is a well-known engineering math application written in C by Mathworks. At present, MATLAB has become the basic application software in many scientific and technological fields in the world. Its powerful matrix computing power and intuitive, convenient programming features are the reasons for choosing it for writing DEA programs.

Before programming, save the input matrix as xxx1.xls and the output matrix as xxx2.xls. The Matlab program for solving linear programming (P) is as follows:

```
x=[xxx1];
y=[xxx2];
n=size(x',1);
m=size(x,1);
s=size(y,1);
A=[-x' y'];
b=zeros(n,1);
LB=zeros(m+s,1);
UB=[];
for i=1:n;
    f=[zeros(1,m) -y(:,i)'];
    Aeq=[x(:,i)' zeros(1,s)];
beq=1;
w(:,i)=LINPROG(f,A
,b,Aeq,beq,LB,UB);
E(i,i)=y(:,i)*w(m+1:m+s,i);
end
```

After the operation of the Matlab program of linear programming (P), it can be seen that the relative efficiency of the five decision units is 0.8445, 1, 0.1890, 1, and 0.6889, respectively. According to the C<sup>2</sup>R model's criteria, a decision unit with a relative efficiency value of 1 is at least a weak DEA valid. Therefore, a decision unit with a relative efficiency value of 1 is valid for at least a weak DEA. From this, the following conclusions can be drawn: the decision-making units Jilin and Hainan are DEA effective, which theoretically shows that these two decision-making units are both scale-effective and technologically effective. In the economic system composed of these five decision-making units, their production factors have reached the best combination and achieved the best output effect. The other decision units have  $\theta$  values less than 1, indicating that they are all non-DEA valid. The relative low efficiency shows that the input resources are not fully utilized, the output is not optimized, and in the final

analysis, there are problems in the digital government operation and management within the government, which should be improved.

## 4 COUNTERMEASURE

### 4.1 Improve the Establishment of Government Information Disclosure Systems

Digital transformation is not an option, but a necessity for governments to respond to these crises. Governments around the world must improve their capacity to strategically use emerging digital technologies and develop innovative digital public services to respond to and defeat the pandemic. (Sikkut 2022) With the rapid development of digital technology, digital government transformation (DGT) has been legitimized in response to the pandemic, helping to improve the efficacy of innovation, and local governments should further strengthen the sharing of information when building digital government to improve the understanding of local residents about government information. First, the government can announce the release of information through news broadcasts or local TV stations, such as Heilongjiang Satellite TV, so that the public can understand the latest information. The second is to disseminate through the publicity mode of the Internet, and release the latest information on government public services on official websites, WeChat public accounts and Weibo government affairs accounts. By improving the construction of the information disclosure system, it is inevitable that the public can better understand public services, and then enhance their understanding of the digital government of Harbin, Heilongjiang Province, so as to increase citizens' willingness to use them. (DONG 2022)

### 4.2 Establish a Unified Public Service System

With the rapid development of 5G and machine learning, various innovative information systems are constantly emerging. Among them, the Public Service Information System (PSIS) has attracted a lot of attention from researchers. However, existing public service information systems can only handle simple tasks and cannot answer complex questions asked by citizens. (Liu 2022) Establish a unified public employment service information system in the province that integrates functions such as business

handling, data aggregation and data analysis, provide information handling functions for all categories of public sector business, unify the province's business regulations, integrate business processes of various categories, strengthen cross-business collaborative handling and business continuity, and comprehensively gather the province's public employment service business data resources to carry out data analysis and application on this basis. Simultaneously open the Internet and mobile Internet business application system and service evaluation feedback functions to improve the convenience and service experience of service recipients to obtain public employment services.

### 4.3 Increase Citizens' Participation

The development of Internet technology has irreversibly changed the "climate" of media and information dissemination, changed the interaction mode between citizens, society and the state, the Internet has undoubtedly become the "biggest variable" in the modernization of national governance, and citizens must actively participate in the construction of digital government, so that our country can become better. In this regard, in the early stage of public service construction, the government should collect public opinions through official website surveys, let the public actively participate in the guidance and suggestions of public services, and strive to build public services into the best service model. In addition, it is necessary to allow citizens to actively participate, and when the public service system is built, the public can actively supervise and complain to ensure the stable implementation of various public service policies. On the basis of citizens' increased participation, it is inevitable to improve residents' satisfaction with public services. (MA 2022)

### 4.4 Establish a Secure Government Website

According to the questionnaire survey, 40% of residents believe the news released by the government and enterprises on the online platform, and many people believe that there are risk problems in online business, and it is important to establish an information security management organization, strengthen organizational coordination, give play to its role of overall planning, scientific management, macro-control and decision-making, strengthen information security management, and form a comprehensive information security management

organizational system. It is necessary to gradually establish and improve the information security organizational system. (Zhang 2022) The system should include leading groups for confidentiality work established by various localities and departments; Government network and information security coordination group with the participation of the head of the department; A group of security consulting experts composed of domestic and foreign security experts is engaged. According to the needs of construction and application, corresponding information security management and execution agencies (such as "government security centers") can also be established to be responsible for the security and confidentiality of the entire government information system, including the provision of related services. (Zhang2017)

## 5 CONCLUSION

This This paper has issued a questionnaire to survey Harbin citizens and analyze the problems and optimization paths of Harbin digital government, which has certain theoretical and practical significance, but there are still certain limitations, and the research on some issues is not in-depth enough. As the capital city of Harbin, government departments should pay more attention to the online quality education of citizens, so that they understand their responsibilities and rights as citizens, so that they can actively care about relevant government decisions and the handling of major events, so as to improve the public's sense of participation. Digital government is an extension and transformation of e-government, which makes the daily business operation of the government more efficient on the basis of using data science.

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