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The Impact Mechanism of Digital Governance on Platform Performance: The Mediating Role of Network Effects

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Abstract

As an essential mechanism in digital platform operations, digital governance plays a crucial role in optimizing platform management, enhancing user experience, and strengthening market competitiveness. In the current digital economy, how does digital governance influence platform performance through network effects? What are the underlying mechanisms? Based on these questions, this study explores the impact of digital governance on platform performance and examines the mediating role of network effects.This study reviews and summarizes the relevant literature on digital governance, network effects, and platform performance, organizing the logical relationships among these variables. A theoretical model is proposed, positioning network effects as a mediating variable. Data were collected through a questionnaire survey and analyzed using SPSS and AMOS.Based on the research findings, this study provides recommendations for optimizing digital governance strategies to improve platform performance. Platform enterprises should enhance their data governance systems, improve information transparency, and optimize user interaction mechanisms to strengthen network effects.

Keywords**:** *Digital Governance, Platform Performance, Network Effects, Intermediary Effects*

1. Introduction

The advent of information technology has precipitated the emergence of digital platforms as an integral component of the contemporary economy. These digital platforms offer infrastructure and services that facilitate connections among a substantial number of users and third-party service providers, thereby establishing multilateral markets. Research indicates that digital platform capabilities, as underlying dynamic capabilities, exert an indirect influence on performance by enhancing enterprise agility and network capabilities (Ayadi et al., 2024), thereby providing a capability basis for the design of digital governance mechanisms. In recent years, as the scale and complexity of platforms has increased, the importance of platform governance has also become increasingly prominent. Moro Visconti (2019) emphasises that the efficacy of digital platform governance hinges on a balanced approach to information sharing with stakeholders and risk management. The design of information transparency, user participation and data security mechanisms plays a pivotal role in the long-term development of the platform under different platform governance models. Digital governance, as a novel governance mechanism, aims to ensure the stable operation of the platform, the legitimate rights and interests of users, and data security by formulating and implementing various management regulations and policies.

Network effects are identified as a pivotal factor in the success of digital platforms. The existence of network effects leads to an enhancement in the value of the platform with an increase in the number of users, thus creating a positive feedback loop through which more users are attracted to join the platform. Empirical research by Galani & Anagnoste (2024) has demonstrated that the coordinated growth of monthly active users (MAU) and average revenue per user (ARPU) is the core manifestation of network effects. In addition, Jin (2023) proposed that reshaping digital governance models, especially in terms of network effects, affects platform operations. Consequently, the present study aims to explore strategies for enhancing network effects.

Digital governance can be defined as a form of governance that uses digital technologies (such as algorithms, artificial intelligence, blockchains, etc.) to automate control, coordination, incentives, and trust mechanisms. Chen et al. (2022) proposed a value-governance-design triad framework, which demonstrates that platform governance can maximise network effects by coordinating the behaviour of complementors.

The design of governance mechanisms must strike a balance between open interfaces (e.g. API permissions) and quality control (e.g. access audits). The design of such mechanisms may draw on the practical experience of smart city governance (Bastos et al., 2022). Gawer (2014) also proposed that a platform is not just a market or a technical architecture, but a dynamically evolving organisation (meta-organisation). His research demonstrates that the governance of a platform exerts influence not only on platform innovation, but also on its network effects and competitive landscape. Digital governance, as such, represents a departure from traditional governance models, with the potential to enhance organisational management efficiency and public trust through increased transparency, accountability and information sharing. It plays a pivotal role in contemporary organisational structures and value creation, particularly in the context of navigating complex globalised markets and digital transformation. Labhard & Lehtimäki (2022) propose a model that leverages digitalisation to enhance enterprise competitiveness through the optimisation of information flow, the reinforcement of network effects, and the promotion of innovation. Digital governance also encompasses data privacy protection, ethical considerations and the safeguarding of user rights, thereby ensuring the legitimacy, security and sustainability of platforms and organisations. Digital governance, therefore, is not merely the application of technology; it is also a strategic resource that promotes innovation and sustainability in organisations through its unique governance mechanisms.

Network effects can be defined as the phenomenon in which the value of other users or market participants increases when the number of users increases in a platform or market. However, it should be noted that the multi-ownership behaviour of users can interfere with the measurement of the effect (Rietveld & Schilling, 2021). Network effects can thus be categorised into two distinct types: direct network effects and indirect network effects.Direct network effects.These refer to the increase in value for other users when the number of users of the same type increases. To illustrate, on social media platforms, an increase in the number of users results in an increase in the number of connections and interactions each user can have, thereby increasing the value of the entire platform (Katz & Shapiro, 1994).Indirect network effects, on the other hand, are characterised by the observation that an increase in the number of users of one type leads to an increase in the value of the other type of user. In a bilateral market, an increase in the number of buyers attracts more sellers to join the platform, and vice versa,this interplay has been shown to enhance the experience of both parties and the collective value of the platform (Rochet & Tirole, 2003).Network effects play a crucial role in modern digital platforms and bilateral markets, facilitating market growth and innovation by enhancing the attractiveness and competitive advantage of the platform (Li et al., 2022; Vakeel et al., 2021). These effects not only determine the success of the platform, but also influence the competitive dynamics of the market and the strategic decisions of organisations.

The term "platform performance" is defined as the economic efficiency, user satisfaction and operational efficiency demonstrated by a platform during its operation. The enhancement of platform performance is contingent upon the interplay of numerous factors, with the pivotal factors comprising digital governance and network effects. The following metrics can be utilised to gauge platform performance:Economic performance.The economic performance of a platform is reflected in financial indicators such as revenue growth, transaction volume and profitability. An effective pricing strategy, optimal resource allocation and effective management of bilateral or multilateral markets all have a direct impact on the economic performance of a platform (Rysman, 2009).User satisfaction.Measuring platform performance by user growth rate, user retention rate and user engagement is another method. User satisfaction is influenced by transparency, user experience and network effects, which are, in turn, affected by platform governance and design mechanisms (Manoharan et al., 2023).Operational efficiency.The overall operational effectiveness of a platform encompasses its performance in terms of digital governance, network effects and innovation capabilities. The enhancement of digital governance through strengthening its mechanisms can improve information transparency and accountability, thereby enhancing user trust and engagement and ultimately improving the overall performance of the platform (Hanisch et al., 2023).The performance of a platform is a significant indicator of its competitiveness and long-term success in the market. It not only reflects the current operational performance of the platform, but also predicts its future development potential.

The present study has been designed to explore the ways in which digital governance affects platform performance through network effects. Specifically, the study will analyse the impact of different dimensions of digital governance (e.g. data protection, user governance) on network effects, explore the

mediating role of network effects between digital governance and platform performance, and explore the mechanism of digital governance's impact on platform performance through differentiated transmission paths of direct network effects and indirect network effects.

2. Objectives

1) What is the mechanism of the impact of digital governance on network effects?

2) How does network effect play a mediating role between digital governance and platform performance?

3) How does digital governance affect platform performance through different paths of network effects?

3. Materials and Methods

The present study is founded upon the bilateral market theory of Rochet & Tirole (2006), which subdivides network effects into direct and indirect categories. According to this theory, the value of a platform is essentially created through the self-reinforcing mechanism of network effects, rather than through the direct effect of a single governance measure (Hinz et al. 2020). Digital governance is identified as a fundamental component of platform design, with Armstrong (2006) emphasising the enhancement of user trust through data protection measures, the reduction of information asymmetry through transparency policies, and the optimisation of decision-making feedback through participation mechanisms. The synergy of these measures generates the environmental basis for amplifying network effects.In summary, this paper proposes a research model, as shown in Figure 1.

H1: The effectiveness of digital governance has a positive impact on the network effect of the platform.

H2: The network effect has a significant positive impact on platform performance.

H3: The network effect mediates the relationship between digital governance and platform performance.

H4: The implementation of digital governance has a positive impact on platform performance.

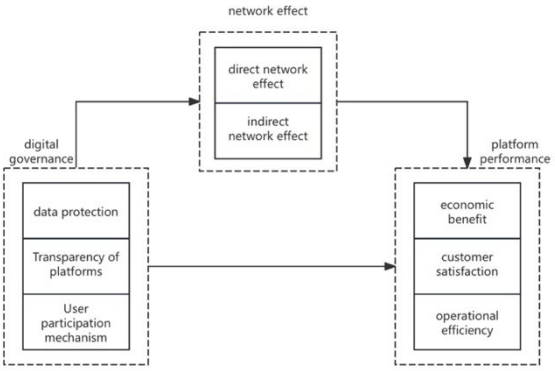

Figure 1 Conceptual Framework
Source: Author

The present study utilised the Questionnaire Star platform to disseminate questionnaires to users of the data platform across the country, with a total of 450 questionnaires distributed. A total of 423 valid responses were received during the questionnaire recovery stage. In order to ensure the validity of the data, the recovered questionnaires were meticulously screened according to rigorous standards. This process involved the elimination of 12 questionnaires that exhibited highly consistent answers or were suspected of being randomly answered. Ultimately, 411 questionnaires were deemed to be valid.

The statistical software packages SPSS and AMOS were utilised for the purpose of descriptive statistics, reliability and validity analysis, correlation analysis, structural equation modelling (SEM) and mediating regression analysis. The objective of this was to study the correlation between the level of adaptation and influencing factors.

4. Results and Discussion

4.1 Results

This questionnaire was distributed to users of the data platform on the Questionnaire Star platform from 10 January to 20 January 2025. A total of 423 questionnaires were distributed for this study, and 411 valid questionnaires were returned, for a validity rate of 97.16%. See Table 1 for details.

Table 1 Descriptive statistical analysis table of demographic variables

Variable	Category	Frequency	Percentage	Theoretical Distribution
Gender	Male	197	47.93%	48%
	Female	214	52.07%	52%
Age	18 years and under	49	11.92%	12%
	19-25 years old	144	35.04%	35%
	26-35 years old	115	27.98%	28%
	36-45 years old	62	15.09%	15%
	46-55 years old	29	7.06%	7%
	56 years and older	12	2.91%	3%
Education level	High school and below	90	21.90%	22%
	Junior college	103	25.06%	25%
	Undergraduate course	156	37.96%	38%
	Master degree	49	11.92%	12%
	Doctorate and above	13	3.16%	3%
Occupation	School student	123	29.93%	30%
	In office	185	45.01%	45%
	Freelance work	49	11.92%	12%
	Entrepreneur	33	8.03%	8%
	Retired/Unemployed	21	5.11%	5%

Source: Author's conduct

As illustrated in Table 1, the gender ratio in the study sample is relatively balanced, with 47.93% of participants identifying as male and 52.07% as female, which is essentially in accordance with the theoretical distribution (48%:52%). This finding suggests that both male and female users are equally engaged in the use and governance of digital platforms, and the research outcomes are representative of both genders. With respect to age demographics, the sample encompasses all age ranges, with the 19-25 age group (35.04%) and the 26-35 age group (27.98%) accounting for the highest proportions, collectively constituting 63.02%. This finding indicates that the primary respondents of the study are youthful user groups, who typically function as core users of digital platforms. Concurrently, respondents aged 36-45 (15.09%) and 46 and above (9.97%) also accounted for a significant proportion, thereby underscoring the pivotal influence of the middle-aged demographic on the platform economy and governance. With respect to educational attainment, the data indicates that 53.04% of respondents possess a bachelor's degree or higher qualification (37.96% hold a bachelor's degree, 15.08% possess a master's degree or higher), while 21.90% have a high school diploma or below and 25.06% have a college diploma. This data indicates that the respondents in this study are predominantly highly educated users. The majority of respondents possessed a certain degree of professional knowledge, which enabled them to comprehend concepts such as digital governance and network effects. This ensures the scientific nature of the research conclusions. With regard to employment status, the proportion of employees and entrepreneurs combined was 53.04%, of which 45.01% were employees and 8.03% were entrepreneurs, indicating that more than half of the respondents in this study had stable occupations and financial resources. These demographic groups are typically more attuned to the governance rules of digital platforms, network effects, and platform performance. The demographic composition of the sample was further delineated by the inclusion of students (29.93%), freelancers (7.03%), and the unemployed (7.03%), thereby ensuring a comprehensive representation of the population under study.

As demonstrated in Table 2, the Cronbach α coefficients of each variable in this study are higher than 0.8. This finding indicates that the measurement tools employed for all variables have high reliability.

Specifically, the α coefficients for data protection (α = 0.851), platform transparency (α = 0.849), direct network effects (α = 0.849), indirect network effects (α = 0.855), operational efficiency (α = 0.861), and economic effects (α = 0.857) all range from 0.849 to 0.861, indicating a satisfactory level of reliability; the reliability of user satisfaction (α = 0.863) is also elevated, and it is capable of accurately reflecting users' true attitudes. The α coefficient of user participation (α = 0.885) is the highest, indicating that the reliability of its measurement tool is high, the measurement results are reliable, and it can be used for further analysis. See Table 2.

Table 2 Descriptive statistical analysis of variables and reliability test table

Variable	Number of items	Cronbach's Alpha
Data protection	3	0.851
Transparency of the platform	3	0.849
User participation	4	0.885
Direct network effects	3	0.849
Indirect network effects	3	0.855
Operational efficiency	3	0.861
User satisfaction	3	0.863
Economic effects	3	0.857

Source: Author's conduct

A factor analysis was employed to conduct a study of information condensation, and the suitability of the research data for factor analysis was analysed. As illustrated in Table 3, the KMO value is 0.931, which exceeds the 0.6 threshold and fulfils the prerequisite criteria for factor analysis, thereby affirming the validity of the data for this analytical approach. Furthermore, the data passed the Bartlett sphericity test ($p<0.05$), thereby indicating its suitability for factor analysis. See Table 3.

Table 3 Validity test table

KMO Value		0.931
Bartlett sphericity test	Chi-square approximation	6116.757
	df	300
	P	0

Source: Author's conduct

The factor analysis was conducted utilising the maximum variance method with the SPSS software. The absolute values of the factor load coefficients of each item in Table 4 are all greater than 0.4, and the load coefficients of most items are higher than 0.7, indicating a good correlation between each item and the corresponding factor. Specifically, the items for user participation (UP1-UP4), user satisfaction (UM1-UM3), operational efficiency (OE1-OE3), indirect network effects (INE1-INE3), economic effect (ECO1-ECO3), data protection (DP1-DP3), platform transparency (PT1-PT3) and direct network effect (DNE1-DNE3) items all show high loadings on their respective factors, effectively reflecting the corresponding factor dimensions. This finding indicates that the scale has been reasonably designed, with a clear correspondence between each item and the factor. This provides a reliable basis for subsequent factor analysis and empirical research, and verifies the structural validity of the scale. See Table 4.

Table 4 Factor load diagram after rotation

Name	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8
DP1								0.794
DP2								0.759
DP3								0.761
PT1						0.762		
PT2						0.792		
PT3						0.789		
UP1	0.79							
UP2	0.746							
UP3	0.747							
UP4	0.786							
DNE1							0.805	
DNE2							0.772	
DNE3							0.768	
INE1				0.799				
INE2				0.802				
INE3				0.775				
OE1			0.788					
OE2			0.77					
OE3			0.815					
UM1		0.816						
UM2		0.756						
UM3		0.805						
ECO1					0.774			
ECO2					0.778			
ECO3					0.79			

Source: Author's conduct

As demonstrated in Table 5, the eight factors extracted by factor analysis can explain 77.445% of the total variance, indicating that these factors can better reflect the inherent structure of the data. Prior to rotation, the first factor exhibits a characteristic root of 10.529, a variance interpretation rate of 42.116%, and occupies a dominant position; the characteristic roots of the remaining factors are all less than 2, and the variance interpretation rates range from 4.627% to 5.747%, with a cumulative variance interpretation rate of 77.445%. Following the rotation, a change in the order of the factors is observed. The first factor has an eigenvalue of 3.019 and a variance interpretation rate of 12.076%. The variance interpretation rates of the subsequent factors range from 9.219% to 9.500%, and the cumulative variance interpretation rate is still 77.445%. This outcome indicates that the factor rotation has effectively simplified the factor structure and made the interpretation of each factor clearer. The Kaiser criterion (characteristic root greater than 1) was also met, with seven factors identified after rotation. This further validates the efficacy of the factor extraction process. The results of the factor analysis demonstrate that the extracted factors possess both adequate representativeness and interpretability, thereby providing substantial support for subsequent research. See Table 5.

Table 5 Total variance explained

Number	Before rotation			After rotation		
	Characteristic root	Variance explained %	Cumulative %	Characteristic root	Variance explained %	Cumulative %
1	10.529	42.116	42.116	3.019	12.076	12.076
2	1.437	5.747	47.864	2.375	9.5	21.576
3	1.315	5.26	53.123	2.353	9.413	30.989
4	1.281	5.123	58.247	2.353	9.413	40.402
5	1.262	5.049	63.296	2.322	9.289	49.691
6	1.198	4.791	68.087	2.321	9.283	58.974
7	1.183	4.731	72.818	2.313	9.252	68.226
8	1.157	4.627	77.445	2.305	9.219	77.445

Source: Author's conduct

As demonstrated in Table 6, a significant positive correlation ($p<0.01$) is observed between all the variables in the study, including operational efficiency, user satisfaction, economic effects, data protection, platform transparency, user engagement, direct network effects and indirect network effects. The majority of the correlation coefficients between variables range from 0.45 to 0.53, indicating a strong correlation between them. See Table 6.

Table 6 Pearson's correlation test by sub-dimension

	Operational efficiency	User satisfaction	Economic effect	Data protection	Transparency of the platform	User participation	Direct network effect	Indirect network effect
Operational efficiency	1							
User satisfaction	0.456**	1						
Economic effect	0.486**	0.474**	1					
Data protection	0.474**	0.487**	0.499**	1				
Transparency of the platform	0.468**	0.470**	0.488**	0.481**	1			
User participation	0.494**	0.508**	0.498**	0.533**	0.479**	1		
Direct network effect	0.486**	0.473**	0.477**	0.499**	0.488**	0.498**	1	
Indirect network effect	0.462**	0.443**	0.459**	0.472**	0.475**	0.487**	0.459**	1

* $p<0.05$ ** $p<0.01$
Source: Author's conduct

Table 7 shows that there is a significant positive correlation ($p<0.01$) between platform performance, data governance and network effects. The correlation coefficient between data governance and platform performance is 0.742, indicating that improving the level of data governance has a significant positive impact

on platform performance. At the same time, the correlation coefficient between data governance and network effects is 0.693, indicating that data governance is a key factor in improving network effects. In addition, the correlation coefficient between network effects and platform performance is 0.672, which further shows that improving network effects can significantly promote the improvement of platform performance. There is an interactive relationship between data governance, network effect and platform performance, which highlights the central role of data governance in improving platform performance and enhancing network effect, and also provides strong support for the subsequent path analysis and mediation effect test. See Table 7.

Table 7 Total dimension Pearson correlation test

	Platform performance	Data governance	Network effects
Platform performance	1		
Data governance	0.742**	1	
Network effects	0.672**	0.693**	1

* p<0.05 ** p<0.01

This paper uses AMOS to test the structural equation model, as shown in Figure 2 below:

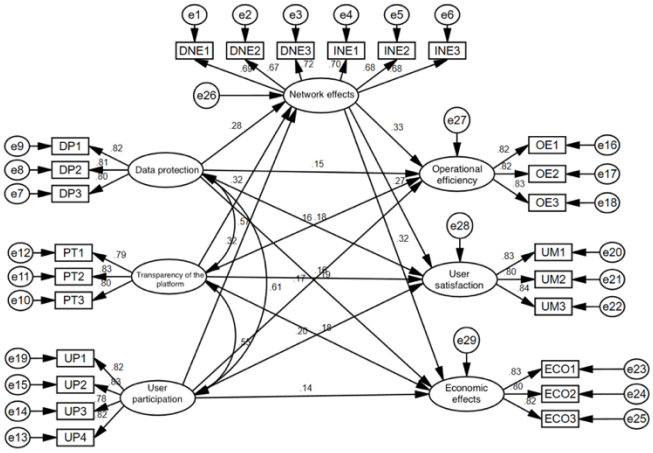

Figure 2 Structural equation model diagram
Source: Author's conduct

The commonly used model fit indices mainly include the following four aspects: (1) The ratio of chi-squared statistic ($\chi 2$) to degrees of freedom (df): if $\chi 2/df$ is less than 3, the model is better, and the better the fit between the sample data and the model, the better. (2) Goodness of fit index (GFI): the minimum requirement for this index is usually GFI>0.85, preferably GFI>0.90, and the closer it is to 1, the better. (3) Root mean square error of approximation (RMSEA): The lower the value, the better. (4) Model fit index: This paper uses the three model fit indices of CFI, NFI and IFI. The values of these three indices can be greater than 0.85, and the closer they are to 1, the better the model fit. As can be seen from Table 8, the structural equation model fit indices are within the reference range, so the factor model has a good fit.

Table 8 Model fitting test table

Test metrics	Fitting criteria	Model fitting index	Fitting effect
χ^2/df	<3	2.422	Ideal
RMSEA	<0.10	0.059	Ideal
CFI	>0.85	0.939	Ideal
NFI	>0.85	0.901	Ideal
GFI	>0.85	0.873	Ideal
TLI	>0.90	0.928	Ideal
IFI	>0.90	0.939	Ideal

As demonstrated in Table 9, data protection exerts a substantial positive influence on network effects (path coefficient 0.239, $p < 0.001$), signifying that the enhancement of data protection measures can considerably foster the development of network effects. The positive impact of platform transparency on network effects is even more significant (path coefficient 0.260, $p < 0.001$), indicating that improving transparency is an important factor in enhancing network effects. Furthermore, the positive effect of user participation on network effects is significant (path coefficient of 0.263, $p < 0.001$), suggesting that increased user participation can effectively promote the enhancement of network effects. Furthermore, the enhancement of network effects has been shown to have a significant positive impact on operational efficiency (path coefficient of 0.404, $p < 0.001$), indicating that the enhancement of network effects can significantly improve the operational efficiency of the platform. Concurrently, the network effect exerts a substantial positive influence on user satisfaction (path coefficient of 0.338, $p < 0.002$) and economic effect (path coefficient of 0.407, $p < 0.001$). These findings suggest that enhancing the network effect not only enhances user satisfaction but also substantially promotes the economic performance of the platform. Data protection has been shown to have a significant positive impact on user satisfaction (path coefficient 0.195, $p < 0.011$), operational efficiency (path coefficient 0.157, $p < 0.037$) and economic effect (path coefficient 0.203, $p < 0.008$). This indicates that data protection measures have a positive effect on the overall performance of the platform in multiple ways. Transparency also has a significant positive impact on operational efficiency (path coefficient 0.161, $p < 0.019$), user satisfaction (path coefficient 0.162, $p < 0.021$) and economic effect (path coefficient 0.184, $p < 0.008$), further highlighting the importance of platform transparency. User participation has also been shown to have a significant positive effect on operational efficiency (path coefficient of 0.168, $p < 0.016$), user satisfaction (path coefficient of 0.209, $p < 0.003$) and economic benefits (path coefficient of 0.148, $p < 0.036$). This indicates that an increase in user participation has an important driving effect on the platform's multi-dimensional performance. In summary, the path analysis results demonstrate that data protection, platform transparency and user participation collectively promote the operational efficiency, user satisfaction and economic benefits of the platform through both direct and indirect effects, providing a substantial empirical foundation for platform governance. See Table 9.

Table 9 The route has been verified

	Estimate	S.E.	C.R.	P
Data protection-Network effect	0.239	0.055	4.343	***
Transparency of the platform-Network effect	0.26	0.05	5.241	***
User engagement-Network effect	0.263	0.051	5.16	***
Data protection-User satisfaction	0.195	0.077	2.535	0.011
Data protection-Operational efficiency	0.157	0.075	2.089	0.037
Data protection-Economic efficiency	0.203	0.076	2.656	0.008
Transparency of the platform-Operational efficiency	0.161	0.069	2.342	0.019
Transparency of the platform-User satisfaction	0.162	0.07	2.314	0.021

	Estimate	S.E.	C.R.	P
Transparency of the platform-Economic efficiency	0.184	0.07	2.649	0.008
User engagement-Operational efficiency	0.168	0.07	2.41	0.016
User engagement-User satisfaction	0.209	0.072	2.927	0.003
User engagement-Economic effect	0.148	0.071	2.098	0.036
Network effect-User satisfaction	0.338	0.108	3.131	0.002
Network effect-Economic effect	0.407	0.108	3.767	***
Network effect-Operational efficiency	0.404	0.107	3.779	***

Source: Author's conduct

As illustrated in Table 10, Model 1 demonstrates that digital governance exerts a substantial positive influence on platform performance, as evidenced by a path coefficient of 0.746, which is statistically significant at the $p < 0.01$ level. This finding accounts for 55.1% of the variance in platform performance. Furthermore, Model 2 demonstrates that digital governance exerts a substantial positive influence on direct network effects (path coefficient of 0.752, $p < 0.01$), accounting for 36.7% of the variance in direct network effects. Model 3 further corroborates the mediating role of direct network effects between digital governance and platform performance. It is noteworthy that the impact of digital governance on platform performance remains substantial after accounting for the mediating effect (path coefficient = 0.399, $p < 0.01$), while the mediating path coefficient of direct network effects on platform performance is 0.461 ($p < 0.01$). The overall model accounts for 75.6% of the variance in platform performance. This finding suggests that the direct network effect functions as a pivotal mediating mechanism through which data governance influences platform performance, and that digital governance further enhances platform performance by amplifying the direct network effect. See Table 10.

Table 10 Direct network effect intermediary regression model sub-test

	Platform performance	Direct network effects	Platform performance
Constant	0.848**	0.854**	0.454**
	(7.200)	(4.943)	(5.080)
Digital governance	0.746**	0.752**	0.399**
	(22.381)	(15.384)	(12.926)
Direct network effect			0.461**
			(18.526)
Sample size	411	411	411
R^2	0.551	0.367	0.756
Adjusted R^2	0.549	0.365	0.755
F	F (1,409)=500.930,p=0.000	F (1,409)=236.653,p=0.000	F (2,408)=631.647,p=0.000

* p<0.05 ** p<0.01 t-value in brackets
Source: Author's conduct

As demonstrated in Table 11, the indirect effect of digital governance through direct network effects is significant (effect value 0.347, 95% confidence interval [0.284, 0.410], p = 0), and the confidence interval does not include 0, indicating that this mediation path is reliable. Furthermore, the direct effect of digital

governance on platform performance is also significant (effect value 0.399, 95% confidence interval [0.339, 0.460], p = 0), indicating that digital governance not only contributes directly to platform performance, but also has an indirect impact by enhancing direct network effects. The total effect is 0.746 (95% confidence interval [0.681, 0.811], p = 0). See Table 11.

Table 11 Direct network effect Mediating effect test

Item	Meaning	Effect	lower limit 95% CI	Ceiling 95% CI	SE	t	p	Conclusion
Digital governance-direct network effects-platform performance	Indirect effect	0.347	0.284	0.41	0.032	10.931	0	Some intermediaries
Digital governance-platform performance	Direct effect	0.399	0.339	0.46	0.031	12.926	0	
Digital governance-platform performance	Total effect	0.746	0.681	0.811	0.033	22.381	0	

Source: Author's conduct

As illustrated in Table 12, Model 1 demonstrates that the indirect impact of digital governance on platform performance is significant (path coefficient = 0.746, $p < 0.01$), accounting for 55.1% of the variation in platform performance. This finding substantiates the notion that digital governance plays a pivotal role in influencing platform performance. The second model examined the direct impact of data governance on indirect network effects in greater detail. The results demonstrated that data governance significantly enhanced indirect network effects (path coefficient 0.740, $p < 0.01$), explaining 34.2% of the variance in indirect network effects, indicating that data governance can effectively enhance indirect network effects. The third model integrates the mediating effect of indirect network effects and finds that part of the total impact of data governance on platform performance is achieved through indirect network effects (mediation path coefficient 0.158, $p < 0.01$). It is also demonstrated that the direct impact of data governance on platform performance is still significant after considering the mediating effect (path coefficient 0.629, $p < 0.01$), and that the overall model explanatory power is increased to 57.6%. This finding underscores the pivotal mediating function of indirect network effects in the association between digital governance and platform performance. Moreover, it emphasizes the direct and indirect contributions of digital governance to platform performance. See Table 12.

Table 12 Indirect network effect intermediary regression model sub-test

	Platform performance	Indirect network effect	Platform performance
Constant	0.848**	0.898**	0.706**
	(7.200)	(5.011)	(5.989)
Digital governance	0.746**	0.740**	0.629**
	(22.381)	(14.592)	(15.753)
Indirect network effect			0.158**
			(4.991)
Sample size	411	411	411
R^2	0.551	0.342	0.576
Adjusted R^2	0.549	0.341	0.574
F	F (1,409)=500.930,p=0.000	F (1,409)=212.916,p=0.000	F (2,408)=277.562,p=0.000

* p<0.05 ** p<0.01 t-value in brackets

Source: Author's conduct

As demonstrated in Table 13, indirect network effects appear to mediate the relationship between digital governance and platform performance to a certain extent. Specifically, the indirect effect of digital governance on platform performance through indirect network effects is significant (effect value 0.117, 95%

confidence interval [0.063, 0.183], p = 0), and the confidence interval does not include 0, indicating that this mediation path is reliable. The direct effect of digital governance on platform performance is also significant (effect value 0.629, 95% confidence interval [0.551, 0.707], p = 0), indicating that digital governance not only has a direct contribution to platform performance, but also an indirect impact through enhanced indirect network effects. The total effect is 0.746 (95% confidence interval [0.681, 0.811], p = 0). See Table 13.

Table 13 Indirect network effect Mediating effect test

Item	Meaning	Effect	lower limit 95% CI	Ceiling 95% CI	SE	t	p	Conclusion
Digital governance-indirect network effect-platform performance	Indirect effect	0.117	0.063	0.183	0.031	3.813	0	Some intermediaries
Digital governance-platform performance	Direct effect	0.629	0.551	0.707	0.04	15.753	0	
Digital governance-platform performance	Total effect	0.746	0.681	0.811	0.033	22.381	0	

Source: Author's conduct

Based on the above research results, it can be seen that hypotheses H1, H2, H3 and H4 are all valid. Therefore, all hypotheses are supported by the data analysis.

4.2 Discussion

The results of the above data analysis show that:

1)The present study investigates the role of digital governance in promoting network effects. The study found that digital governance can significantly enhance the network effects of platforms. The study identified data protection, platform transparency and user participation mechanisms as key factors contributing to this enhancement. The implementation of data protection measures has been shown to reduce users' privacy concerns and enhance their trust in the platform, thereby increasing user retention and activity and amplifying direct network effects. Increased transparency on the part of the platform helps merchants and users to obtain more effective information, improves the fairness and credibility of the platform, further promotes the entry of merchants, and enhances indirect network effects. User participation mechanisms enhance the sharing and connection of information among users through interactive feedback, making users more sticky and strengthening network externalities. Consequently, effective digital governance not only fosters heightened user trust in the platform, but also optimises the platform ecology and strengthens the connection between users and merchants, thereby promoting continuous growth in network effects.

2) The role of network effects in promoting platform performanceThe research results demonstrate that network effects have a significant role in promoting platform performance. The development of the platform is influenced by both direct and indirect network effects, which impact the platform in distinct ways. The enhancement of direct network effects is associated with an increase in the size of the user base, a higher frequency of interactions between users, and a greater degree of information sharing. These factors, in turn, increase user loyalty and the market attractiveness of the platform, ultimately boosting transaction growth and economic benefits. Conversely, enhancing indirect network effects has been shown to attract more merchants and service providers to the platform, optimise the matching of supply and demand, increase the diversity of goods and services, and enable users to obtain a better quality of consumption experience. These effects ultimately increase user satisfaction and the competitiveness of the platform. Consequently, the formation of network effects not only promotes user growth and merchant participation, but also optimises the platform ecology, improves the user experience and competitive advantage in the market, and enables the platform to occupy a more advantageous position in the fierce market competition.

3) The mediating role of network effects between digital governance and platform performanceFurther analysis found that network effects play an important intermediary role between digital governance and platform performance. In other words, digital governance exerts a direct influence on

platform performance, whilst concurrently enhancing competitiveness through the augmentation of network effects. Specifically, data protection exerts a significant influence on platform performance through direct network effects, chiefly by enhancing user trust and improving user retention, thus leading to an enhancement in the economic benefits of the platform and an increase in user satisfaction. Furthermore, platform transparency primarily impacts platform performance through indirect network effects, optimising the operating environment for merchants, enhancing the efficiency of the matching process between merchants and users, and strengthening the overall market competitiveness of the platform. The user participation mechanism, in turn, exerts an influence on both direct and indirect network effects by enhancing user interaction and optimising information flow, thereby fostering closer collaboration between platform users and merchants and consequently leading to an improvement in overall performance. Consequently, the enhancement of platform governance strategies must encompass not only the efficacy of governance mechanisms, but also the consideration of network effects transmission mechanisms to achieve enhanced performance.

5. Conclusion

The findings of this paper demonstrate that reasonable digital governance can effectively enhance network effects and thus improve platform performance. Drawing upon the research conclusions, this study has yielded the following key insights.

Firstly, it is recommended that platform enterprises strengthen their digital governance to enhance user trust and platform stickiness. The research findings indicate that data protection, platform transparency and user participation mechanisms have a significant impact on network effects and platform performance. Consequently, platform enterprises must prioritise enhancing data protection measures to ensure user privacy and mitigate the risk of user attrition. Simultaneously, enhancing transparency within the platform and ensuring that users and merchants have a comprehensive understanding of the platform's policies and operating principles will foster greater trust. Furthermore, the establishment of user participation mechanisms, such as the optimisation of the user feedback system and the enhancement of the interactive experience, can further increase users' dependence on the platform, improve user stickiness, and ultimately promote the long-term development of the platform.

Secondly, it is imperative to leverage network effects to foster the sustainable growth of the platform. Research findings have confirmed the mediating role of network effects in the relationship between digital governance and platform performance. This indicates that platform enterprises should give full consideration to the impact mechanism of network effects when formulating governance strategies. Specifically, the platform should implement measures to enhance direct network effects, such as improving social interactions and optimising content recommendations, to increase the connectivity and interaction frequency between users. Concurrently, indirect network effects should be reinforced by attracting high-quality merchants, optimising supply and demand matching, and enhancing the quality of platform services, thereby establishing a stable ecosystem and improving the long-term retention rate and transaction conversion rate of users.

It is imperative that platform governance strategies are adapted to suit local conditions, eschewing a 'one-size-fits-all' approach. Different types of platforms should focus on different governance models. To illustrate this point, consider the case of social and e-commerce platforms, which are predicated on fostering interaction and content ecosystem development to amplify direct network effects. Conversely, transaction-matching platforms such as business-to-business (B2B) marketplaces and online retail platforms should prioritise the refinement of merchant management mechanisms and platform transparency to optimise the transaction environment and enhance indirect network effects. Consequently, when implementing digital governance, platform companies should adopt flexible and diverse governance strategies that take into account their own business models, market needs and user characteristics, in order to improve governance efficiency and market competitiveness.

6. Limitations and future research directions

6.1 Limitations

Despite the comprehensive exploration of the impact mechanism of digital governance on platform performance and the validation of the mediating role of network effects in this study, certain limitations must be acknowledged. Future research can be further expanded in the following areas.

1) The limitations of the research sample must be considered. The collection of data for this study was primarily conducted through the utilisation of online questionnaires, with the data transmission primarily occurring via social media platforms such as WeChat groups and Moments. Although a total of 411 valid questionnaires were collected, which met the requirements for model verification, there are still some limitations in terms of the sample.

2) The limitations of the research methods employed must also be considered. The present study utilised a questionnaire survey and structural equation modelling (SEM) to analyse the data. While it was able to verify the causal relationships between variables, the cross-sectional nature of the data precluded the observation of dynamic changes between digital governance, network effects and platform performance.

3) Limitations of the research content: The present study focuses on how digital governance affects platform performance through network effects, and selects data protection, platform transparency and user participation mechanisms as the key variables of digital governance. While these variables are considered to be of significant importance, it is acknowledged that other crucial governance factors may be absent from the analysis.

4) The interactive effects within the platform ecosystem have not been the subject of full consideration. The present study is chiefly concerned with the impact of digital governance on network effects, and does not explore in depth the interactions between various governance dimensions within the platform.

6.2 Future research directions

1) The exploration of novel research variables is imperative. The present study concentrated on the manner in which digital governance affects platform performance through network effects; however, the impact of governance mechanisms may extend beyond these variables. For instance, subsequent research could incorporate factors such as platform ecological health, user trust levels, and competitive intensity to further elucidate the impact mechanism of platform governance.

2) A dynamic study should be conducted to analyse the long-term impact of governance strategies. The present study utilised a questionnaire survey for data collection, which can reflect the current attitudes and behaviours of users towards digital governance. However, it cannot measure the long-term impact of governance measures on user behaviour. Consequently, subsequent research endeavours should employ longitudinal research (Panel Data) to systematically track alterations in platform governance over time and comprehensively analyse its long-term impact on user behaviour and platform performance.

3) The scope of research should be expanded to explore the governance model of multinational platforms. The governance of digital platforms is no longer confined to a specific country or region. The implementation of digital governance may be influenced by regulatory policies, cultural environments and user behaviour habits in different countries.

4) The impact of smart governance on network effects in combination with emerging technologies should also be explored. The rapid advancements in technologies such as artificial intelligence and blockchain have rendered smart governance a pivotal mechanism for enhancing platform transparency and optimising user experience.

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