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Convenience and efficiency of using government services remotely

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Abstract: Government online services are often considered a core component of e-government, generating significant interest not only among practitioners and scholars but also among policymakers because of their crucial role in enhancing a country's governance capacity. This study, which is based on the United Nations E-Government Survey's Online Service Index, the World Bank's Worldwide Governance Indicators, and the Global Innovation Index, investigates how e-government online services' technology, institutional frameworks, content provision, e-participation, and service provision, as well as innovation, enhance the national governance capacity and offer governance support. The study confirms the critical role of the aforementioned factors in boosting governance capacity and offers three mutually nonexclusive solution types that enhance governance support. These solutions support governance by improving the closeness of interactions between the government and the public, the potential for public participation in governance, and the government's own influence. Additionally, the study reveals that innovation can enhance the impact of e-government online services on national governance capacity, thereby providing a more comprehensive perspective on how e-government online services influence national governance.

This study advances our understanding of how e-government enhances a nation's governance capability and offers supplementary insights into the fields of interdisciplinary innovation research and mixed-methods research.

Keywords: E-government Qualitative comparative analysis (QCA) Necessary condition analysis (NCA) Principal component analysis (PCA).

Introduction: Online service-based e-government is a relatively new concept that provides value to citizens through streamlined governance processes online. This concept has sparked widespread interest among not only practitioners and scholars but also policymakers. It is crucial for enhancing a nation's government's governance capacity. Globally, many governments have taken strong measures to implement online platforms to improve governance transparency and flexibility. Some studies emphasize the benefits of doing so, as it not only reduces government costs but also stimulates innovation through stakeholder participation. In particular, as public services transition from offline to online, e-government online service platforms can enrich public service delivery and serve as a new bridge connecting the government and citizens, ultimately leading to better governance.

E-government is defined as "government agencies using the internet to provide public sector information and online services via the internet". Although the positive role of e-government in governance improvement has been confirmed in many studies, the results are not clear regarding how e-government online services, as a vital practice within e-government, contribute to governance enhancement.

This study makes significant contributions from several perspectives. First, from a research perspective, this study explores the impact of e-government online services on a country's governance capacity. While many studies have investigated the impact of e-government on governance capacity, this research differs in that it focuses on crucial online service practices within e-government. Unlike most studies that concentrate on linear relationships within a single

domain, this research incorporates innovative dimensions to understand how countries integrate innovation into their online services and, in turn, enhance their governance capacity.

Another example is the tangible benefits derived from service innovations provided by national governments through e-government. A case study from Indonesia demonstrated that public service innovations organized by the national government can establish online relationships among various elements within a country, thereby significantly enhancing the efficiency and speed of public services.

In summary, the purpose of this study is to answer two key questions. First, how do online services enhance government governance capacity and provide better support? Second, what role does innovation play as a core concept within this context? Therefore, this study designs a multidimensional and multilevel theoretical framework that first discusses the impact of online services on national governance capacity from dimensions such as the technology level, institutional framework, content provision, service provision, and e-participation mechanisms. It then discusses the impact of innovation on national governance capacity and various aspects of online services to clarify the key mechanisms through which innovation operates.

Moreover, the application of innovative technology has profound implications for government governance capacity. First, the integration of information and communication technology into bureaucratic and political systems is often seen as having a positive impact, enhancing citizens' political influence, and promoting the emergence of "creative citizens". Second, by improving the data collection and analysis processes, innovative technology can help governments identify problems more accurately, formulate policies, and monitor social trends.

While the United Nations E-Government Survey is a valuable resource, it has certain limitations. The survey heavily relies on the coverage of different types of services when assessing a country's e-government online service capacity, which might limit the data performance of high-level countries in the evaluation indicators. Considering a country's capacity as weak in a particular area simply because it has fewer projects in that area is a one-sided approach. This means that even if a country excels in other aspects, its scores in the United Nations E-Government Survey may be restricted if the scope of its online services is narrow.

Therefore, this study needs to introduce new dimensions to better reflect the true levels of various countries and how online services genuinely impact national governance capacity.

However, during the construction of the dataset, several issues are encountered. In the UN E-government Survey, each assessed country is assigned scores on the basis of the various target functions or services it provides through its official online e-government service channels. A score of 1 is awarded for each service or function that can be easily accessed and available through the official online e-government service channel. If a target function is missing or inaccessible during the assessment, a score of 0 is given. By answering 180 questions nested under five major categories, a relatively objective and comprehensive evaluation system for online service capacity is constructed.

However, the data obtained through this method may present some issues. First, the evaluation criteria are overly simplified, and an overemphasis on breadth in data performance can result in a lack of depth in reflecting capacity. Second, data lack variability between items. For example, in the case of the content provision level, there are only 10 standard services, resulting in a data precision of only 0.1 (with a minimum of 0.3 and a maximum of 1). This does not adequately represent the differences in performance across different countries in this category.

The PCA method allows for the integration of multidimensional data without the need to set explicit weights, unlike weighted calculation methods. However, PCA can be seen as a black-box approach that forms complex linear combinations of original data variables, making not only the operations and outcomes during the data transformation process less intuitively understandable but also the interpretation of its results more complex.

To visually demonstrate the differences in outcomes between the PCA method and traditional weighted calculation methods, as well as to validate the reliability of the PCA method in this research context, a comparative experiment is designed. This experiment involves contrasting the OSI data calculated through the weighted method of the United Nations (OSIUN) with the OSI data processed via PCA (OSI_PCA) in this study.

Additionally, the consistency levels for the institutional framework, service provision, e-participation index, and technology level variables are all above 0.8, indicating that these four variables provide reliable explanations for high governance capacity. The consistency and coverage levels for content provision are also substantial, indicating its specific explanatory power for the outcomes.

Recent methodological studies on QCA have suggested obtaining explanatory explanations from parsimonious

solutions rather than intermediate. This is because parsimonious solutions are closer to minimal or nonredundant sufficient conditions, and redundant conditions do not make a difference. However, nested comparisons of parsimonious and intermediate solutions remain the mainstream method in current QCA usage, as they can provide richer research conclusions. Therefore, this study bases its core conditions on the solutions provided by parsimonious solutions, which are summarized from the four paths of intermediate solutions, to form two types of solutions for achieving high governance levels: government-public interaction-oriented (configurations S1 and S3) and government-supply-oriented (configurations S2 and S4).

With the inclusion of the innovation factor, the characteristics of the formed path configurations become more pronounced, and innovation serves as a key condition in all paths, indicating that innovation can provide richer information for configurations seeking high government governance capacity, supporting propositions P6 and P7.

However, the research results also indicate that many samples apply to both of these solution types, such as the United States, China, the United Kingdom, France, and other countries. These countries perform well in all indicators, serving as examples of both strong government–public interaction and proactive government service provision. Therefore, further experimentation is needed, combining more information for confirmation.

The evaluation indicators that incorporate innovation information can more comprehensively assess the performance levels of different countries' governments in various areas and better reflect the profound impact of online government services on a country's governance levels. Configuration S10 shows that a country's high governance capacity level is the result of a multidimensional, collaborative effort. Progress is required in various aspects, such as the institutional framework, content provision, service provision, e-participation, and technology, to drive innovation and more comprehensively evaluate and improve the quality and depth of online services to meet evolving governance needs, thereby supporting propositions P1-P5. Comparisons with configurations S1–S4 and S5–S9 reveal that only in the QCA analysis, which incorporates overlaid innovation information, do all online service factors emerge as key factors in the configurations, thereby supporting Proposition P7. This finding is consistent with the results of the NCA.

Configuration S10, as the only configuration explaining 77.7 % of the cases, indicates that this path is applicable to the majority of countries and serves as a universal configuration.

Innovation systems must help understand core microlevel behaviors and the "wider environment" within which they operate. This means that various influencing factors at different levels, including technology, institutional frameworks, content provision, e-participation, and service provision, are subject to and dependent on the existence of an innovation system.

In this study, the frequency and consistency thresholds are set to 1 and 0.8, respectively. The robustness of the results is verified repeatedly within the range of 1 to 2 for frequency thresholds and 0.5 to 0.8 for consistency thresholds. The results remain consistent within this range, indicating that the research findings are robust.

In terms of theoretical contributions, this study collects theoretical foundations that underlie the significant influence of different factors of e-government online services on governance capacity, which is often overlooked in the dimension of e-government research. Moreover, this study identifies three solution types for achieving high-level governance capacity, each of which demonstrates how governments can use e-government online services to establish a more stable and positive foundation for relations with citizens, deliver superior proactive services, and achieve comprehensive development by incorporating innovation. These aspects collectively contribute to enhanced support for governance.

Furthermore, the comparative results of this study indicate that online governance service capacity indicators that incorporate innovation information demonstrate a stronger explanatory relationship with governance capacity than do those that do not incorporate innovation information. This finding shows that innovation can enhance the impact of e-government online services on national governance capacity and that incorporating considerations of innovation capacity can more effectively enhance the national government's understanding of the true state of e-government service components.

Based on the above discussion, it can be concluded that online government services quality isthe most direct factor on public satisfaction of e-government. Offline government servicequality via its impact on perception of online services quality, thus indirectly has an impact onpublic satisfaction. Therefore, the government should focus on improving the e-governmentonline service quality in order to improve the public service satisfaction of e-governmentservices; but this does not mean that the government can ignore the quality of the traditionalgovernment services. Good offline services

still have a strong influence on improving publicperception of online service quality.

First, owing to the challenges in data collection, this study uses an e-government evaluation system developed by the United Nations. Different evaluation systems may provide different perspectives. Additionally, measuring a country's innovation level via the Global Innovation Index (GII) from the World Intellectual Property Organization may not comprehensively and objectively measure a country's innovation capabilities, particularly as reflected in e-government online services.

Finally, from a practical perspective, this research utilizes PCA for data processing and combines the NCA and QCA methods to analyze the interdependent group effects and explanatory asymmetry of governance capacity affected by e-government. This approach provides case-based support for the use of the QCA method and its ability to break the assumption of uniform symmetric explanatory effects in linear regression.

CONCLUSION

On the basis of a comprehensive theoretical framework, this study initially theoretically proves that government online services can enhance governance capacity. This finding demonstrates that five evaluation dimensions within e-government online services play crucial roles in improving governance capacity. Through a combination of NCA and QCA, the study reveals three types of mutually nonexclusive configurations for high levels of governance capacity, illustrating how these five evaluation dimensions interact to influence and enhance governance capacity. In summary, this research contributes to interdisciplinary innovation research and the field of mixed-methods research.

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