

Digital Technology in Rural Governance: the Governance Paradox and Adaptive Pathways

Xiaorong Gong

University of Jinan, Jinan, China.

Abstract: The rapid diffusion of digital technology into rural governance has become a central component of digital rural development and grassroots governance modernization in China. Government service platforms, village WeChat groups, grid-based management systems, the 12345 Government Service Hotline, mini-programs, and data platforms can improve information transmission, public service delivery, citizen voice, and administrative oversight. Yet the same technologies may also generate digital exclusion, data-driven formalism, grassroots administrative burden, platform fragmentation, and relational detachment. This article calls this built-in conflict a governance paradox. While digital tools can help boost how well governance works, at the same time they also bring new administrative problems and cost more to run. This study uses China's scholarship programs, its national policy papers, and also international research about the digital divide, the extra work that administration has to do, and digital government, to build a four-part analysis framework. It centers on technical common sense, what people who work in the system can do, how different organizations work together, and how well things fit into the existing institutional environment. This analysis shows that negative results caused by digitalisation do not come from technology itself. Actually, these problems come up when digital systems are put into place within existing administrative incentive setups, organizational borders, and many different kinds of rural social environments. To make these governance conflicts less of a problem, the paper pushes for a governance strategy that puts people first and adapts to local needs. This strategy brings online and offline service delivery channels together, helps villagers and local grassroots workers build up their digital skills, cuts down on unnecessary reporting work, stops platforms

from expanding without checks, makes data sharing rules and accountability methods work better, and ties digital infrastructure back to local rural governance practices that are rooted in the community. This study does not just use the too-simple split judgement that you have either digital empowerment or digital burden. It connects the repeated problems in governance to how these problems might come about, and also looks at the matching institutional changes that can help fix these issues.

Keywords: Digital Technology; Rural Governance; Digital Rural Development; Governance Paradox; Digital Divide

1. Introduction

As the Digital China agenda and the rural revitalization strategy continue to advance, digital technology has become an increasingly important instrument for modernizing rural governance. Digital rural development is not only a component of agricultural and rural modernization but also a key means of improving grassroots governance systems and governance capacity. National policy documents have explicitly identified digital rural development as a strategic direction and have called for the modernization of rural governance and public services through digital means [7,8]. In practice, government service platforms, village affairs disclosure systems, grid-based governance platforms, WeChat groups, mini-programs, short-video platforms, and the 12345 Government Service Hotline are changing how information is transmitted, services are delivered, and villagers participate in local governance. Traditional rural governance in China has re-lied heavily on the experience of village cadres, acquaintance-based social relations, face-to-face communication, and administrative mobilization. Traditional rural governing in China mostly depends on what village cadres have learned through years of work, social

connections built on knowing people personally, talking directly in person, and getting people organized through official channels. These arrangements often possess strong relational foundations and local adapt-ability, but they can also suffer from slow in-formation transmission, uneven access to public services, limited channels for participa-tion, and insufficient procedural transparency. This system has strong roots in personal relationships and can adjust well to local conditions, but it also has problems. Information gets passed around really slowly, not everyone gets the same public services, there are not many ways for people to get involved, and procedures don't have much clear, open rules to follow. The historical movement from "bringing writ-ten information to the countryside" toward "bringing digital technology to the country-side" reflects a broader transformation in the relationship between state governance and rural society [4]. How things have changed, starting with getting written documents and information out into villages and now moving to putting digital tech in rural areas, this whole shift shows that the connection between how the government runs things and how rural society works is changing big time [4]. Digital technologies create new possibilities for addressing some of these limitations through data collection, platform-based case circulation, online processing, and data-assisted decision support. Digital tech now gives us new chances to fix at least some of these problems, by gathering data, moving cases around on online platforms, handling things over the internet, and letting data help make decisions better.

Bringing digital technology into governance doesn't automatically make the governance work better, actually. Digital governance usually puts a lot of focus on standard rules, fixed procedures, data tracking and centralized platforms. But rural communities still work really differently: they have mixed groups of people, knowledge that's tied to local places, people interacting with each other all the time, and people work things out through personal connections. When one-size-fits-all digital systems don't fit well with how rural society works, new problems for running things can pop up. Villagers who're older or don't know much about digital tools might find it harder to get the services they need. Local officials may have to type the same information over and over into different systems. Building fancy platforms and keeping lots of digital

records might get more attention than actually solving real problems. And talking online might end up replacing the in-person talks that are needed for sorting out tricky disagreements or talking through public issues together.

The existing literature has increasingly recognized this dual effect. Chinese studies have documented tensions between digital empowerment and digital burden, including digital exclusion, technology-centered governance, implementation alienation, platform fragmentation, and the weakening of relational governance [1-6,9]. International research similarly shows that digital inequality extends beyond physical access to differences in skills, use, and outcomes [10,11], while digitalized administrative systems can transfer discretion from frontline officials to information architectures and create new forms of administrative burden and exclusion [12,13,15]. Evidence from China also indicates that older people, particularly vulnerable rural groups, remain exposed to digital exclusion even when digital infrastructure is widely available [14].

So this paper asks three main questions: Why is it that digital technology can grow the ability of rural governance, but at the same time create whole new limits on how that governance works? How do these conflicting effects actually come about? What changes to the current system can cut down the bad impacts without getting rid of all the good things digitalization brings? This paper does conceptual analysis by looking at existing research and policy papers, instead of doing on-the-ground work in just one place. It makes three different contributions to this area of study. It changes how we talk about the topic: instead of asking whether digital tech just makes grassroots governance stronger or just makes it harder, it looks at how both things happen at the same time and how they affect each other. It also puts four different parts that explain the problem -- how tech thinks through problems, what people involved can do, how different organizations work together, and how well it fits into the current system -- into one single framework that you can use to look at the whole picture. It connects how the paradox works to changes we can make to fix it, which means we see digital governance as something we have to design as a system, not just something that's technical on its own.

2. Literature Review and Analytical

Framework

2.1 From Digital Empowerment to a Governance Paradox

Research on digital rural governance has often begun from an empowerment perspective. Digital platforms can reduce information and transaction costs, make administrative processes more traceable, expand channels for public participation, and improve the targeting of public services [2,4,6]. This perspective is consistent with the policy orientation of China's digital rural strategy, which treats digitalization as an important means of strengthening rural governance capacity and improving public service effectiveness [7,8]. Yet an empowerment-only perspective cannot explain why the expansion of digital systems may coincide with heavier grassroots reporting requirements, exclusion of low-skill users, duplicated data entry, or declining space for face-to-face problem-solving.

A second body of research emphasizes the unequal social distribution of digital benefits. The digital divide is now commonly understood as a multidimensional phenomenon involving access, skills, patterns of use, and the ability to convert digital resources into meaningful outcomes [9-11]. Rural areas are especially vulnerable because digital inequalities often overlap with demographic ageing, educational differences, weaker service capacity, and spatial disadvantage [10]. In China, research on older people shows that rural and otherwise disadvantaged groups can remain digitally excluded despite the wider diffusion of smart devices and online services [14]. These findings imply that an online service can be technically available while remaining substantively inaccessible to some citizens.

2.2 Institutional Embedding of Digital Government

A third line of research looks away from the technology itself and toward the management systems that the technology is actually a part of. Bovens and Zouridis point out that communication and information tech can push public management away from what is called street-level bureaucracy and into something they call screen- and system-level bureaucracy. This change moves a lot of the decision-making power away from people working directly with the public and into the software, rules, and how

information is organized [12]. Another field of research, looking at administrative burden, goes on to show that when people interact with government programs, it creates learning, following rules, and mental stress costs for them. And these burdens don't just come from the people themselves - they depend on how the policy is made and how it's put into action [13]. Peeters and Widlak have a similar finding too: when information systems are all connected, they can accidentally push people out of getting services they need. This happens when the standardized way data is stored can't deal with the complicated real-world situations that people live in [15].

These ideas are really important for how rural areas are governed digitally. Digital systems don't just show up in a place with no existing rules - they work together with how people are checked on doing their jobs, which departments have power, how many people can work on things, rules about data, and the local social connections that already exist there. Research on adaptive governance also says that digital government needs rules and setups that can deal with new technology and what people need, while still keeping everyone clear on who is responsible for what [16]. Because of that, what comes out of rural digitalization has to be looked at as the result of how technical systems, people in government, how organizations are set up, and the local rules all work together.

2.3 a Four-Dimensional Analytical Framework

On this basis, the paper develops a four-dimensional framework. The technological-rationality dimension concerns whether digitalization is treated as an instrumental means of solving public problems or as an end in itself; an excessive technology-centered orientation can transform data and platforms into performance symbols rather than problem-solving tools. The actor-capability dimension concerns whether villagers and grassroots officials possess the skills and resources required to use digital systems effectively; unequal capability can convert service convenience into exclusion. The organizational-coordination dimension concerns the relationship among departments, platforms, and data standards; weak coordination can convert integration initiatives into duplicated reporting and platform fragmentation. The institutional-contextual-fit dimension concerns

whether standardized digital rules are compatible with the demographic, social, and relational characteristics of different villages; poor fit can produce rigid service delivery and weaken locally embedded forms of governance.

The four dimensions are analytically distinct but mutually reinforcing. For example, a technology-centered performance regime can encourage agencies to build separate platforms, which increases grassroots reporting burden; fragmented systems can then intensify the disadvantage faced by digitally vulnerable citizens; and rigid platform procedures can reduce the discretion needed to adapt services to local conditions. The governance paradox is therefore not a single unintended consequence but a patterned outcome of institutional interactions. The following sections first identify the empowering effects of digital technology, then examine four recurrent paradoxical tensions, and finally explain how the four mechanisms generate those tensions and how they can be adjusted.

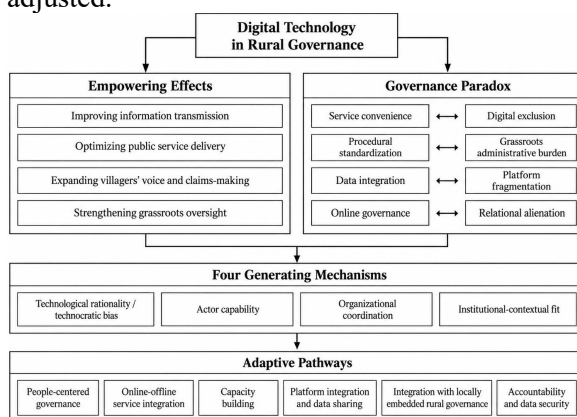


Figure1. Analytical Framework of Digital Technology in Rural Governance

3. Empowering Effects of Digital Technology in Rural Governance

3.1 Improving the Efficiency of Information Transmission

Digital technology first transforms the way information circulates in rural governance. Under conventional arrangements, policy publicity, village notices, and public affairs were commonly communicated through oral notification by village cadres, loudspeaker broadcasts, bulletin boards, or meetings. Even though these older communication ways worked within local village social connections, they were still held back by limits on time, how far messages could go, and how many people

actually moved around. More and more young and middle-aged people now work outside their home villages, so the old ways of talking to everyone often can't get messages to all people living there right when they need it.

New digital tools have made way more communication options available for villages. Things like WeChat groups for the whole village, official social media pages run by the village, government service websites, little apps people use on phones, and short video platforms - all of these let policy updates, news about village business, and announcements for services get to villagers much faster than before. For the local government workers, these digital platforms make it quicker and easier to get information out to more people. For regular villagers, they make it cheaper and easier to get the information they need about policies and local services. Because of all this, how information gets sent around has changed from what was mostly a one-way, in-person, scattered system to a multi-channel model that mixes online and offline ways of talking to people.

Digitalization also makes it easier to track information. When people talk face to face, they might leave things out, say different things to different people, and it's hard to figure out who's responsible for what. But if you post information on WeChat groups, government platforms, and village affairs systems, you can save it, look for it later, and check it again any time. This ability to track past information can help make things more open, and it's also easier for villagers to keep up with what's happening in public affairs. So the good things digital communication does for governance aren't just about getting things done faster - it also helps create a long-lasting record of information that doesn't go away.

3.2 Optimizing Public Service Delivery

One more thing digital technology does is change how public services are given out. Back in the day, if villagers wanted medical insurance, social security checks, subsidies or official papers, they had to go back and forth many times to village committees, town governments or even county-level departments. People didn't have the same information as the officials, and processes weren't clear, so that made residents spend more time and money getting things done, and also made local government services work worse.

Now that government service platforms and

mobile apps are more widely used, some services can be finished online, on phones, or by booking an appointment ahead of time. Digital systems put all the before scattered services into one place on these platforms, so people can get guides on what to do, send in their documents, check how their application is going, and leave comments much easier. This cuts out unnecessary trips outside, and also makes the whole process more standard and easier to see what's going on.

Digital technology is also able to help with giving more targeted services. When local grassroots governments record and look at people's service needs, what kind of applications they use, different sorts of claims people file, and how each case ends up, they can spot where public services are missing and hand out resources a lot more accurately. In areas like care for old people, help for those in need, medical coverage and help finding jobs, governing with data might help to find groups that have special needs and make it easier to hit those targets when giving out services. Case studies about how digital governance works in the countryside also show that when technology matches what local governments need, it can create new abilities to organize things [6].

Making public services work better isn't just about putting old processes onto the internet. If you think more deeply about it, digital change can totally change how local governments and people who live in villages work together. People who live in the area aren't just getting public services without doing anything anymore; they can look up policy information, send in requests, check how things are going, and watch how things get done all through online systems. Because of all these changes, the way public services get delivered ends up being more open, lets people get more involved, and is easier to see what's going on.

3.3 Expanding Channels for Villagers' Voice and Claims-Making

Digital tech also gives villagers more ways to get involved in local governance and share what they want, or what they are unhappy about. In the old system, villagers usually depended on village leaders, village meetings, people they know, or going directly to the town government to talk about their problems. Even though these old ways let people talk face to face, they don't always work well, they take longer to get

answers, and you can't easily see what happens after you raise an issue.

Digital platforms, hotline work order systems and online messaging channels now let people submit requests in a much more ordered, rule-following way that gets them recorded, moved along and answered. Villagers can tell about problems with public services, roads or other buildings, disagreements between people, dirty environment and other local stuff through hotlines, government official platforms, or even WeChat groups. When a request gets written down, it becomes an official work order that gets sent to the right department, which makes a whole administrative process that you can track step by step.

What this change means is that digital technology doesn't just work as a tool for management - it also acts as a go-between for members of the public to get involved. Digital ways of communicating can make it easier for people to share their opinions, check how village business is going, and take part in local public issues. This can help rural governance become more open and let more people be included in its procedures.

If you look at things from a governance point of view, digital platforms also make people less dependent on personal ties when they want to make a claim. In the old days, some villagers had to depend on local village leaders, their family members, people they knew, or even going to ask in person just to get their problems noticed. The channels through these platforms let people voice their claims in a more set up, step-by-step, open way. Because of that, people don't need to have access to certain social circles as much to be able to take part.

3.4 Strengthening Grassroots Oversight

Digital technology also make it easier to record and monitor rural governance work. In the old traditional system, some village matters might not be open enough, are hard to follow up on, and it is not clear who is responsible for what. Digital platforms let information about village affairs, how money is spent, how projects are going, and how public resources get split up be shown in ways that are much more open to everyone.

First, online systems for disclosing information and government platforms can make the way village affairs are published follow clear rules, so that local people can look up information

about local decisions, agricultural support policies, how public funds are used, and how projects are progressing. Second, digital records make it easier for higher-level governments to keep an eye on things. Data records, step-by-step traces, and feedback on results let grassroots administrative work get checked and assessed a lot more easily.

In this way, digital tech helps make rural governance more institutional by moving some activities away from practices that rely on personal experience and connections, and toward more clear rules, data, and standard steps. But the value of digital checking isn't just about doing what higher administrative levels want. Its more important value is that it makes villagers' rights to get information, join in and keep things under supervision stronger. When things that happen in the village are shared openly on time, accurately and fully, digital platforms lower the money people have to spend to get public information, and make the people in charge more responsible to local people.

4. The Governance Paradox of Digital Technology in Rural Governance

Putting digital tech into rural governance doesn't only bring good results. Since rural communities have complicated social structures, different population features and old cultural traditions, the same tech that makes things work more efficiently can also create new problems for governing. Four sets of opposite pressures make up this governing paradox: easier access to services but some people can't use digital tools, set procedures for everything but more work for local people on the ground, putting all data in one place but different platforms still don't work together, and running things online but less personal connections between people.

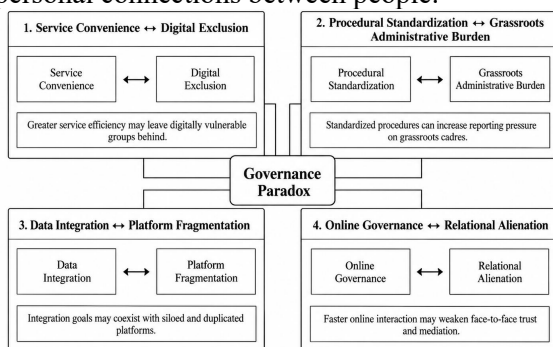


Figure 2. Four Core Tensions in the Governance Paradox of Digital Rural Governance

4.1 Service Convenience and Digital Exclusion

Digital governance presupposes that relevant actors can access and use digital technologies. In rural communities, however, digital capabilities are unevenly distributed. Younger villagers may use smartphones and government platforms with ease, whereas older adults, people with lower levels of education, persons with disabilities, and some left-behind residents may lack the skills, confidence, or willingness required to use digital services. As a result, digitalization can generate new forms of participatory exclusion.

The digital divide is therefore not limited to whether internet infrastructure is available. It also concerns whether individuals possess the skills and resources required to use digital systems effectively. Research on the transition from the digital divide to differences in digital dividends underscores that access alone does not guarantee equal benefits from digitalization [9]. Even where network infrastructure covers a village, residents who lack digital literacy may still be unable to obtain meaningful benefits from online platforms. For those unable to use smartphones independently, online payment, online applications, and digital authentication may become new barriers rather than conveniences.

This form of digital inequality can undermine equity in public service provision. If grassroots governance relies excessively on online platforms without maintaining offline alternatives, assisted services, or intermediary support, residents with weaker digital capabilities may be excluded from services that are formally available to everyone. Technologies introduced in the name of equalizing public services may thus widen disparities in actual service access.

The same problem affects participation. Digital platforms appear to offer open channels to all villagers, but those channels are most usable by groups with stronger digital capabilities. Less digitally skilled residents may possess formal opportunities to participate while remaining practically excluded by technical thresholds. This divergence between formal openness and substantive exclusion is one of the central manifestations of the governance paradox.

4.2 Procedural Standardization and Grassroots Administrative Burden

Digital technology is intended to improve

administrative efficiency, yet its practical operation can create new burdens for grassroots cadres. As the number of digital platforms, work groups, mobile applications, and information systems increases, cadres may be required to perform extensive data entry, upload documents and photographs, provide screenshots as evidence of task completion, check in online, and maintain multiple systems. The governance process becomes more standardized on paper, while the actual workload at the grassroots level may increase.

This problem is closely linked to digital trace requirements and performance pressure. In some localities, digital platforms function not only as service tools but also as instruments for upward inspection, performance assessment, and responsibility tracking. To demonstrate that tasks have been completed, grassroots personnel may spend substantial time preparing materials, uploading images, completing forms, and maintaining platform records. Instead of reducing administrative workload, technology can produce a condition of continuous "online busyness." Research on digital governance has described related phenomena as digital burden, execution alienation, and digital formalism [2,5,10].

When substantial administrative energy is devoted to satisfying platform requirements and assessment indicators, the time available for direct contact with residents and substantive problem-solving is reduced. Digital governance may then produce the paradoxical combination of complete data but unresolved problems, or standardized procedures but weak outcomes. The issue is particularly important because it reveals that inefficiency can be generated not by a lack of digitalization, but by the manner in which digital tools are integrated into bureaucratic accountability systems.

Grassroots digital burden is therefore not an inevitable property of technology itself. It emerges when digital systems become embedded in a pressure-based administrative regime that privileges supervision, ranking, and visible proof of compliance. Under such conditions, cadres may reorient their work toward satisfying platform indicators rather than responding to residents' actual needs. Digitalization then risks becoming a new mechanism of administrative formalism.

4.3 Data Integration and Platform

Fragmentation

Digital governance focuses on putting data together and managing things in a coordinated way, but when you get to work at the grassroots level, broken-up platforms and separated data stores are still really big problems. Different departments usually make their own separate systems based on their own jobs and duties. This ends up creating many different platforms that use different ways to define data, different rules for reporting, and different standards for checking work. This means grassroots workers have to use several systems all at the same time. International research on system-level bureaucracy likewise cautions that integration through information architecture can create new dependencies and exclusionary effects when organizational coordination is weak [12,15].

When platforms get split into different incompatible pieces, two direct problems show up right away. It leads to lots of work that gets done over and over again. The same info about people, services, or specific cases has to get put in again and again across all these separate systems. It also makes the overall ability to manage things weaker. When different systems can't talk to each other easily, sharing information doesn't work well, and people working at local government level find it really hard to get a full, correct, and up-to-date understanding of what's going on with local management work.

This issue is extra bad because lots of problems in managing rural areas cross the lines that separate different government departments. For example, help for families with low incomes might need involvement from civil affairs, HR and social security, health insurance, and agriculture and rural affairs departments. Sorting out disagreements might need village committees, court offices, police, and the local town government all working together. If digital platforms can't work together well across these different organization lines, the technology might still work okay for collecting all the data, but it won't actually help different groups work together to fix problems.

Fragmentation can spread out responsibility too. If a case that comes into one system needs work from multiple departments, it might get passed back and forth between different platforms and agencies over and over. When there's no one clearly in charge and no good way to coordinate the work, a problem can just keep moving

around digitally but never actually get fixed. This kind of "going around on platforms without actually solving anything" can hurt how much people trust digital governance systems.

4.4 Online Governance and Relational Alienation

Rural governance is not just about taking care of administrative tasks; it also has to do with managing how people get along with each other in society. In rural communities, people interact over and over again - between neighbors and between villagers and the local officials who work there. To sort out many disagreements at the grassroots level, you don't only need formal rules; you also rely on talking to each other in person, convincing people with both logic and how they feel, the unwritten rules of the village, and knowledge that's been built up over time by people who live there.

Digital technology can make communication and moving cases along go faster, but it can also cut down on how much people interact with each other directly. When problems are sorted out through WeChat groups, hotline tickets, or messages from online platforms, they can get done a lot quicker. But the whole process might end up missing that connected communication you need to understand complicated social situations. In disputes among neighbors, family conflicts, or land-related disagreements, purely digital interaction may be insufficient to capture the underlying relationships, emotions, and histories that shape the conflict.

If grassroots governance becomes overly dependent on online platforms and neglects trust, reciprocity, and relationship networks, governance may become faster but less socially responsive. Such a shift can weaken both problem-solving quality and villagers' trust in grassroots organizations. The loss of relational warmth identified in research on the negative effects of digital empowerment is therefore not a peripheral issue but a substantive governance risk [1].

Digital technology's advantages lie in its increasing speed, standardization, and traceability. However, in rural areas, governance relies heavily on trust and social relationships. Dispute mediation, public discussion, and handling of sensitive village affairs still require face-to-face communication. If online governance replaces direct communication, rural governance may become platform-driven rather

than relationship-driven, reducing the integrative capacity within rural communities.

5. Mechanisms Generating the Rural Digital Governance Paradox

The paradox of governance is not caused by digital technology itself. It is the result of the relationship between technology and governance concepts, actor capabilities, organizational structures, and institutional arrangements. There are four main mechanisms at play here: a technocratic bias, the lack of sufficient digital capacity in grassroots actors, inadequate coordination and sharing of data across platforms, and the misalignment between standardized institutional design and heterogeneous rural governance contexts.

5.1 Technocratic Bias in Governance

One is technocratic bias that assumes digital governance is the same as digital infrastructure, namely, platform development, software implementation, hardware installation, and data collection. In such assumptions, the presence of technology is believed to bring better governance by itself. Such an assumption is not only an underestimate of the social complexity of rural governance but also aligns with existing critiques of technological solutionism in rural digital governance [3].

Rural governance is not merely an information-processing endeavor. It requires interest coordination, emotional communication, social mobilization, and the building of consensus and legitimacy. While digital systems can help streamline information flow and manage processes, they cannot be expected to resolve conflicts of interest, mend fractured community relationships, or stimulate genuine civic engagement. When technology is viewed as an end rather than a means, digital governance risks becoming an empty ritual. Technocratic bias also leads to a misalignment of grassroots expectations. Platforms designed for residents may be transformed into tools to showcase governance results, while data collection meant to aid decision making becomes a performative exercise to meet bureaucratic targets. If digital governance is confined to visible technological features and quantitative indicators, then real issues in rural areas may not be addressed. The root of this paradox thus lies in the tension between technical rationality and public values. Digital technology should remain a tool that

serves the needs of the people and the pursuit of public interests, not a rigid system that displaces local conditions. The success of digital governance relies on the extent to which technological capabilities are directed toward substantive governance outcomes.

5.2 Insufficient Digital Capacity among Grassroots Actors

This depends on the capability of relevant subjects, including villagers, village cadres, grid workers, and township officials, to make sense of their digital interactions. Villagers need to have basic capabilities related to information retrieval, platform use, and online expression. Grassroots officials require skills associated with platform operation, data processing, online communication, and multi-departmental coordination. The reality is that these capability deficits persist. Some villagers are unable to use digital platforms on their own, which means that services cannot reach them. Some village cadres are able to carry out prescribed data entry, but not to utilize data to identify issues, inform decisions, or improve governance, such that digital tools remain operational but do not become capabilities. In this sense, digital capacity cannot simply be reduced to digital skills. Village cadres might know how to enter data, but not how to understand it; they might know how to post in a WeChat group, but not how to facilitate public participation online; they might know how to operate a platform, but not how to weave it into the local governance system. They do not know how to convert digital tools into governance capacity. Similarly, a platform might be useful for some villagers, but incomprehensible for others. Unless capacity differences are taken into account in institutional design, they will only lead to further disparities: those with high levels of digital capacity benefit even more, while those with lower levels of capacity are left at a disadvantage.

5.3 Inadequate Platform Coordination and Data-Sharing Mechanisms

Effective digital governance requires platform coordination and data sharing, yet departmental fragmentation and platform barriers remain significant. Agencies often build systems around their own responsibilities, which increases the number of grassroots platforms and produces inconsistent standards, incompatible data definitions, and limited interoperability. Without

unified planning and institutionalized sharing rules, digital platforms can create new information silos rather than eliminating old ones. In digital-government terms, interoperability must be accompanied by institutional coordination and clear accountability; otherwise, the same information architecture that promises integration may reproduce administrative exclusion [15,16].

Weak coordination reduces governance efficiency and increases grassroots workload. Cadres must simultaneously complete offline governance tasks and respond to multiple online systems, while residents may be asked to submit the same materials repeatedly to different departments. Studies of execution alienation in grassroots digital governance show how technically connected systems can remain organizationally fragmented [5,10].

At the organizational level, platform fragmentation reflects underlying departmental boundaries. Agencies build systems, control data, and define performance indicators according to their own mandates. These arrangements reproduce boundaries of authority, responsibility, and organizational resources. Digital technology has the potential to break information barriers, but without organizational coordination it may instead digitize and harden those barriers.

Data security and privacy concerns further complicate sharing. Rural governance involves sensitive information on population, land, social security, social assistance, health, and property. In the absence of clear rules on data use, authorization, and responsibility, departments may be reluctant to share information because of perceived risk. Insufficient data sharing therefore has technical, organizational, and institutional causes, and cannot be solved through technological interoperability alone.

5.4 Misalignment between Institutional Design and Rural Governance Contexts

Digital governance institutions typically emphasize uniformity, standardization, and replicability, whereas rural communities are highly heterogeneous. Villages differ in demographic structure, economic conditions, cadre capacity, residents' habits, infrastructure, and the types of problems they face. When digital governance arrangements are overly rigid and insufficiently attentive to local differences, institutional design can become detached from grassroots practice. The central design problem

is therefore how to preserve baseline standards while allowing sufficient discretion for local adaptation, a concern also emphasized in adaptive-governance research [16]. Take, for example, the situation in rural communities where there is a large proportion of elderly people. A firm insistence on "only online" for service provision would make public services less available. Or take a village with very few administrators. It will cost a great deal of time and effort to maintain several platforms at once. There is no one-size-fits-all model for digital governance that can be applied without modification to local contexts. The lack of fit can also be seen in the evaluation system. If the performance of digital governance is measured mainly by platform activity, data-upload volume or online processing rate, while resident satisfaction, the quality of resolving problems and reducing the burden at the grassroots level are not measured, then cadres might rationally choose to optimize the indicators rather than achieving real effects. This can fuel digital formalism. Institutional design should strike a balance between uniformity and local flexibility. Uniformity is still valuable in ensuring interoperability, accountability, and service quality, but local flexibility is essential if digital tools are to be woven into the fabric of rural governance rather than superimposed upon it.

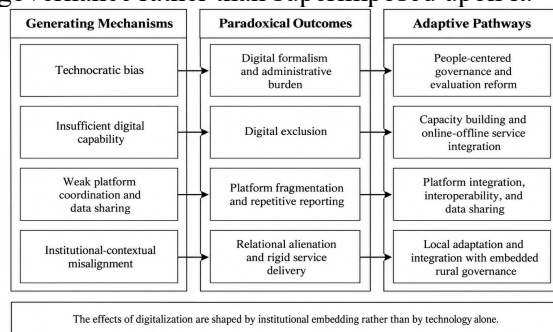


Figure 3. Generative Mechanisms, Paradoxical Outcomes, and Adaptive Pathways

6. Adaptive Pathways for Digital Technology-Enabled Rural Governance

Addressing the governance paradox requires coordinated adjustments in governance philosophy, service delivery, actor capability, platform design, and the relationship between digital and locally embedded forms of governance. The objective should not be to replace traditional governance with digital systems, but to establish a productive connection

between technological capacity and the social realities of rural communities.

6.1 Adopting a People-Centered Approach to Digital Governance

The first priority is to reaffirm the instrumental character of technology. The purpose of digital governance is not to build more platforms or collect more data, but to solve concrete problems and improve grassroots governance outcomes. Evaluation should therefore prioritize residents' sense of benefit, the rate and quality of problem resolution, the reduction of unnecessary grassroots workload, and equity in public service access.

A people-centered approach also requires restraint toward technological solutionism. Digitalization should not be equated with platformization or datafication. A digital tool is valuable only when it responds to villagers' needs, reduces administrative friction, improves public services, or supports effective coordination. Technology that increases visible digital activity without improving governance outcomes should not be treated as successful digitalization.

People-centered digital governance must also recognize social differences within villages. Rural residents are not abstract data points; they differ in age, occupation, education, health, mobility, and familiarity with digital technology. A uniform technical solution cannot replace differentiated public services. Digital convenience and service equity must therefore be pursued simultaneously.

6.2 Building Integrated Online-Offline Service Provision

Digital governance should complement rather than eliminate offline governance. For groups with weaker digital capabilities, governments should retain physical service windows, village-level proxy services, telephone consultation, and, where necessary, door-to-door assistance. Older residents, persons with disabilities, and left-behind groups in particular require accessible offline alternatives and face-to-face guidance. Rural communities can also establish digital assistance mechanisms by mobilizing village cadres, grid workers, volunteers, and returning young residents. These actors can help villagers complete medical insurance payments, social security authentication, policy searches, service applications, and other digital procedures. Such

intermediary support allows communities to benefit from digital convenience without turning technological capability into a prerequisite for receiving public services.

Online-offline integration should not mean simply maintaining two parallel channels. The two modes should perform complementary functions. Online platforms are well suited to information publication, service inquiries, progress tracking, and data recording, while offline services are better suited to policy explanation, assisted processing, relational communication, and the needs of special groups. Effective integration can combine efficiency with accessibility and social responsiveness.

6.3 Strengthening Digital Capacity among Villagers and Grassroots Cadres

The conversion of digital technology into governance capacity depends on the capabilities of the people who use it. For villagers, local governments and communities should provide practical digital skills training, on-site guidance, simple instructional materials, and simplified service interfaces. Platforms should also be adapted for older users by reducing unnecessary authentication steps, simplifying navigation, and maintaining alternative channels.

For grassroots cadres, training should extend beyond basic platform operation. It should include data interpretation, problem diagnosis, online communication, digital public participation, and cross-departmental coordination. Cadres should not function merely as data-entry operators; they should be able to use digital systems as resources for organizing services, identifying needs, and solving problems.

Capacity building should also be differentiated by group. Younger villagers can be encouraged to participate in village oversight, volunteering, and digital communication; older residents require basic operational assistance and reliable offline alternatives; and grassroots cadres need training in integrated platform use, data governance rules, and resident-oriented service methods. Only when the capabilities of different actors improve together can digital technology become a shared governance resource.

6.4 Promoting Platform Integration and Data Sharing

Reducing digital administrative burden requires stronger platform integration and more effective

data sharing. County and township governments should coordinate digital governance planning and avoid repetitive platform construction and duplicate data collection by different departments. Frequently used information concerning population, social security, social assistance, land, and dispute resolution should, where legally permissible and secure, be shared across relevant administrative systems.

Unnecessary digital trace requirements and repetitive reporting should also be reduced. Grassroots cadres should be relieved of low-value data entry and material uploading that do not contribute to substantive governance. Platforms should be evaluated by whether they help solve problems rather than by the volume of digital records they produce. Interoperability, data reuse, and closed-loop case handling are therefore central to genuine efficiency gains.

Platform integration also requires clear rules governing data rights and responsibilities. Institutions must specify which data may be shared, who is responsible for maintaining them, how access is authorized, how security is protected, and how accountability is assigned when problems occur. Data sharing can be both effective and trustworthy only when organizational responsibilities are clear.

6.5 Integrating Digital Governance with Locally Embedded Rural Governance Practices

However, rural governance cannot and should not be completely digitized. Emotions, interests, and social relations often involve complex, nuanced circumstances that call for the use of traditional resources such as the capital and social network of the acquaintance society, village rules and customs, villager deliberations, mediation by key local figures, and direct face-to-face communication. The use of digital technology in rural governance should be to supplement, not replace, self-governance, governance by rules, and morality-based and community-based modes of governance. Therefore, it is necessary to establish a combination of online identification of problems and offline negotiation and problem-solving. Digital platforms can be used to collect claims, record processes, and give feedback on outcomes, while grassroots organizations and entities are engaged in communication, coordination, emotional comfort, and dispute mediation, thereby giving full play to the

strengths of digital technology in terms of timeliness and traceability.

Furthermore, the integration of digital technology and rural governance should be mindful of the local social fabric and residents' living habits. Common information collection, communication, and administrative processing matters can be handled online, while complicated disputes and issues requiring public deliberation should be addressed through meetings, household visits, and face-to-face mediation. Only by integrating digital technology with rural communities and local context can its social sustainability be ensured.

6.6 Strengthening Accountability and Data Security Safeguards

When we work on digital governance, we're dealing with massive amounts of personal information and public affairs data. That's why we need strong accountability rules and security safeguards. Some teams focus at building platform fast instead of thinking about long-term maintenance, we collect tons of data but never bother updating it, and who even follows up on public appeals logged into the system? These messy issues happen because no one's clearly defined who's responsible for four key tasks: platform construction, operation and maintenance, data updates, and data use. This may cut down most of these problems, to some extent.

When a resident submits a problem through digital channel, we have to clearly spell out who's in charge, how long processing will take, how we'll give feedback, and what system keeps our work in check. Accountability mechanisms make sure every public claim goes through a complete closed loop, so no issue gets dropped or forgotten halfway. Also, we can't collect more data than we need or keep asking for the same details repeatedly, we have to stick to principles of necessity and proportionality when gathering information. We may strengthen access control and authorization procedures, this helps reduce risks of information leakage and misuse.

Security can't be used as excuse for organizations to refuse cooperation. Chasing efficiency too hard might make us ignore privacy or misuse data that should be handled legally, and that would only hurt public trust over time. If we work on both accountability and security based in same priorities, digital governance can boost efficiency while keeping

that public trust strong.

7. Conclusion

Digital technology has become an important instrument for the modernization of rural governance. By improving information transmission, restructuring public service delivery, expanding channels for villagers' claims and participation, and strengthening governance oversight, digital systems can generate substantial new governance capacity. Yet technology is not inherently or uniformly empowering. In rural social contexts, digitalization can also produce digital exclusion, grassroots administrative burden, platform fragmentation, and relational alienation. The result is an governance paradox in which greater governance capacity coexists with new governance costs.

The analysis suggests that this paradox is generated by four interrelated mechanisms: technocratic bias in governance, insufficient digital capacity among grassroots actors, weak platform coordination and data-sharing arrangements, and the poor fit between standardized institutional design and heterogeneous rural governance contexts. These mechanisms demonstrate that the effects of digitalization are shaped less by technology alone than by the institutional and social arrangements through which technology is introduced and used.

Accordingly, digital rural governance should adopt a people-centered orientation, integrate online and offline services, strengthen the digital capacity of villagers and grassroots cadres, reduce redundant platforms and reporting, improve data sharing, reconnect digital systems with locally embedded forms of rural governance, and reinforce accountability and data security. The central objective is not the expansion of digital infrastructure for its own sake, but the creation of governance arrangements in which technology improves problem-solving, equity, responsiveness, and trust.

This paper is primarily a conceptual analysis based on existing scholarship and published scholarship and policy documents rather than field research in a specific village or county. Future studies should test and refine the proposed framework through comparative county- or village-level research. Interviews with village cadres, grid workers, ordinary

residents, and government service personnel could reveal how digital systems operate in everyday governance, how different groups experience their benefits and burdens, and under what institutional conditions the governance paradox is mitigated or intensified. Comparative designs could also examine whether the four proposed mechanisms vary systematically across regions with different demographic structures, fiscal capacities, platform architectures, and levels of digital literacy.

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