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The Human Cost of Digital Transformation: Exclusion, Accessibility and Citizen Vulnerability in Platform-Based Public Services

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Abstract

Digital transformation has changed the citizens' relationship with the state by shifting more and more public services to online platforms, mobile apps, digital identity platforms, and integrated administration platforms. The formal availability of an online service does not necessarily imply its equal or equivalent accessibility, although these developments can reduce transaction time, improve administrative efficiency and enhance transparency. From the perspective of human cost, this paper explores the four interrelated dimensions of digital exclusion, effective accessibility, administrative burden and citizen vulnerability of platform-based public services. It is based on a structured narrative and comparative secondary data methodology that synthesises peer-reviewed scholarly sources, recent cross-national research and authoritative sources from the International Telecommunication Union, the United Nations, OECD and World Health Organization. The comparative evidence shows that digitalisation can lead to a decrease of traditional costs for access to government services but shift or introduce other costs to citizens. Effective access remains constrained by inequalities in connectivity, digital skills, education, age, rural location, disability and language, as well as by complex and fragmented administrative systems. Another challenge with digital self-service is the potential for learning and compliance difficulties, reliance on intermediaries, privacy risks, and susceptibility to authentication or system failures. The paper constructs a framework of human cost in five dimensions: access, capability, administrative, psychological and vulnerability costs. It argues that the success of digital transformation should be assessed by whether citizens can access public services equitably, safely and with reasonable effort, rather than merely by the availability of technology or the volume of digital transactions.

Keywords: Digital transformation, digital exclusion, public services, accessibility, citizen vulnerability, administrative burden, digital governance, platform-based services

Introduction

Digital transformation is a key aspect of today's public-sector reform. Government interactions were traditionally based on physical offices, paper documents, and in-person communication but are now moving towards online portals, mobile apps, digital identity systems, automated processes, and integrated databases. Digital services, if well designed, can shorten waiting time,

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extend access beyond conventional working hours, enhance information accessibility, and ease administration. In this definition, digital transformation goes beyond the initial step of the computerisation of current processes to embrace institutional reintegration and rethinking the services based on the needs of the users. This transformation is occurring worldwide. The United Nations E-Government Survey 2024 (for all 193 UN Member States) shows that the development of digital government continues to improve. While there are regional and national-local differences, the percentage of the global population residing in countries that are considered lagging in digital-government development fell from 45.0% in 2022 to 22.4% in 2024 (United Nations Department of Economic and Social Affairs, UN DESA, 2024). Expansion, however, should not be equated with inclusion. The International Telecommunication Union (ITU) stated that in 2025, approximately 6.0 billion people (or 74% of the world's population) used the Internet while about 2.2 billion people were not. Use of the internet was 94% in a high income country but 23% in a low income country; 85% of urban populations used the internet compared to 58% of rural populations. Estimated use was 77% for men and 71% for women; and 82% of the population aged 15 to 24 was online, and 72% of the rest of the population (ITU, 2025). Such disparities are especially impactful when services such as healthcare, banking, and transportation rely on digital infrastructure for access, or when these platforms are intricate and demand navigating through a vast array of information.

Digital inequality is not limited to access of the Internet. The inequalities in usage and outcomes (Helsper, 2012) and in physical connectivity have been a step forward in the research, and the model of inequalities in economic, cultural, social and personal resources is relevant to the 'linkage' between digital exclusion and inequalities. A citizen can have a smartphone and mobile data, but not be able to comprehend eligibility requirements, to go through proper identity verification, to upload documents properly or to bounce back from the failed transaction.

This is particularly true in public services where citizens have no control over whether they need social protection, civil registration, identity documentation, pensions, administration of healthcare, or taxation, or whether they need a licence. Where such services are platform-dependent, access to the platform can be a barrier to rights, entitlements or legally required transactions. Research on digitalised welfare demonstrates that digital-by-default welfare systems can be demanding on citizens' self-service, for already disadvantaged citizens (Schou & Pors, 2019). Human cost is used in the study as an analytical concept rather than as a monetary measure or standalone theory. It encompasses the burdens, disadvantages and risks that citizens may experience when access to essential public services increasingly depends on digital platforms, including exclusion, learning and compliance requirements, authentication difficulties, psychological stress, reliance on intermediaries, privacy and cybersecurity risks and service disruptions. The idea is influenced, in part, by administrative-burden theory, which suggests that learning, compliance and psychological costs of citizen-state interactions are indicators of administrative burden (Moynihan et al., 2015).

The research problem is the disconnect between traditional indicators of successful digital-government and conditions for successful citizen access to digital-government. Governments

can report on numbers of online services, registered users or completed transactions but will not capture users who try and fail to access the service, users who abandon an app, users who repeatedly try to log in, users who are assisted by the government to access services or users who do not use the service. Data from Ukraine further shows that accessibility is not the same as equal and inclusive use and that the use is different, depending on digital competencies, access to the Internet, age, education, place of residence, trust and data protection concerns (Larin, 2026). The body of existing knowledge about digital government, digital divide, administrative burden and cybersecurity is extensive, but each is typically studied in isolation. Less focus has been paid to understanding how they work together to create compounded citizen-level impacts when critical services are platform specific. This study aims to fill this gap with four objectives: (1) to explore transformations of administrative and access burdens from institutions to citizens as a result of platform-based transformation; (2) to identify structural, demographic, capability-related and institutional factors associated with exclusion; (3) to analyse how platform design, administrative complexity, data practices and technological dependence create vulnerability; and (4) to develop an integrated framework to assess the human cost of digital public-service transformation.

RQ1. How can digital transformation expand overall access to public services while simultaneously generating new forms of exclusion? RQ2. What structural, demographic, capability-related and institutional factors influence effective access to platform-based public services? RQ3. How does platformisation redistribute administrative burdens and create new forms of citizen vulnerability? RQ4. What institutional and design measures can minimise human costs while retaining the benefits of digital public-service transformation? It proposes a framework of five dimensions – access, capability, administrative, psychological and vulnerability costs – to evaluate digital transformation, arguing that access to the service and public value, not technology alone, are the parameters by which to measure it.

Literature Review

The initial approach of e-government scholarship was to focus on efficiency and the minimizing of bureaucratic friction through the use of information and communication technology. In the digital era, this expanded to include the concepts of administrative reintegration, needs of the users and full digitalisation (Dunleavy et al., 2006). however, digitization does not necessarily produce substantive organizational change. Cordella and Tempini (2015) demonstrate that digital systems can streamline certain administrative activities and maintain or transform other administrative activities. In terms of public value, increased efficiency does not always lead to better accessibility, privacy or accountability (Bannister & Connolly, 2014). The OECD also highlights the need for digital public services to be accessible, equitable and user-focused (OECD, 2022). In the context of e-Albania platform, Prifti and Sinoimeri (2025) highlight this tension, which is manifested in a mix of benefits in terms of efficiency and access to services, on one hand, and infrastructure, technical and digital-literacy obstacles, on the other.

Studies on the digital divide have now progressed to a broader concept of connectedness and disconnection. Digital inequalities are related to other socioeconomic and personal inequalities, as Helsper (2012) has shown, and even in the case of a widespread Internet availability, digital

inequalities remain, as van Deursen and van Dijk (2014) have indicated. Lythreatis et al. (2022) name socioeconomic conditions, demographic characteristics, digital skills, infrastructure and social support as important determinants of digital inequality. In the field of public services, this literature suggests a differentiation between formal and effective accessibility. A service might be formally online and available, but citizens may have inadequate connectivity, digital skills, understanding of procedures, authentication capability, and support to access the service. Digital accessibility is thus a sequential process, meaning exclusion can happen at various points in the service process even once someone is able to access the Internet.

Age, education, language, place of residence and disability can intersect with existing be used inequalities and shape citizens ability to use digital publics effectively. Buchert et al. (2023) demonstrate that poor digital literacy, language barriers and lack of knowledge of welfare services can be a barrier to the use of digital services independently by older migrants. Similarly, Li et al. (2026) find that older, less educated and migrant populations in e-government services in China face greater difficulties. Lack of infrastructure, poor connectivity, and low digital literacy also can limit access in rural settings (Mone et al., 2026). Persons with disabilities can also suffer from accessibility barriers when digital interfaces, verification or documents are incompatible with assistive technologies. In 2021, WHO estimates that some 1.3 billion people (16% of the world population) lived with a high level of disability (WHO, 2022).

An important principle to consider when thinking about the effects of digitalisation on the citizen level is administrative-burden theory. Moynihan et al. (2015) differentiate between learning, compliance and psychological costs in citizen–state relations. Fragmented systems can exacerbate these burdens with complicated registration processes, disconnected databases and limited access to information, while digital systems can alleviate these burdens with streamlined systems, interoperable databases, and clearer response from the system. Digital transformation is thus not inherently about the eradication of bureaucracy, but also about shifting administration away from institutions to citizens.

Schou and Pors (2019) demonstrate how digital self-service can impose new burdens on citizens and exacerbate inequalities. These burdens can be exacerbated by institutional fragmentation. Saaida and Ayyat (2025) note that weak interoperability, limited infrastructure, and insufficient digital skills and inadequate data governance are significant constraints in developing-country settings whilst Baddam (2026) points towards the access benefits and privacy, security and governance risks of integrated digital public-service systems.

The literature reviewed collectively demonstrates the potential of digital transformation to create more efficient and accessible public services, but also to create new forms of exclusion, administrative burden and citizen vulnerability. Previous research, however, tends to isolate issues of digital access, users' capacity, institutional design, administrative burden and privacy. Their cumulative interaction has received less attention, as necessary public services become more and more platform-specific. The present study fills this gap by incorporating these dimensions in a human-cost context that emphasizes effective accessibility and citizen vulnerability.

Research Methodology

The study employs a qualitative, descriptive and comparative secondary data approach to examine exclusion, accessibility and citizen vulnerability in platform based public services. No primary data were collected through surveys, questionnaires, interviews or field observations. it is based solely on published evidence. Narrative review and comparative secondary data analysis. The evidence base is on peer reviewed research on digital government, digital inequality, administrative burden, accessibility and citizen vulnerability, and recent empirical research on digital public-service delivery in Albania, Ukraine, Indonesia, Finland and China. Current statistics and policy evidence are sourced from authoritative institutional sources such as the International Telecommunication Union (ITU), United Nations Department of Economic and Social Affairs (UN DESA), OECD and World Health Organization (WHO). Sources were purposively selected on their relevance, methodological quality, empirical contribution and verifiability. The analysis groups the factors into the following categories: access resources (connectivity, devices, affordability); capability factors (digital skills, education, language, age-related capabilities, accessibility needs); administrative accessibility (usability, authentication, documentation, interoperability, support); and citizen vulnerability (privacy and cybersecurity risks, dependency on intermediaries, service disruption, psychological burden). The analysis integrates five dimensions of human cost: access, capability, administrative, psychological and vulnerability costs. The study does not seek to establish causal relationships, rather, it identifies recurring mechanisms across the reviewed evidence. Comparisons across countries are difficult due to variation in definitions, the design of research, and the populations examined; results of particular studies are thus interpreted as contextual evidence rather than statistically generalizable results.

Analysis and Discussion

Digital Expansion and the Persistence of Unequal Access

Digital transformation has reduced the importance of physical distance by enabling document submission and citizen government interaction beyond conventional office settings and working hours. However, digital delivery does not an ensure universal access because connectivity and digital capabilities remain unevenly distributed.

Table 1*:* Selected Indicators of Global Digital Inequality, 2025

Indicator	**2025 estimate**
World population using the Internet	74%
People remaining offline	2.2 billion
Internet use in high-income countries	94%
Internet use in low-income countries	23%
Urban population using the Internet	85%
Rural population using the Internet	58%
Men using the Internet	77%

Women using the Internet	71%
Youth aged 15-24 using the Internet	82%
Rest of the population using the Internet	72%

Note: Data from International Telecommunication Union (2025).

The impact of these disparities will vary with the level of platform dependence. Where digital services remain optional, poor connectivity may primarily reduce convenience, where digital platforms become dominant or effectively mandatory, however, poor connectivity can become a substantive barrier to public services. Substantive access can also be limited in the face of an online platform that has become dominant or is effectively required. Even when overall progress is good on the national scale, there can be internal differences. Despite this, UN DESA (2024) finds that there is still strong capacity building in digital-government, but also gaps between national and local capacity. However, the ability of the State to offer a platform is not the same as citizens' ability to make effective use of it. This difference is supported by the evidence from Ukraine, the Internet accessibility, digital skills, age, level of education, place of residence, confidence and concerns about data protection influence digital-service engagement (Larin, 2026). Village-level studies also reveal infrastructure constraints can compound institutional capacity issues to create inequities in service effectiveness (Mone et al., 2026). Digital transformation can enhance access to aggregates but, some groups may still be disadvantaged due to the fact that not every difference in resources, skills, support or platform usability can be overcome by eliminating physical distance.

From Connectivity to Effective Accessibility

Connectivity is just the first step in a transaction in a digital public-service system. Effective use may require suitable device, a mobile number or email address, identity-verification documents, the ability to upload documents and the capacity to interpret digital notifications. Each requirement creates another possible point of failure. This is why digital inequality still exists despite high rates of Internet connection. For Van Deursen and van Dijk (2014) it is the quality and nature of the use that becomes more unequal, whereas for Helsper (2012) it is the resources, skills, and motivation. Expansion of infrastructure is thus not sufficient to guarantee equal access to complex administrative structures. The illustration of the cumulative nature of exclusion is demonstrated by age. According to ITU data, 82% of the population aged 15-24 is online in 2025, whereas only 72% of the rest of the world's population is online. Age should not be equated with technological incompetence, its effects may intersect with previous digital experience, education, income, disability, and service complexity. Buchert et al. (2023) illustrate how independent use was more challenging for older migrants from Russia, with language limitations, lack of knowledge of welfare institutions, and lack of digital skills and fear of making mistakes combining to make it more difficult.

Similarly, Li et al. (2026) note increased challenges for older, less educated and migrant users in China. It is worth contrasting with Albania. Prifti and Sinoimeri (2025) find that the e-Albania platform provides significant gains in terms of accessibility, but they also point to issues related to digital-literacy and infrastructure/platform-reliability issues. For rural and remote citizens, digitalisation can therefore produce a dual effect, it may reduce travel costs

while simultaneously creating new connectivity and capability requirements. Disability too has a relational nature of accessibility. According to WHO, in 2021 there were approximately 1.3 billion people living with a significant disability, which is 16% of the world's population (WHO 2022). The barrier of a digital service that does not require going to a non-accessible office can be overcome, but the poor labelling of interfaces or authentication methods that are inaccessible to assistive technologies can also be a barrier. Accessibility, therefore, should be seen not simply as the presence of a portal or Internet connection, but as the successful and efficient transition from a service need to a substantive administrative outcome.

Digital Self-Service and Redistribution of Administrative Burden

The drive for digital transformation is frequently linked to administrative efficiency, such as fewer paper forms and reduced counter-based service, automated processing and lower transaction costs. These gains are significant, but it would also seem to be an important question to consider whether some of the administrative burden has been moved from institutions to users. Administrative-burden theory distinguishes three forms of burden – 1) learning costs, 2) compliance costs, 3) psychological costs. All three can be reduced through well-designed digitalisation. Services can be easier to find, databases can be interoperable to avoid duplication of effort when documenting, and up-to-the-minute status information can minimise uncertainty. OECD (2022) therefore advocates user-centred service journeys and appropriate reuse of information. However, these gains may not materialise when existing bureaucratic procedures are merely transferred online rather than substantively simplified.

The citizens are likely to encounter elaborate electronic forms and multiple authentication, document format requirements, and generic automated rejection messages. Digitalisation does not always lead to a decrease of administrative work, but instead moves it elsewhere. When public agencies fail to coordinate effectively citizens may be required to perform the coordinating work themselves. This challenge is demonstrated in numerous digital-governance research platforms in the local context, including multiple submissions and procedures that keep manual verification processes behind a digital interface. These can re-create traditional complexity in the form of digital bureaucracy. Self-service can also lead to the reliance on family, neighbours, community groups, cybercafes or services provided by third parties. Supporting inclusion can increase the chances of inclusion, but a dependent reliance can diminish privacy and autonomy especially in welfare, health, taxation and identity-related transactions. This constraint is not evident in traditional performance metrics. When a digital transaction is completed, there is no evidence that it took repeated attempts, a lot of help from an intermediary or that it involved disclosure of sensitive information. Transaction volumes are thus just a partial measure of accessibility. Digital platforms offer the most value when they streamline processes, but when not well-designed and not combined, these systems can be cause for citizens to bear the burden of learning, compliance and troubleshooting. Individual resources are not the only determinants of citizen accessibility: institutional structures in digital platforms also matter. Public-sector systems tend to fragment across agencies, leading to the creation of different databases, credentials, interfaces and procedures. Interoperability is thus both technical and accessibility.

While API-based and cloud-native designs offer benefits in terms of better integration and accessibility, Baddam (2026) describes the need to identify disconnected systems and inconsistent interfaces as ongoing challenges. Where verified information can be lawfully exchanged across interoperable systems, repeated data submission can be reduced, where systems remain fermented, citizens effectively become information carriers between agencies. The experience of developing countries indicates that fragmentation often happens in the context of poor infrastructures, low level of resources, low digital literacy and poor data governance (Saaida & Ayyat, 2025). Similarly, Mone et al. (2026) highlight the importance of institutional preparedness and capacity building for successful digitalization at village level.

The results indicate that Cordella and Tempini's (2015) thesis to consider ICT as a part of bureaucracy, not necessarily a replacement for it, is substantiated. Therefore, the success of a digital public service must be judged not by the presence of an online form, but by its successful completion in its entirety. Some exclusion is a governance problem, not just a skill problem: where databases remain poorly integrated, citizen may be required to compensate for institutional gaps through repeated information submission and navigation of complex procedures. Platform based public services handle sensitive data, such as identity information, financial conditions, health information, taxation information and entitlement histories. Better data integration means easier services, but also more critical privacy, cyber security and institutional accountability. And identifies risks that can result in operational disruption, financial loss and loss of trust as unauthorised access, data breach and cyberattacks. Citizen vulnerability isn't just about the likelihood of being attacked, however. Moreover, it highlights an unequal dependency: those in need of essential services may lack an effective control over whether or not to provide information, or which platform or how administrative data are processed. Failure will thus have service specific consequences. Failure of an entertainment platform is typically an inconvenience, failure of a pension, welfare, health, taxation or identity platform can impact income, care, legal compliance or access to another entitlement. Technical reliability can then be seen as an accessibility issue. Trust is a result of and a requirement for digital-government involvement. Citizens must be assured that information will be safeguarded, that errors are reparable, that choices can be questioned, and that human assistance will be provided in case digital processes go wrong. It is therefore a more important concept in public value that Bannister and Connolly (2014) emphasise: greater processing means not necessarily better government if it comes at disproportionate expense of issues of privacy, access and accountability.

Table 2: Human-Cost Framework for Platform-Based Public Services

Dimension	**Typical mechanisms**	**Potential citizen consequences**
Access cost	Weak connectivity, unaffordable data, unsuitable or unavailable devices	Inability to reach services, repeated attempts, continued travel

Capability cost	Limited digital skills, language barriers, disability, unfamiliar procedures	Errors, abandonment, dependence on assistance
Administrative cost	Authentication, repeated data submission, documentation, fragmented platforms	Time loss, compliance burden, delayed service
Psychological cost	Fear of mistakes, uncertainty, lack of understandable support	Stress, reduced confidence, avoidance
Vulnerability cost	Privacy exposure, cyber risks, service outages, dependence on intermediaries	Loss of confidentiality, fraud risk, interrupted or denied access

Source: Author's conceptual synthesis based on digital-inequality, administrative-burden and public-value literature, particularly Helsper (2012), Moynihan et al. (2015), Schou and Pors (2019), and Lythreatis et al. (2022).

These categories overlap. For example, an older rural individual might experience poor connectivity as well as low digital literacy, poor identity verification and poor access to support services. Human costs are cumulative and multidimensional, addressing one barrier may therefore be insufficient. Improved broadband cannot compensate for poor design, training cannot resolve system outages, and usability improvements cannot simplify inherently complex administrative procedures. Similarly, OECD (2022) places users' needs at the center of its focus, places the right service channels and stresses the avoidance of exclusionary barriers.

Assessment must transcend digital supply. Along with portals, registered users, completed transactions, governments should explore failed authentication, abandoned applications, repeated attempts, assisted transactions, accessibility complaints and any differences in access or transaction results by demographic and geographic segment. These measures can identify citizens who do not finish the satisfaction survey.

finally, services should be developed around whole citizen journeys. Repeated submission might be limited by interoperability and lawful reuse of verified information, subject to the principle of data minimisation, transparency and accountability. A commitment to accessibility should be incorporated into the design process by making it compatible with assistive technology, easy to understand, using appropriate authentication methods and providing low bandwidth options. Digital-literacy programs must be in addition to, not instead of, institutional responsibility. To minimise the impact of digitisation on people, attention needs to be paid to capability, administrative simplification, accessibility, interoperability, privacy and security, as well as infrastructure and meaningful assistance.

Conclusion

Digital transformation has increased the accessibility, ease and likely efficacy of public services, but digital gains are not guaranteed and unearned. The evidence reveals the benefits of digitalization in mitigating waiting, geographical distance and paper-based processes and in

establishing new dependencies related to connectivity, devices, digital skills and authentication systems and administrative design. The first research question was about the viability of having better access to aggregates and exclusion. This is because there is a difference between formal availability and effective accessibility. Some citizens may have trouble or be unable to access a service that is available online. This is further illustrated by the inequalities of connectivity around the world; in 2025, 2.2 billion people were still offline, and there was significant disparities by income, residence, gender and age (ITU, 2025).

The second question focused on the factors that influence good accessibility. Often times, connectivity, device access, digital skills, education, language, age-related capabilities, disability, rural infrastructure, and institutional support and service complexity intersect. Assessing accessibility should then be done by the ability of the citizens to move from a service need to a substantive outcome rather than simply by the presence of a portal. The third question was about administrative burden and vulnerability. If procedures are kept simple and information is reused in the right places and systems are interoperable, digital systems can help to lower learning and compliance costs. Instead of merely replicating the bureaucracy in the digital realm, citizens could be expected to take on more responsibility for interpreting rules, handling credentials, submitting evidence and handling technical issues. Additional vulnerability comes in the form of privacy exposure, cyber risks, outages, and reliance on intermediaries.

The main conceptual innovation of the paper is the Human-Cost Framework for Platform-Based Public Services, which includes access, capability, administrative, psychological and vulnerability costs. It links to public-value and administrative-burden theory, and digital-inequality scholarship, while highlighting the cumulative nature of exclusion. The framework is of an analytical type and not a validated quantitative index. Policy needs to be about enabling access instead of just nominal access: easier end-to-end service journeys, better interoperability, accessible design, privacy and cyber security protections, meaningful human access and appropriate alternative communication channels. Digital transformation should remove – not simply move – administrative hurdles from agencies to citizens.

Further research is required to directly study failed and assisted transactions, to compare burdens within social groups and through service channels and to explore the impact AI-enabled public services have on exclusion and vulnerability. Finally, the success of digital-government should be assessed on the basis of whether citizens of different resource and capability levels are able to access public services, rights and entitlements fairly, safely and with reasonable effort.

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