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Examining the Influence of Digital Public Service Transformation on perceived Socioeconomic Development: Evidence from Gimbi Town Administration, West Wollega

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Abstract

The digital public services transformation has been seen as a useful tool for enhancing public service delivery and perceived socioeconomic development. Yet, there is limited literature on the contribution of different aspects of digital public services in the perceived socioeconomic development of local governments in Ethiopia. This study analyzed the relationship of digital public service transformation on the perception of socioeconomic development in Gimbi Town Administration in Ethiopia. The quantitative research design was used in conducting the study. Primary data was obtained from 350 valid response citizens who had prior experience with digitally transformed public services using a structured five-point Likert-scale questionnaire. Descriptive statistics, reliability analysis, and multiple linear regression techniques were used for analyzing the data. The results indicated that participants perceived high efficiency ($M = 3.64$), responsiveness ($M = 3.73$), and usefulness ($M = 3.87$) of digitally transformed public services while low accessibility ($M = 3.15$) and availability ($M = 3.01$). Perceived socioeconomic development was measured by a mean value of 3.47 ($SD = 0.77$; $N = 350$). The multiple linear regression model was significant, $F(5, 345) = 456.653$, $p < .001$. All five dimensions of digital public services transformation exerted positive and statistically significant influence on the perception of socioeconomic development, which included accessibility ($\beta = .347$), availability ($\beta = .325$), efficiency ($\beta = .283$), usefulness ($\beta = .281$), and responsiveness ($\beta = .276$); all were statistically significant ($p < .001$). While accessibility demonstrated the strongest positive standardized beta coefficient, responsiveness showed the lowest coefficient; however, the effect was still statistically significant. These results indicate that enhancing digital public services' accessibility, availability, efficiency, responsiveness, and usefulness may lead to greater perceived socioeconomic benefit. The paper suggests that Gimbi Town Administration should focus on accessible, available, efficient, responsive, and citizen-focused digital public services.

Keywords: Digital public service transformation; digital government; socioeconomic development; availability; accessibility; efficiency; responsiveness; usefulness Gimbi Town; Ethiopia.

1. Introduction

Digital transformation is becoming more and more prevalent when it comes to the process of how the government manages administrative procedures, interacts with its citizens and provides public services. The transition from electronic government to digital government has meant that the focus is no longer placed on technology, but rather on transforming government processes and citizen-focused services (Dunleavy et al., 2006; Janowski, 2015). When it comes to local government, this is especially important as citizens encounter the government most often through public services. Consequently, digital public service transformation does not just entail the use of technology, but also the provision of better accessible and useful services (Androniceanu, & streimikienė, 2025). Prior research was predominantly focused on the analysis of factors such as the adoption of e-government, quality of services, trust, citizen satisfaction, and performance of administration. It has been found out that perceived usefulness, trust, quality of services, and design from user perspective affect the adoption and assessment of online public services by citizens (Carter & Beanger, 2005; Welch et al., 2005; Tolbert & Mossberger, 2006; Teo et al., 2008; Verdegem & Verleye, 2009). Nevertheless, such factors serve only as proximate measures of performance of digital governments and cannot provide an answer to whether digital public services make citizens benefit socially and economically.

For that reason, recent studies have started expanding their scope from service-level effects to well-being and quality of life. Fan et al. (2022) discovered that e-government efficiency could foster subjective well-being, whereas (Vasylieva et al. 2026) identified a positive relationship between the development of e-government and quality of life based on evidence from 76 countries. Jiang et al. (2026) and Li et al. (2026) also detected positive relationships between digital public services, digital technology, and subjective well-being mediated by livelihood, education, health, socialization, infrastructure, and convenience. Those results imply that digital public services might yield effects that go beyond the administrative efficiency of government operations. However, those effects are contingent on citizens' ability to access and utilize digital services, which is affected by digital literacy, infrastructure, costs, and institutions (Ji, H., et al., 2026; Abdurahman, S., & Kabanda, S. 2024; Alaei & Chan, 2026).

This aspect becomes even more critical in the context of Africa because digital transformation is taking place with certain constraints on the ground of infrastructure, connectivity, capabilities, and capacity of institutions. As can be seen from evidence in Ghana and Kenya, e-government can enhance efficiency, accessibility, responsiveness, transparency, and the quality of public services, but implementation and technological problems can undermine these gains (Osei-Kojo, 2017; Ngeywo & Ghabon, 2026). With regard to Ethiopia, several papers have explored the issues of e-governance, public services, the performance of e-government, citizen satisfaction, and digital public infrastructure (Pathak et al., 2007; Yehuala, D.M (2017); Mishra & Geleta, 2020; Goshu & Nasir, 2025). However, empirical research on how digital transformation of public services in local government affects socioeconomic development experienced by citizens is comparatively scarce. The question is especially important given the fact that the Digital Ethiopia 2030 Strategy prioritizes digital infrastructure, digital skills, digital public services, and inclusive digital development. The achievement of these goals requires the provision of high-quality digital services on the part of local institutions.

Initial results from a pilot study in Gimbi Town Administration underscore this implementation challenge. The pilot determined that the electric power utility, water service office, Ethio-telecom, trade office, agriculture office, MESOB service, and land administration office are institutions where some level of service digitization process has started. But the degree of digitization process varies by institutions, and the services provided by the institution are still largely dependent on physical or manual processes, with low interaction between the different service-providing offices. According to the initial results from the pilot study carried out through interviews, small-scale surveys, self-assessments, skill tests, and observations by the research team, approximately only 39% of the surveyed government employees have the digital skills needed to deliver the services digitally, while the network connectivity is limited and unreliable. The Gimbi evidence therefore points to a potential gap between national digital-transformation ambitions and local implementation. Where digital systems remain fragmented, digital skills are limited, and connectivity is unreliable, citizens may not consistently experience the expected benefits of digital public services. More importantly, there remains insufficient empirical evidence showing whether the quality and functionality of these services are associated with broader socioeconomic outcomes in Ethiopian local-government settings. Existing studies have largely examined adoption, service quality, satisfaction, trust, governance, or administrative performance, while emerging evidence on well-being has mainly originated from other geographical and institutional contexts.

The current study seeks to fill the aforementioned empirical gap by exploring how far five key dimensions of digital transformation of public services namely; accessibility, availability, efficiency, responsiveness and usefulness have an impact on socioeconomic development at the level of Gimbi Town Administration. Rather than merely assessing whether digital technology has been introduced, the current study looks at the citizen experience with digitized public services as well as the socioeconomic implications thereof.

The study will specifically seek to:

1. To examine the influence of digital public service availability on perceived socioeconomic development
2. To examine the influence of digital public service accessibility on perceived socioeconomic development
3. To examine the influence of digital public service efficiency on perceived socioeconomic development
4. To examine the influence of digital public service responsiveness on perceived socioeconomic development Gimbi Town Administration
5. To examine the influence of digital public service usefulness on perceived socioeconomic development.

2. Literature Review and Hypothesis Development

2.1 Conceptualization of Digital Public Service Transformation

In turn, the current research trend in the area of digital public services has focused on the outcomes of using digital technologies by the government, rather than the adoption of technologies themselves. Previous research mainly focused on e-government adoption, service quality, citizen satisfaction, trust, and administrative efficiency (Al-Hujran, et al., 2015; Moon, 2002; Al-Adawi, et al., 2005). The current research trend expands the discussion to the outcomes related to quality of life, subjective well-being, social inclusion, and more general socioeconomic outcomes (Fan et al., 2022; Vasylieva et al., 2026). Importantly, the developmental potential of digital public services lies not only in their digitalization, but in citizens' ability to access, use and benefit from them.

For the current research, digital public service transformation is defined in terms of the following five dimensions: accessibility, availability, efficiency, responsiveness, and usefulness. Socioeconomic development is defined as a multidimensional concept encompassing economic opportunities, social services, savings of time and money, and quality of life/well-being. In this context, the following sections provide the synthesis of empirical research on the relationship between each dimension of digital public service transformation and socioeconomic development.

2.2 Theoretical foundations

This research will be mainly based on Public Value Theory (PVT), with the help of Digital-Era Governance (DEG) theory, in analyzing the potential impact that the digitalization process in the field of delivering public services can have on citizens' perception of the socioeconomic development of their situation. Public Value Theory, initially proposed by Moore (1995), changes the emphasis within public sector management from efficiency in administrative procedures to the creation of results and benefits that the citizens and wider society would value. According to this approach, public service should not only be considered as something that can be achieved by technology implementation in the work of government entities or reducing costs associated with public administration. The value of the service, which was created, is in improvement of citizens' experience, capability, opportunities, or any other positive result that it brings. This idea is proved to be very relevant to analyze the situation connected with digital public services nowadays. Some recent empirical studies showed that digital public services can create value for citizens' lives through providing better-quality services, increased satisfaction, productivity, communication, trust, etc.

2.3 Public Value Theory

Public Value Theory (PVT), advanced by Moore (1995), provides the theoretical basis for explaining how digital public services can contribute to citizens' perceived socioeconomic development. The theory emphasizes that public services should be evaluated not only by administrative efficiency or technological adoption but also by the benefits they generate for citizens and society. Digital public services can create

public value by improving service quality, reducing transaction costs, saving time, and expanding access to public services and socioeconomic opportunities. Recent studies similarly demonstrate that digital government can generate individual and societal benefits, including improved productivity, citizen satisfaction, trust, and cost savings (MacLean & Titah, 2022; Luna et al., 2024).

In this study, PVT explains the expected relationships between the five dimensions of digital public services and perceived socioeconomic development. Accessibility can reduce physical and procedural barriers, while availability ensures that services can be accessed when needed. Efficiency can minimize administrative delays and transaction costs, whereas responsiveness can strengthen communication between citizens and government institutions. Usefulness reflects the extent to which digital services meet citizens' needs and provide practical benefits. These service characteristics may improve citizens' access to information, public services, and socioeconomic opportunities, thereby contributing to perceived socioeconomic development. This argument is consistent with the view that digital government creates public value when technological improvements translate into meaningful benefits for service users (MacLean & Titah, 2022; Luna et al., 2024). Accordingly, PVT provides the theoretical justification for examining the relationships between accessibility, availability, efficiency, responsiveness, usefulness, and perceived socioeconomic development in Gimbi Town Administration, Ethiopia.

2.4 Digital-Era Governance theory

Whereas Public Value Theory offers an understanding of why advances in digital public services ought to be important to citizens and society, the concept of Digital-Era Governance provides an additional perspective regarding how the organizational structures of government institutions could utilize technology in order to make significant changes in the process of delivering public services. The idea of Digital-Era Governance was born as an answer to fragmentation and functional separation of administrative structures and highlights three inter-related ideas that include reintegration, needs-based holism, and digitization (Dunleavy et al., 2006). This set of principles is important to this research because a successful digital public service transformation cannot be achieved simply through the digitization of already existing paper-based processes.

Current studies indicate that the Digital Era of Governance remains an essential framework for the analysis of modern public sector transformation. According to Ravšelj et al., digital technology is a key feature of the transformation of governance and public administration, while Lindquist identifies the digital era of government as an innovative phase of public sector transformation characterized by a change in the use of services, interaction, and administration facilitated through digital technology. Recent research by Dunleavy and Margetts (2025) shows that innovations in data science and artificial intelligence are contributing to Digital Era Governance by improving the ability of governments to gather, integrate, and analyze big data sets.

The link between the two theories could thus be explained in the following manner. In essence, Digital-Era Governance describes how governance changes have brought about changes in terms of service delivery, while Public Value Theory explains what the results of those changes are. The process of digital-era governance ensures that

public services can be made accessible, available, efficient, responsive, and valuable due to the organizational and technological conditions created by digital-era governance. As a result of these features of the services, public value is created by lowering the transaction costs of citizens, saving time, making services and information accessible, ensuring strong interaction with government, and increasing opportunities for citizens.

2.5 Theoretical relationship between Digital Government Services and Perceived Socio-Economic Development

Considering the integration of Public Value Theory and Digital Era Governance, this research suggests the existence of a theoretical mechanism where the transformation of digital public service provides socioeconomic value by means of citizen experience of public services enhancement (Moore, 1995; Dunleavy et al., 2006). The mechanism may be described as follows:

Transformation of digital public service → accessibility, availability, efficiency, responsiveness, and usefulness → reduction in time, cost, and procedural obstacles and increased service and opportunity accessibility → enhanced citizen capacities and opportunities → perception of socioeconomic development.

According to the Dunleavy et al., (2006); Ravšelj et al., (2022). The first phase relates to the digital transformation of government service provision. Digital-Era Governance claims that such digital transformation will help to create a more integrated, citizens-centered, and digitalized administration process. The second phase relates to the nature of service qualities of citizens. If digital services are easily accessible, constantly available, effective, responsive, and beneficial, then citizens will be able to get government services in a way that is less physically, informatively, financially, and procedurally complicated. The third phase relates to the creation of benefits for citizens. These benefits could be saved time, lowered expenses related to transportation and transactions, access to government information and services, enhanced capacity of interacting with government organizations, and better access to economic and social opportunities. The last phase relates to the evaluation of socioeconomic development from the perspective of citizens.

The theoretical model under discussion is supported by recent studies demonstrating that digital government may help create value for individuals and society. First of all, according to MacLean & Titah (2022), e-government contributes to several kinds of public-value results such as increased productivity, service quality, satisfaction, trust, and communication. Moreover, Luna et al. (2024) argue that the use of digital services leads to individual benefits, for example, the generation of cost savings and increased capabilities. At the same time, such benefits may also be viewed as societal ones. As a result, the concept of digital government remains to be used to describe an instrument for improving public services and creating social outcomes (Lee et al., 2024). In its turn, the present paper develops the notion of public value and examines empirically the link between five dimensions of digitally transformed public services including accessibility, availability, efficiency, responsiveness, and usefulness and perceived socioeconomic development.

Thus, the theory underlying the present study does not posit that the use of digital technology inevitably leads to socioeconomic development. Instead, it posits that digital technologies create the potential for public value if they enhance the quality and usability of public service delivery and create substantial value for citizens as a result of such enhancement. This point is essential since digitalization may yield minimal public value if the services provided are of low quality, not accessible to citizens, poorly designed, or disconnected from their real needs. In this sense, accessibility, availability, efficiency, responsiveness, and usefulness become the primary ways in which digital transformation of public services could be linked with socioeconomic development.

2.6 Digital Public Service Accessibility and perceived Socioeconomic Development

Accessibility is a basic requirement for the realization of the gains associated with digital public services. Digital government transformation has the potential to minimize geographic, bureaucratic, and procedural barriers by enabling citizens to gain information and access services without having to make repeated trips to government agencies. The early literature on e-government indicated that accessibility was one of the main gains anticipated in digital government. Stephen H, et al., (2003) showed that local governments used more e-government as a way to enhance the interactions and service delivery processes, whereas (McNeal, R., et al., 2008). Asserted that online government services could increase citizen access to public information and administrative services. Similarly, Norris and Reddick (2013) pointed out that digitalization of local governments can change how citizens interact with public organizations.

The empirical findings from Africa also confirm the importance of accessibility. In her study on e-government and public-service quality in Ghana, (Tiika, B. et al., 2024). Defined service quality in part based on service accessibility and indicated that e-government has the potential to increase service access while at the same time decreasing costs. On the other hand, poor ICT infrastructure, power outage, and illiteracy have also been recognized as constraints which can hinder citizens in deriving these benefits. This observation becomes especially important in the context of local-government situations, where the existence of digital platforms does not guarantee citizen accessibility.

The link between accessibility and welfare is being increasingly proven based on the recent literature. In a cross-country panel for 76 countries for the period of 2012-2024, (Acquah, A. 2024) have found that e-government development had positive effects on quality of life. The pathway mechanisms of their analysis include online public services and digital infrastructure as mechanisms through which digital government affects quality of life. Likewise, (Mahlangu, G., & Ruhode, E. 2021) have found, based on survey data from rural China, that digital public services are positively related with subjective well-being.

It is clear from the above findings that accessibility can help in socioeconomic development through allowing citizens to have access to the information and services that are provided through the government. However, there is not enough literature that has studied accessibility in the perspective of being a tool for achieving socioeconomic development through the process of adoption of digital services. Most of the available literature studies the role of accessibility in relation to service quality and adoption. Therefore, the current study argues

that better accessibility of digital public services will lead to better ability of citizens to have access to the services and resources that are needed for their socioeconomic development.

H1: Digital public service accessibility has a significant positive influence on perceived socioeconomic development.

2.7 Digital Public Service Availability and perceived Socioeconomic Development

Availability relates to the degree of consistency and accessibility of the digital services at the time when the citizens need them. Contrary to accessibility, which is focused on the citizens' ability to access and use services, availability is concerned about the availability and coverage of the digitally based services. The existence of a digital service that is always not available and accessible may be of little use to its development (Al-Kibsi, G., et al 2001).

Service availability was identified early in the field of e-government as a vital performance indicator. Lobonç, et al., (2026) posited that the online government would increase the accessibility and availability of public services, whereas (Mihaila, et al., 2024) put emphasis on the importance of perceived usefulness and compatibility as factors of e-government acceptance. Akhtar Shareef et al. (2014) proved the same point by showing that the citizens' acceptance of e-government depends on its maturity and characteristics.

Evidence from Ethiopia is highly relevant to this dimension. According to Yehuala, D.M (2017) who studied the implementation of e-governance in Ethiopia, the dimensions of service availability, responsiveness, transaction time, and transaction time and place flexibility should be considered when assessing the efficiency of e-government. In addition, the researcher stated that the success of e-government should not be limited to the financial results but the actual benefits and service results such as transaction time, responsiveness, service availability, and the costs of receiving services should be assessed. This implies that the development value of digital public services is largely determined by citizens' ability to receive them when needed.

Modern evidence from the international experience proves this point of view. In particular, according to Mahlangu, G., & Ruhode, E. (2021) the use of online public services and the development of digital infrastructure became one of the key drivers of quality of life increase. Also, Jiang et al. (2026) state about the significant association between the usage of digital public services and subjective well-being, as the use of digital services contributes to access to health, education, livelihood, social interaction, and other services.

Nevertheless, availability is still an important issue in developing-country environments. In his work, Bojang, M. B. (2019) has shown that the lack of infrastructure and power shortages is some of the constraints limiting the effectiveness of e-government in Ghana. In similar ways, the same issues apply to Ethiopia where connectivity, digital competence and institutionalism may impact the reliability of digital public services.

Thus, although available research shows that availability of the services is one of the factors contributing to the realization of the benefits of digital government, there is little empirical information regarding the link between such availability and socio-economic development of the citizens. This study is intended to fill the identified gap in the literature.

H2: Digital public service availability has a significant positive influence on perceived socioeconomic development.

2.8 Digital Public Service Efficiency and perceived Socioeconomic Development

Efficiency is one of the benefits often mentioned regarding digital government. Digital government can help decrease the time needed for processing, administrative procedures, duplication, traveling needs, and transaction costs related to getting access to government services. Hence, efficiency serves as an essential factor through which digital public services can create economic and social value for citizens (Hilhorst et al., 2022; Nyang'au, J. 2016).

According to Afonso, et al., (2024) e-government can help increase the convenience and efficiency of government services delivery as it decreases barriers connected with traditional administrative process. In addition, Finocchiaro et al., (2025) Pointed out that e-government could be an important way through which local governments would be able to increase their administrative and service procedures efficiency. The work of De Witte, et al., (2025) offers evidence in support of this position, as it shows that e-government can help to increase efficiency and lower costs of public-service delivery, thus improving its quality. Dogbe, et al., (2026) found transaction-processing times and costs involved in the provision of governmental services to be significant performance criteria for e-government programs. Thus, it could be assumed that the value of digital public services could be determined not only by the cost of the technological implementation or economic benefits but also by how much faster and more convenient services are provided compared to their manual provision.

The connection between the level of efficiency and outcomes for citizens is also revealed in literature about citizens' satisfaction and well-being. The study by Mishra & Geleta (2020), which was conducted among 123 users of an e-government program at Addis Ababa Vital Events Registration Authority, found perceived service delivery to be the full mediator of the relationship between e-government and citizen satisfaction. It means that the existence of the system per se is not sufficient for ensuring positive outcomes for citizens, but the quality and effectiveness of the service provided through the system matter. More recent studies develop this logic from citizens' satisfaction to welfare of the people. For example, Fan et al. (2022) have established the link between e-government efficiency and subjective well-being. Likewise, From the perspective of socioeconomic development, efficiency can bring benefits through decreasing the time and financial expenses that citizens need to access public services. Saved time will be used for production, education, family, and leisure activities. Likewise, transaction costs will affect the affordability and accessibility of public service access.

In spite of all these findings, most previous works on the subject investigated efficiency either as an outcome of e-government or as a determinant of satisfaction but not as the connection between these two concepts. That is why the current paper investigates the connection between the perceptions of efficiency of digitally transformed public services and socioeconomic development.

H3: Digital public service efficiency has a significant positive influence on perceived socioeconomic development.

2.9 Digital Public Service Responsiveness and perceived Socioeconomic Development

Responsiveness is defined as the ability of digitally mediated public services to respond quickly and suitably to the demands of citizens. Digital technology can help enhance the responsiveness of public services by offering quicker communication, digital submission of requests, automatic notification, feedback tools, and process monitoring (Tolbert and Mossberger 2006).

Responsiveness has been identified as one of the core dimensions of digital government through which it can be judged whether digital government works well or not by the previous literature on digital government (Karampotsis, et al., 2024). For example, (Lobonț, et al., 2026) highlighted that digital government can enhance the responsiveness of government through its communication and service delivery capabilities. There is more recent evidence from Africa showing that the issue of responsiveness still remains important. In their study of the e-government platforms in Kenya, Ngeywo and Ghabon (2026) paid special attention to efficiency, transparency, accessibility, and responsiveness of governmental institutions. Platforms analyzed in this research included e-Citizen, IFMIS, iTax, and Huduma services and their benefits and challenges related to the service delivery were discussed. It means that responsiveness still remains an important dimension through which digital platforms could improve service delivery in Africa.

Socioeconomic implications of responsiveness lie in its ability to decrease uncertainty, delays, number of visits, and administrative obstacles. Responsive digital service could provide citizens with timely information, quicker resolution of problems with service delivery, and fewer interruptions while completing transactions. These aspects could help in increasing the access of citizens to economic and social opportunities and thus ensure.

Nevertheless, the majority of studies have looked at responsiveness from an angle of service quality, governance, or citizen satisfaction. There is little research on the impacts of digital-service responsiveness on socioeconomic development of citizens especially in the context of local government in Ethiopia. Thus, the current research contributes to the existing body of knowledge by exploring the connection between the two variables.

H4: Digital public service responsiveness has a significant positive influence on perceived socioeconomic development.

2.10 Digital Public Service Usefulness and perceived Socioeconomic Development

Usefulness relates to how far citizens view digital public services as having the potential to assist in accomplishing service-related needs in an efficient and convenient manner. Perceived usefulness becomes a critical factor since the transformation of any developmental benefit by digitization can only be possible when the citizens see the services as useful and helpful in improving interactions with the government. Perceived usefulness, trust, and compatibility were found to be important factors in the adoption of e-government by Carter and Bélanger (2005). The research indicates that technological availability is not enough; citizens have to see the utility of digital services to their needs. This idea was further supported by the work of Teo et al. (2008), who proved the importance of quality of service and information in the success of e-government.

The value of usefulness is further reflected in research related to citizen satisfaction. Verdegem & Verleye (2009) stressed the user-oriented perspective in the evaluation of e-

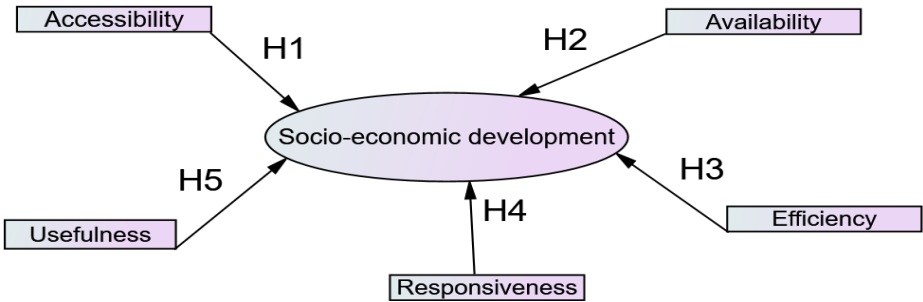
government and highlighted that citizens' experience and perception were critical in assessing the utility of digital services. In the context of Ethiopia, Mishra & Geleta (2020) demonstrated that the effect of e-government on citizen satisfaction worked through perceived service delivery, revealing that citizen outcomes depended not on the mere existence but on the usefulness of digital services.

It is worth noting that in recent years, there is evidence that the utility of digital public services can have a wider impact on welfare. Jiang et al. (2026) demonstrated that digital public services had a positive impact on subjective well-being by influencing such areas as livelihood stability, education and health care, social interaction, and convenience of life. Similar results were obtained by Vasylieva et al. (2026). Namely, the authors revealed that online public services served as an important channel between e-government development and quality of life.

However, the literature has used perceived usefulness mostly as an influencer rather than as a predictor of socioeconomic development in past research works. This paper, therefore, contributes to the existing literature in terms of investigating the influence of citizens' perceived usefulness of digitally transformed public services on socioeconomic development.

H5: Digital public service usefulness has a significant positive influence on socioeconomic development.

Figure 1 Hypothetical conceptual frame work



3. Methodology

3.1 Research Approach and Design

For the empirical analysis, this study utilizes a Quantitative research approach, employing an explanatory cross-sectional research design. The research approach is most suited for this study since the study endeavors to empirically quantify digital public service transformation and socioeconomic development and also statistically evaluate the relationship between digital public service transformation and perceived socioeconomic development of the residents of Gimbi Town. For primary data collection, structured questionnaire was employed, and data was subjected to descriptive statistics, reliability, validity, and correlation analysis. The study took place in Gimbi Town Administration. The study focused on citizens of the town administration who have had experience using digital public services of the town administration.

3.2 Target Population and Unit of Analysis

The target population in this study includes citizens of Gimbi Town Administration who have accessed or used any digital public service of the town administration. The individual citizen is the unit of analysis since socio-economic development outcomes occur at the level of individual citizen.

3.3 Sample Size and Sampling Procedure

The size of the sample was calculated using the suitable sample formula according to the size of the population and the level of precision. In cases where there is a large population size or the actual size of the population is not known, Cochran's formula could be used at 95% level of confidence and 5% margin of error: The minimum size of the sample was first calculated using Cochran's (1977) formula at 95% level of confidence, 5% margin of error and 50% population proportion. The minimum sample size calculated was 384 respondents.

For a large or unknown population:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Using the conventional assumptions:

$$Z=1.96 \quad Z = 1.96 \text{ for } 95\% \text{ confidence level}$$

$$p=0.50 \quad p = 0.50$$

$$q=1-p=0.50 \quad q = 1-p = 0.50$$

$$e = 0.05 \text{ margin of error}$$

$$n_0 = \frac{(1.96)^2(0.05)(0.50)}{0.5^2}$$

$$n_0 = \frac{(3.8416) \times 0.25}{0.0025}$$

$$n_0 = \frac{0.9604}{0.0025}$$

$$n_0 = \underline{\underline{384.16}}$$

Although the required sample size was 384, only 350 respondents provided complete data, representing a 91.1% response rate. This level of participation is sufficient to ensure the validity and reliability of the study results.

3.4 Data source and data collection

Data were collected from quantitative. Structured questionnaires were used for the survey of quantitative data. Structured questionnaires were administered to selected respondents in order to obtain the data needed for main study and testing the hypothesis formulated.

3.5 Data analysis procedures

The data obtained were coded and analyzed using SPSS. Descriptive statistical methods such as frequencies, percentages, means and standard deviation were used to describe respondents' characteristics and main study variables. Validity and reliability tests will be performed.

3.7 Model Specification

The study investigates the effect of digital public service on socioeconomic development. Multiple linear regression **models** were specified as

$$PSED = \beta_0 + \beta_1 ACC + \beta_2 AVA + \beta_3 EFF + \beta_4 RES + \beta_5 USE + \epsilon$$

Where:

PSED = perceived socioeconomic development

ACC = accessibility

AVA = availability

EFF = efficiency

RES = responsiveness

USE = usefulness.

β_0 = Intercept (Constant)

β_1 – β_5 = Regression coefficients of the independent variables

ϵ = Error term

3.8 Validity and Reliability

Cronbach's coefficient alpha can be used to assess dependability; it must be more than 0.70 (Nunnally, 1978; Field, 2013). High Cronbach's alphas highlight the high inters correlations between the scale's items, indicating that they constitute a single entity used to measure a certain construct. Cronbach's alpha as low as 0.60 is acceptable for hypothesis testing, according to other studies (Slater, 1995; Sekaran, 2000; Muhammad, 2010). Table 1 below makes it clear that each construct's Cronbach's alpha value is more than 0.70.

Table 1: Reliability Statistics

Construct	Numbers of Item	Cronbach's Alpha Realibility
Accessibility	5	.880
Availability	5	.855
Efficiency	5	.799
Responsiveness	5	.790
Usefulness	5	.838
Socio economic	12	.896

As per the results in Table 1 above, in the current study the Cronbach alpha coefficient of all constructs is greater than 0.7. This shows almost all constructs of current studies have a good internal consistency scale. Therefore, it is appropriate for further analysis and for hypothesis testing.

4. Results

4.1 Descriptive Result Analysis

Even though the minimum sample size was 384, 350 participants gave full responses, which resulted in a response rate of 91.1%. This is sufficient number of respondents to guarantee validity and reliability of the findings of the research study.

<i>Profile</i>	<i>Category</i>	<i>Frequency</i>	<i>Percent</i>
Sex	Male	255	72.9%
	Female	95	27.1%
Age	18–25 years	67	19.1%
	26–35 years	107	30.4%
	36–45 years	131	37.4%
	46–55 years	46	13.1%
	56 years and above	0	0.0%
Educational Level	Secondary education	14	4.1%
	Diploma	14	4.1%
	Bachelor's degree	151	43.3%
	Master's degree or above	169	48.5%
Occupation	Government employee	174	49.7%
	Private-sector employee	89	25.3%
	Self-employed/business	46	13.1%
	Farmer	2	0.5%
	Student	25	7.0%
	Other/Unemployed	15	4.4%
Frequency of Use	Rarely	2	0.5%
	Occasionally	25	7.0%
	Monthly	89	25.3%
	Weekly	140	39.9%
	Very frequently	95	27.3%

Gender composition: The gender breakdown of the sample is male dominated (72.9%), and this might show citizens of Gimbi Town whose use of service patterns in the finance and administration sectors are males. However, female respondents (27.1%) are noteworthy even though relatively smaller, and this reveals the possible existence of gender disparity in accessing digital services.

Age distribution: The majority of the respondent samples belong to the mid-career age bracket (26-45 years, 30.4%), and those with the highest proportion fall within the age range of 36-45 years (37.4%). This reveals that the use of digitally based services is mainly amongst experienced persons.

Education level: An extremely high number of the respondents have attained at least the bachelor's degree and master's degree levels (91.8%), indicating a highly educated sample of respondents. This shows the possibility of having a high level of understanding for using digitally-enabled public services.

Occupation: More than 40% of the respondent samples are government employees (49.7%), and the rest are the private-sector employees and self-employed respondents (25.3%, 13.1% respectively).

4.2 Types of Digitally Enabled Public Services Used

Table 2: Result of analysis on service types

Service Type	Frequency	Percent
Online government service/application	193	49.7%
Digital payment/e-payment service	164	42.3%
Online registration/certification	150	38.7%
Digital land/property-related service	98	25.3%
Digital tax/revenue service	154	39.7%
Online information/service portal	118	30.4%
SMS/mobile-based public service	27	7.0%
Other	2	0.5%

Out of the 350 individuals surveyed, the most popular digital public services were online governmental services (49.7%), digital payment services (42.3%), and digital tax/revenue services (39.7%). This reveals the significance of transactional and administrative services in the digitalization of public service delivery.

Moderate adoption rates were recorded for online registration/certification services (38.7%) and information websites (30.4%), showing that the residents depend on digital platforms not just for transaction but also for information purposes. Low adoption was observed for land/property-related services (25.3%), possibly because of low availability or lack of demand. SMS/mobile-based services and “other” services had low adoption rates of 7.0% and 0.5% respectively, revealing that conventional mobile technologies are losing ground to web-based platforms.

Table 3: Descriptive result of variables

Variable	Mean	Std. Deviation
Accessibility	3.15	1.259
Availability	3.01	1.249
Efficiency	3.64	1.134
Responsiveness	3.73	1.091
Usefulness	3.87	1.048
Socioeconomic Development	3.47	0.771
Grand	3.47	0.781

Of the five dimensions table above result of digital public service transformation, usefulness got the highest average rating (M=3.87, SD=1.048), followed by responsiveness (M=3.73, SD=1.091) and efficiency (M=3.64, SD=1.134). From the above data, it can be concluded that the respondents saw the digitally enabled public services as useful, fairly responsive, and

efficient to assist their engagements with the local authorities. The moderately lower average ratings were recorded on accessibility ($M=3.15$, $SD=1.259$) and availability ($M=3.01$, $SD=1.249$). Both these two dimensions belong to the moderate category, which means that while digital public services are accessible to citizens, there could still be problems in terms of consistency of access and availability of digitally enabled public services. Grand mean of all the five dimensions of digital public service transformation is 3.47, 0.78, which shows a moderately high perception of digital public service transformation by the respondents. Overall, from the above descriptive statistics, it can be concluded that the respondents perceive digital public services as positively contributing to their socioeconomic situations. Nevertheless, the relatively low scores on the dimensions of accessibility and availability denote areas where improvements can be made to enhance digital public services delivery by the local authorities.

4.3 Regression Analysis Result

Multiple regressions are not only one method but a class of methods which can be used to study the association between one continuous dependent variable and a number of independent variables (predictors). As such, the researcher who was interested in investigating the association between the dependent variable (Perceived Socioeconomic development) and the independent variables (Digital public service transformations). Usefulness, availability, efficiency, accessibility, responsiveness. All the assumptions were tested before running the multiple regression analysis. The different statistical findings are given in the following tables.

Table 4. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	182.114	5	36.423	456.653	.000 ^b
	Residual	27.517	344	.080		
	Total	209.631	349			

a. Dependent Variable: Socio economic

b. Predictors: (Constant), Availability, Efficiency, Accessibility, Responsiveness, Usefulness,

The ANOVA test is used to determine the statistical significance of the multiple regression model. The results show that the regression model is statistically significant, because $F(5, 345) = 456.653$, $p < .001$. This means that the regression model with accessibility, availability, efficiency, responsiveness, and usefulness of digital public services predicts the socioeconomic development of the community in a statistically significant way. The regression sum of squares (182.114) indicates the amount of variability of socioeconomic development caused by five predictors, while the residual sum of squares (27.517) indicates the amount of variability not caused by the five predictors. The total sum of squares is equal to 209.631. The statistically significant F-test means that the regression model with the five predictors is much better than the one without predictors.

Table 5 model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.932 ^a	.869	.867	.28242	1.905

a. Predictors: (Constant), Availability, Efficiency, Accessibility, Responsiveness, Usefulness

b. Dependent Variable: Socio economic

From the Model Summary above, the multiple regression models has produced a very good relationship between the five dimensions of digital public service transformation (accessibility, availability, efficiency, responsiveness, and usefulness) and socioeconomic development. This is due to the multiple correlation coefficient ($R = .932$), which indicates a very strong relationship between the total independent variables and socioeconomic development.

The coefficient of determination ($R^2 = .869$) is indicative of the five dimensions of digital public service transformation having the ability to explain 86.9% of the variations in socioeconomic development of the respondents. The remaining 13.1% of the variation is explained by other variables not included in the regression analysis as well as errors. However, the adjusted R^2 of .867 implies that after accounting for the number of predictors used in the multiple regression analysis, the explanatory power of the model still stands at 86.7%. The standard error of the estimate (.28242) represents the average error in predicting the dependent variable in the multiple regression analysis. Additionally, the Durbin Watson statistic of 1.905 is close to 2.00, indicating that there is some independence in the residuals.

In general, the Model Summary shows that all five dimensions of digital public service transformation have high combined explanatory power of socioeconomic development in Gimbi Town Administration.

Table 6. Regressions output

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.033	.037		-.882	.378
	Accessibility	.216	.008	.347	26.146	.000
	Availability	.200	.008	.325	24.596	.001
	Efficiency	.192	.013	.283	15.339	.000
	Responsiveness	.195	.013	.276	14.619	.000
	Usefulness	.206	.010	.281	20.900	.000

a. Dependent Variable: Socio economic

All five dimensions of digital public service transformation have a positive and statistically significant association with socioeconomic development. In particular, accessibility is the dimension that has the highest impact ($\beta = .347$, $t = 26.146$, $p < .001$), then comes availability ($\beta = .325$, $t = 24.596$, $p < .001$). Also, efficiency is positively related to socioeconomic development ($\beta = .283$, $t = 15.339$, $p < .001$). Usefulness ($\beta = .281$, $t = 20.900$, $p < .001$) and

responsiveness ($\beta = .276$, $t = 14.619$, $p < .001$) significantly contribute to perceived socioeconomic development.

It may be concluded that making digital public services more accessible to citizens and assuring their availability are especially crucial for socioeconomic development in Gimbi Town. At the same time, the significant contributions of efficiency, responsiveness, and usefulness show that socioeconomic development is driven not only by the availability but also by the efficiency, responsiveness, and usefulness of digital public services. All five hypotheses (H1–H5) can be considered confirmed.

Table 7: Summary of hypotheses testing

S.N	Hypothesis	Decision
1	H1 Accessibility has a significant positive effect perceived socioeconomic development	Supported
2	H2 Availability has a significant positive effect perceived socioeconomic development	Supported
3	H3 Efficiency has significant positive effect on perceived Socioeconomic development	Supported
4	H4 Responsiveness has significant positive effect on perceived socioeconomic development	Supported
5	H5 Usefulness has significance positive effect on perceived Socioeconomic development	Supported

5. Discussion of Findings

From the hypothesis test, several insights can be derived that help determine how the digital transformation of public services contributes greatly and positively to the socioeconomic development of Gimbi Town Administration. According to the regression analysis, the model accounts for 86.9% of the variation in socioeconomic development ($R^2 = .869$). It is clear from the relationship between accessibility and development of socio-economic status that the Public Value Theory statement that public services create value by removing obstacles and providing citizens with advantages holds true. Improved digital accessibility in Gimbi Town might help remove obstacles to accessing services provided by the government, which helps citizens save their time and money as well as make use of the services conveniently. The finding is in line with previous studies that have found digital government to offer advantages to citizens in terms of access to and quality of services offered. The relatively larger role of accessibility in the present study may also be attributed to the fact that the process of transformation of services into digital form in Gimbi Town is at an early stage. Therefore, it can be concluded that the dimensions of digital transformation of public services account for a large proportion of variance. All five dimensions, which include accessibility, availability, efficiency, responsiveness, and usefulness, contribute positively and significantly to socioeconomic development. From the result obtained that there exists a positive correlation between the perception of socio-economic development and access to public services delivered through digitization.

Accessibility and perceived Socioeconomic Development

The effect with the highest significance level was noted for digital public service accessibility ($\beta = .347, p < .001$). This implies that the ability of citizens to access public services through digital channels plays an important role in achieving socioeconomic objectives. Higher accessibility will lead to the reduction of barriers in terms of geography, administration, and procedures and allow citizens to get public services without having to go physically to government offices. Based on Public Value Theory, digital accessibility is one of the significant ways of creating value from public services because of the reduction of barriers to accessing the services physically, information ally, and procedurally. Research also shows that enhanced digital accessibility will help increase the capabilities of individuals in accessing public services. The results are in line with previous studies where emphasis was laid on the potential of e-government to increase the availability of public services and overcome the barriers involved in traditional service provision (Rauleckas, 2016; West, 2004; Norris & Reddick, 2013; Rohani, et al., 2025) It is also argued more recently that digitally-enabled public services and digital infrastructures may help in realizing broader quality-of-life outcomes through citizen interactions with public institutions. Hence, the result from Gimbi supports the idea of designing digital public services based on accessibility and usability of citizens.

Availability and perceived Socioeconomic Development

Availability had a significant positive influence on socioeconomic development ($\beta = .325, p < .001$). It seems that availability is one of the crucial factors in the success of using digital public services as it allows people to use the services at any point when needed. It can help people avoid office hours and even the use of service points and might make administration procedures more convenient for citizens. This result supports public value theory and digital availability is one of the significant ways of creating value from public service and the findings from previous literature, where availability of the services and anytime anywhere access are considered some of the important dimensions of digital government (Barbato, G., & Turri, M. 2017; Carter & Bélanger, 2005; Akhtar Shareef et al., 2014; Rofik, et al., 2022).

Efficiency and perceived Socioeconomic Development

In addition to the above, the results confirm that digital public service efficiency significantly positively impacts socioeconomic development ($\beta = .283, p < .001$). This means that speed of processing, reduction of administrative processes, and needlessness for repeating the visits to the offices can create value that goes beyond the actual service delivery process. Time and effort can be saved to use later for employment, business, housework, and any other productive endeavor. These findings confirm previous studies which have shown that digital government can increase the efficiency of public service delivery through speed of processing, administrative processes, and transaction costs (Nurdin, et al., 2011; Evans, D., & Yen, D. C. 2005; Osei-Kojo, 2017). Moreover, they are consistent with the Ethiopian evidence that mentions processing time, availability of the service, responsiveness, and costs of service as indicators of performance of e-government (Goshu, D., & Nasir, M. 2025).

Responsiveness and perceived Socioeconomic Development

There was a positive and significant relationship between responsiveness and socio-economic development ($\beta = .276$, $p < .001$). Even though its effect size was slightly smaller compared to accessibility and availability, this finding shows that there is citizen gain from digital public services, which allow government institutions to respond to any requests, complaints, or questions regarding the services. Digital communication can help people track their progress in dealing with government institutions and reduce any uncertainties and time gaps. It is in agreement with the findings of previous research showing responsiveness as a necessary element for quality of digital public services and successful e-government development (Pathak, et al., 2007; Welch et al., 2005; Hooda, et al., 2022.; Yehuala, D.M (2017).

Usefulness and perceived Socioeconomic Development

Lastly, perceived usefulness had a positive and significant influence on socioeconomic development ($\beta = .281$, $p < .001$). This means that people are more likely to benefit from socioeconomic development when digital public services are actually useful for them and make it easier to achieve their service objectives. This result reinforces findings from the studies on technology adoption indicating that perceived usefulness plays a vital role in the process of acceptance and use of e-government services (Carter & Bélanger, 2005; Abdulkareem, et al., 2022; Teo et al., 2008; Al-rawahna, et al., 2018). Recent research on the relationship between digital public services and quality of life and well-being implies that digital government is beneficial for its users not only in terms of its efficiency but also in other ways. Thus, digital public services in Gimbi must not be assessed only based on whether or not digital channels are present, but also on whether they are useful for citizens.

6. Conclusion and recommendations

The current study explored the effect of digital public service transformation on socio-economic development in Gimbi Town Administration, Ethiopia. The results clearly show that digital public service transformation is an important determinant of socio-economic development. Overall, the regression model is significant and accounts for 86.9% of the variability in socioeconomic development. The results reveal that socio-economic value of digital public services does not depend merely on digitization of services but rather on the ability of citizens to access these services efficiently, responsively and effectively. Thus, the current study suggests that digital public service transformation can become an effective tool to improve socio-economic conditions of citizens provided that the transformation will be carried out in citizen-centric and service-oriented way. In case of Gimbi Town Administration, strengthening of digital service infrastructure and provision of reliable and effective services is crucial in order to reap socio-economic benefits of digital transformations. The results are important for the empirical literature on developmental effects of digital public services at the local government level in Ethiopia.

7. Recommendations

Recommendations from findings include:

- To Improve Accessibility of Digital Services: It is recommended that Gimbi Town Administration increase accessibility of digital service provision and make procedures

simple enough for citizens to access public services without making several trips and facing administrative bottlenecks. Special emphasis should be put on citizens who are not digitally savvy and/or have poor access to digital technology.

- The administration should ensure reliable and uninterrupted access to public services when citizens require them. Infrastructure coordination is also necessary for addressing issues of interruption of connections and systems.
- For Efficiency of Service: Existing service provision procedures should be reviewed, administrative processes which are not needed should be removed, and digitalization processes implemented where possible. Business process improvement should accompany digital transformation rather than simply digitizing manual processes.
- In order to Enhance institutional responsiveness: Digital platforms must offer efficient means of requesting services, getting responses, following-up applications, and complaining about service failures. Public administration offices must develop a response process and track the promptness of service delivery.
- In order to Make focus on the utility of digital services: Services must be designed based on the real needs of the citizens. User feedback must be continuously obtained to find out any challenges that users face in using digital platforms and make them more functional, simple and convenient.
- Enhance citizens' digital competencies: Town administration must collaborate with stakeholders to improve the digital competencies of citizens and their awareness of available public services online. Digital-skills development is crucial to ensure that availability of services results in usage and socioeconomic gains.
- Leverage digital transformation toward socioeconomic considerations: The future digital public-services projects should take into account the ways in which the services can help in socioeconomic development such as facilitating economic participation, access to basic services, productivity, and quality of life of citizens. Therefore, performance monitoring should include socioeconomic indicators in addition to the traditional ones of systems implementation.

8. Contributions and Implications of the study

- This research is an addition to the existing body of knowledge about digital public service transformation insofar as it deals with how the accessibility, availability, efficiency, responsiveness, and usefulness of digital public services relate to perceptions of socioeconomic development by citizens. The contributions and implications of the study are discussed from the perspectives of theory, empirics, methodology, and practice.
- Theoretical the study contribution relating certain dimensions of digital public service transformation to socioeconomic development, the study has extended the application of digital government and public value theories. In particular, rather than looking solely into issues of technology use, service quality, and citizen satisfaction, the study looks into how citizens perceive that digital public services contribute to economic and social development.
- In terms of empirical contributions, the study offers evidence from Gimbi Town Administration, which is an understudied local government setting in Ethiopia. The results indicate significant positive relationships among accessibility, availability, efficiency, responsiveness, usefulness, and perceptions of socioeconomic development. Thus, the study shows evidence that digital public services do not only facilitate administrative tasks but can also be related to the citizens' access to services, time and

cost savings, and effective participation in economic and social activities. Moreover, the study contributes evidence at the local level to the rather scarce empirical literature regarding the socioeconomic effects of digital public services in Ethiopia.

- From the Methodological contribution digital public service transformation has been conceptualized and measured based on five dimensions including accessibility, availability, efficiency, responsiveness, and usefulness, and their relationships with the perceptions of socioeconomic development have been examined using quantitative survey data.
- From practical perspective these findings have significant implications for Gimbi Town Administration and other local government organizations undergoing digital transformation. Firstly, the enhancement of access and availability of digital services should be given priority such that the citizens can access the services easily when they need them. Secondly, government organizations should enhance digital infrastructure, networks, maintenance, and inter-office integration to reduce disruptions and obstacles. Thirdly, to enhance efficiency and effectiveness, there should be simplified digital processes, quick response to citizens' queries, and proper mechanisms for dealing with complaints about digital services. Fourthly, the usability of the digital services should be emphasized and should be useful in addressing citizens' requirements through appropriate functions and not merely by digitalizing paper-based processes.
- The policy implications of the results include increased investment in citizen-centered digital public services and digital infrastructure in the community. Any digital transformation process must have digital skills development, institutional capability building, connectivity, integration of services, and processes that enable monitoring of the citizen experience. The policymaker must also ensure that digitalization does not leave behind citizens who lack digital skills, connectivity, or any other challenge to their ability to use technology.

Limitations and Future Research Directions

- Despite the many benefits, this study suffers from a number of weaknesses which need to be taken into account when evaluating the results obtained. To begin with, this study used the cross-sectional approach, which only takes a snapshot of the attitudes of the citizens at a certain period of time. As such, the results obtained show statistical relationships, but not causality between the transformation of digital public services and socio-economic development.
- Secondly, the study is based on self-reported questionnaires from citizens that have accessed at least one digitally enabled public service. While this approach gives insights on citizen experience, there can be some response and common method bias with regard to their perceptions. In future, it will be beneficial to conduct studies that include citizen surveys with administrative metrics like processing time for service, transaction volumes, system uptime, cost of services and complaint resolution rates.
- Third, this study was conducted in Gimbi Town Administration. This makes it difficult to apply the findings of the study in other towns, rural settings or even in the regional and national governments of Ethiopia. This is because there will be variations in digital infrastructure, institutional capacity, connectivity, economic factors and digital literacy among others. Comparative studies in different towns and regions using different public organizations will give better evidence with regard to the generalizability of the results of this study.

- Fourth, the study was conducted among citizens who have used digital public services. Hence, it can be inferred that the experiences of those citizens who do not use digital public services might have been left out. It will be better for future studies to consider both users and non-users in order to assess the digital divide and see whether any differences in digital proficiency, income, education, age, connectivity or access to digital devices affect the benefits from the use of digital public services.
- Last, the fairly high level of explanatory power of the regression analysis should be taken with some caution since all key constructs have been assessed through similar self-reported scales on the Likert scale. In future research, it is essential to perform further tests of the construct validity, discriminant validity, common method bias, and multicollinearity, and use the structural equation modeling in case of multiple data sources to enhance the robustness of the results.
- In the future, one may employ longitudinal and comparative approaches, use objective administrative data, study the non-users of digital public services, and take into account other factors at institutional and individual levels. This will allow obtaining an integrated view of digital public service transformation and its socio-economic impact in Ethiopia.

Author Contribution Statement

Ebisa Tarfa Gabisa Conceptualization, Data Curation, Formal Analysis, Investigation, Resources, Software, Validation, Visualization, Writing - original draft

Ayana Yohaness lammi Methodology, Supervision, Validation, Writing - review & editing

Chibsa Mulugeta Dhuferra Methodology, Supervision, Validation, Writing - review & editing

Ethical Statement

Before any data was collected, each participant gave their informed consent.

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The author can provide the data that supports the study's conclusions upon reasonable request.

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