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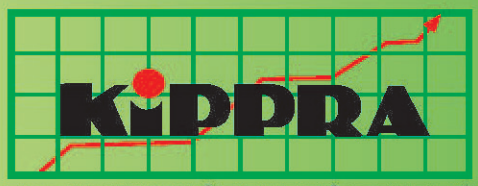

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Addressing Kenya's Digital Divide: County Disparities and Strategies for Inclusive Growth

Martha Nanekoi Naikumi

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Abstract

The study investigates the state of digital divide in Kenya by constructing a comprehensive composite Digital Divide Index (DDI) across five pillars of the digital economy: digital infrastructure, digital government, digital business, digital skills and values, and innovation-driven entrepreneurship. Motivated by the national objective of fostering an inclusive digital economy, this study aims to identify the extent of the digital divide across different demographic, socio-economic, and geographic groups in Kenya. The findings reveal that Kenya experiences a notable digital divide with an overall DDI score ranging from 0.12 to 0.86, indicating significant disparities across the country's counties. The highest levels of the digital divide are observed in counties such as Turkana with a DDI score of 0.12, while the lowest levels are in Nairobi City with a DDI score of 0.86. Digital infrastructure: The country score is 0.45, highlighting considerable disparities, especially between rural and urban areas, with urban regions exhibiting superior infrastructure. Moderate gaps are present in gender and income levels, and age-related disparities. To address these challenges, it is recommended that the Communications Authority of Kenya allocate additional resources from the Universal Service Fund (USF) to expand digital infrastructure in underserved areas. Collaborative efforts with the private sector are also encouraged to develop affordable Internet packages and device subsidies for low-income households. Digital government: With a country score of 0.34, this pillar shows significant disparities in access to digital government services. Moderate gaps are observed across gender, age, and rural-urban divides, with income level disparities further exacerbating the divide. Enhancing digital government access may involve prioritizing the establishment of additional Huduma centres in rural areas and promoting low-cost digital financial services tailored to low-income households. Digital business: The country's score of 0.55 indicates a moderate level of digital divide. While gender disparities are moderate nationally, they are more pronounced in certain regions, and age-related challenges are moderate. The rural-urban divide is significant, and income level disparities also impact digital business participation. The recommendations include establishing digital business incubators and accelerators in rural areas to support local entrepreneurs and introducing financial incentives and expanding e-commerce platforms for rural businesses. Digital skills and values: With a country score of 0.43, this pillar reflects a high digital divide, with the most significant disparities observed in rural areas and among lower-income groups, and moderate gender and age-related divides. To improve digital literacy and skills, targeted initiatives such as expanding digital literacy programmes to rural areas and providing free or subsidized training for low-income individuals are recommended. Enhancing digital skills among women and older adults is also crucial. Innovation-driven entrepreneurship: The country's score of 0.51 suggests a relatively low digital divide, though disparities remain, particularly between urban and rural areas. Gender-related disparities are moderate, and age-related divides are present. It is recommended to establish regional innovation hubs and incubation centres outside major urban areas, and to launch targeted funding and mentorship programmes for women-led startups. Ensuring equitable access to credit and loans for rural and low-income entrepreneurs is also advisable.

Abbreviations and Acronyms

CA	Communications Authority of Kenya
DDI	Digital Divide Index
DTF	Distance-To-Frontier
ICT	Information and Communication Technology
ICTA	Information and Communication Technology Authority
ITU	International Telecommunication Union
KDHS	Kenya Demographic and Health Survey
KPHC	Kenya Population and Housing Census
KNBS	Kenya National Bureau of Statistics
MICDE	Ministry of Information, Communication, and The Digital Economy
SDG	Sustainable Development Goal
SMEs	Small and Medium-sized Enterprises
USF	Universal Service Fund
WEF	World Economic Forum

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1. Introduction

Digital divide is increasingly recognized as a critical issue, characterized by disparities in access to and use of information and communication technologies (ICTs) among individuals, households, businesses, and geographic areas at varying socio-economic levels (International Telecommunication Union - ITU, 2022; Brookings, 2022). This divide stems from an uneven distribution of resources and capabilities necessary for participation in the digital landscape, including infrastructure access, affordability, digital skills, and the relevance of digital services to local contexts. It can be analyzed at two levels: within countries, where inequalities manifest across demographic categories such as income, education, and geographic location, and between countries, highlighting the global digital divide that contrasts developing nations with their developed counterparts.

As digital technologies increasingly permeate daily life, ensuring equitable access and the requisite skills for participation in the digital economy become essential. Digital technologies hold the promise of enhancing economic growth, education, healthcare delivery, and overall social development. However, if certain groups or regions are marginalized due to inadequate access or skills, existing inequalities may be exacerbated. The International Telecommunication Union (ITU) indicates that approximately 5.4 billion people – or 67 per cent of the world's population – are using the Internet in 2023. This represents an increase of 45 per cent since 2018, with 1.7 billion people estimated to have come online during that period. However, this leaves about 2.6 billion people still offline (ITU, 2023).

Globally, the digital divide manifests in varying degrees across countries. According to the ITU, Kenya's Internet penetration rate stood at 23.4 per cent in 2021, lower than its East African neighbours such as Rwanda (26.2%) and Uganda (25.7%) (ITU, 2021). However, Kenya's mobile broadband subscriptions per 100 inhabitants were higher at 47.2 per cent, compared to Rwanda's 35.1 per cent and Uganda's 28.2 per cent (ITU, 2021). This suggests that while Kenya has made progress in mobile connectivity, it still lags in overall Internet access, particularly in rural areas.

Kenya ranks 114th out of 193 countries in the United Nations E-Government Development Index (EGDI) for 2022, with a score of 0.5235 (UN, 2022). This places it below the global average and behind other developing nations such as South Africa (89th) and Mauritius (74th). However, Kenya's EGDI score has improved from 0.4724 in 2020, indicating progress in e-government development and digital inclusion efforts (UN, 2020).

In Kenya, the digital divide is particularly pronounced, with significant disparities in Internet access between urban and rural areas. According to the Kenya Population and Housing Census (KPHC), only 17.8 per cent of households had Internet access, contrasting sharply with 45.7 per cent in urban settings (KNBS, 2019). Rural communities frequently lack the necessary infrastructure and connectivity for reliable Internet services, hindering access to online resources and opportunities. The skills divide reflects the disparities in digital literacy and the ability to effectively engage with digital content, while the economic

divide highlights the affordability challenges faced by low-income individuals in accessing digital services. This situation perpetuates socio-economic inequalities, as those without access to digital technologies are increasingly excluded from educational and employment opportunities that require digital skills (Heeks, 2022). Additionally, the relevance divide emphasizes the importance of tailoring digital content and services to local languages, cultures, and contexts (Van Dijk, 2006; Gillwald et al., 2018).

Recognizing the urgency of addressing the digital divide, the Kenyan government has integrated the digital transformation agenda into its broader economic strategy through the Bottom-Up Economic Transformation Agenda pillar of Digital Superhighway. This initiative aims to empower marginalized communities by promoting inclusive economic growth, ensuring that all citizens can participate in and benefit from the digital economy. Central to this agenda is the Universal Service Fund (USF), which plays a pivotal role in enhancing ICT connectivity in underserved areas. The USF collects levies from telecom operators to subsidize network deployment, thereby facilitating access to digital services for low-income populations. Significant investments are being made to expand the national fibre-optic network, with plans to lay out an additional 100,000 kilometres to provide Internet access to schools, health facilities, and rural businesses. This comprehensive approach aligns with the National Digital Master Plan 2022-2032, emphasizing the need for an equitable digital economy through pillars such as digital infrastructure, digital government, digital business, digital innovation and entrepreneurship, and digital skills development. The government aims to create a robust digital ecosystem that fosters innovation, enhances public service delivery, and bridges the digital divide by focusing on these areas.

The purpose of this paper is to conduct a comprehensive assessment of the digital divide in Kenya, focusing on disparities across the key pillars of the digital economy. This study aims to construct a composite digital divide index and identify the levels of digital divide across various demographic, socio-economic, and geographic groups. By providing insights into the current state of digital inclusion, the research will inform targeted interventions and policy measures to ensure that no one is left behind in the digital era. Addressing the digital divide is vital for the country's sustainable development and the realization of the United Nations Sustainable Development Goals (SDGs), particularly SDG 9 (Industry, Innovation, and Infrastructure) and SDG 10 (Reduced Inequalities).

The remainder of this paper is structured as follows: Section two discusses the policy context of digital inclusion; section three explores existing literature with theoretical and empirical insights on addressing the digital divide; section four outlines the methodology of the study, focusing on theoretical and analytical frameworks; section five presents the analysis of results and discussions; and section six concludes with conclusion and policy recommendations.

2. Review of Policy Interventions in Kenya

The digital divide in Kenya is a pressing issue characterized by significant disparities in access to and utilization of information and communication technologies (ICTs). As of 2021, approximately 96 per cent of the population had access to some form of mobile connectivity, a notable increase from 94.4 per cent in 2016 (GeoPoll, 2021). However, this still leaves around 4 per cent of the population, or about 2 million people, unserved by mobile networks (Connecting Africa, 2021). The coverage of 2G networks has improved, with only 4 per cent of the population unserved as of 2021, down from 5.6 per cent in 2016 (Statista, 2024). For 3G, coverage has reached nearly universal levels, indicating progress in access to more advanced mobile technologies. Despite these advancements, broadband access remains a critical concern, with the access gap for 3G and 4G services shrinking from 22.2 per cent in 2016 to just 5 per cent by 2021, highlighting that a portion of the population still lacks access to high-speed Internet (Connecting Africa, 2021).

Geographic disparities further exacerbate the digital divide. The 2016 ICT Access Gaps Study identified 348 sub-locations without telecommunication services. The Universal Service Fund (USF) has targeted 202 of these sub-locations for connectivity projects, achieving success in connecting 67 out of 78 targeted areas, but leaving 11 still needing service due to challenges such as insecurity. Additionally, the USF has connected 885 public secondary schools to broadband, with plans to extend connectivity to more schools, particularly those lacking digital learning resources.

The Kenyan government has implemented various policies and initiatives aimed at enhancing digital inclusion, including the National Digital Master Plan 2022-2032 and the Bottom-Up Economic Transformation Agenda. These initiatives emphasize the importance of digital connectivity in promoting inclusive economic growth and aim to empower marginalized communities. Furthermore, the Digital Literacy Programme, which includes initiatives such as the Ajira Digital Programme and the Presidential Digital Talent Programme, focuses on enhancing digital skills and competencies among citizens, equipping them with the necessary knowledge to leverage digital technologies effectively. The DigiSchool programme targets primary school students by providing digital devices, developing digital content, and training teachers to integrate ICT into education from an early age.

Also, the Kenya Education Network (KENET) and the National Research and Education Network (NREN) aim to incorporate digital literacy programmes in schools and higher education institutions across Kenya. KENET, the NREN of Kenya, is a not-for-profit membership operator incorporated in 1999 following an MOU between the governments of Kenya and the USA to provide high-speed Internet and allied services to academic and research institutions, including universities, training institutes, schools, research institutes, and libraries.

The Huduma Kenya Programme enhances access to government services through centralized service centres and an online platform, improving convenience for marginalized and remote populations. Presently, Kenya boasts 53 Huduma centres nationwide, serving approximately 55,000 customers daily.

Table 2.1: Policy and legal review

Issue	Description	Policies, Laws, Masterplans, Strategies	Interventions	Gaps
Access to ICT	Disparities in access to digital technologies and the Internet across different regions, socio-economic groups, and demographics in Kenya	Kenya National Digital Master Plan 2022-2032 ICT Policy Framework 2019 Kenya Information and Communications Act (1998) Bottom-Up Economic Transformation Agenda (BETA) Kenya Communications (Universal Access and Service) Regulations 2009	Establishment of the Universal Service Fund (USF) to enhance ICT connectivity in underserved areas by subsidizing network deployment. The aim is to provide access to ICT services in rural areas, promote universal access to affordable and quality ICT services, and support the development of ICT infrastructure Broadband infrastructure expansion aimed at expanding the national fiber-optic network by 100,000 kilometres to ensure universal access to high-speed Internet	Limited reach of USF in rural areas High costs of Internet access Limited incentives for private sector investment in ICT infrastructure due to high CAPEX and OPEX

Digital Literacy	Disparities in digital literacy levels and skills development across different regions, socio-economic groups, and demographics in Kenya	Digital Literacy Programme (2016) Basic Education Act (2013) National Education Policy (2019)	The Digital Literacy Programme (DLP) targets primary school students by providing digital devices, developing digital content, and training teachers Ajira Digital Programme enhances digital skills among youth, training over 300,000 individuals for online jobs Presidential Digital Talent Programme develops skilled ICT professionals for public sector transformation	Disparities in digital literacy across regions, especially in arid and semi-arid areas Limited availability of digital equipment at all levels of education
Infrastructure Development	Inadequate ICT infrastructure, particularly in rural and underserved areas, hindering access to digital technologies and the Internet	Bottom-Up Economic Transformation Agenda – Digital Superhighway Pillar (2022) National ICT Policy (2019) Kenya National Digital Master Plan 2022-2032 Kenya Communications (Universal Access and Service) Regulations, 2009 National Addressing Number draft policy	Broadband infrastructure expansion aimed at expanding the national fiber optic network to ensure universal access to high-speed Internet Promoting public-private partnerships for ICT infrastructure investment Establishment of the Universal Service Fund Advisory that oversees the utilization of the USF to enhance ICT connectivity in underserved areas by subsidizing network deployment	Inadequate incentives for private sector investment in ICT infrastructure due to high CAPEX and OPEX High costs of Internet access

Affordability	High costs of digital devices and Internet services limiting access for low-income individuals and households	Kenya National Digital Master Plan 2022-2032 Competition Act (2010) National ICT Policy 2019 National Payments Strategy 2022-2025 National E-commerce strategy	Subsidized Internet access programmes to provide discounts on Internet packages Promoting competition to lower prices The strategy advocates for lowering regulatory costs and simplifying licensing for new entrants, ensuring that more players can provide affordable services by reducing costs associated with infrastructure development	Affordability remains a barrier for many low-income individuals and households
Gender and Equity	Disparities in access and usage of digital technologies between men and women, and marginalized groups in Kenya	National ICT Policy (2019) Gender Equality Act (2011) Equal Opportunities Act (2007)	Targeted programmes for women and marginalized groups Digital skills training for women and girls and establishing women-led tech hubs	Insufficient focus on gender disparities and inclusion of marginalized groups in digital transformation efforts
Inclusive Access	Ensuring that all segments of the population, including women, youth, persons with disabilities, and marginalized communities, can access and benefit from digital services	Huduma Kenya programme (2014) National ICT Policy (2019)	Huduma Kenya programme enhances access to government services through centralized service centres and online platforms Community networks licensing framework to provide Internet access to low-income and marginalized areas	Need for more tailored strategies and interventions to address the specific needs and challenges faced by different marginalized groups

Innovation and entrepreneurship	Fostering a vibrant digital economy and supporting the growth of startups and tech companies in Kenya	Kenya Vision 2030 Kenya Digital Economy Blueprint (2019) Kenya National Digital Master Plan 2022-2032 Competition Act (2010)	Establishment of the Konza Technopolis Development Authority as a flagship initiative with the goal of becoming a sustainable, world-class technology hub and a significant economic driver for the country Kenya Digital Economy Blueprint promotes innovation-driven entrepreneurship by attracting investments and talent in the ICT sector, supporting startup growth, and positioning Kenya as a regional hub for digital innovation	Limited access to venture capital for startups, particularly those located outside major urban centres

The digital divide in Kenya encompasses several key policy issues that significantly impede equitable access to information and communication technologies (ICTs). Access to ICT remains a critical challenge, despite the efforts made through the Universal Service Fund (USF). While the USF has successfully subsidized ICT infrastructure projects, its reach is limited, particularly in rural areas where connectivity is most needed. The ambitious goals outlined in the National Digital Master Plan have not been fully realized due to slow implementation, leading to persistent access gaps that necessitate more targeted interventions to ensure that underserved populations can benefit from digital technologies.

Digital literacy is another pressing concern, as evidenced by the Digital Literacy Programme, which has trained over 300,000 young people through initiatives such as the Ajira Digital Programme. However, significant disparities in digital literacy rates persist, especially in arid and semi-arid regions where rates fall below 50 per cent. This situation highlights the urgent need for cohesive and targeted digital literacy programmes that address these regional disparities, ensuring that all citizens are equipped with the skills necessary to navigate the digital landscape effectively.

Infrastructure development is recognized as vital in the Bottom-Up Economic Transformation Agenda, yet high costs of Internet access continue to pose a barrier for many. Although the expansion of the fibre-optic network is underway, the affordability of these services remains a critical issue that must be addressed

to facilitate widespread access to digital resources. Many low-income households find the costs of Internet services prohibitive, indicating that more aggressive pricing regulations and subsidies are necessary to ensure that digital services are affordable for all segments of the population. Additionally, the lack of incentives for private sector investment in ICT infrastructure due to high capital expenditure (CAPEX) and operating expenditure (OPEX) has hindered the expansion of digital connectivity. Initiatives such as the Community Networks Licensing Framework have the potential to provide access to the Internet in low-income areas and marginalized communities, but more support is needed to make these initiatives viable.

Gender and equity in ICT access also present significant challenges. While policies aimed at promoting gender equity exist, their implementation has been inconsistent, resulting in gaps in access for women and marginalized groups. Targeted programmes are essential to ensure that these populations are not left behind in the digital transformation. Additionally, inclusive access initiatives, such as the Huduma Kenya Programme, have improved access to government services, but more tailored strategies are needed to support women, persons with disabilities, and elderly populations in effectively accessing and using digital services.

Lastly, fostering innovation and entrepreneurship is critical for developing a vibrant digital economy. Initiatives such as the Konza Technopolis aim to create technology hubs that support innovation; however, challenges remain in enhancing access to venture capital for startups, particularly those located outside major urban centres. Addressing these policy issues is essential for bridging the digital divide and ensuring that all Kenyans can participate in and benefit from the digital economy.

3. Literature Review

This section reviews the existing theoretical and empirical literature on the digital divide, focusing on key frameworks and recent findings relevant to Kenya's context. Theoretical perspectives, including Amartya Sen's Capability Approach and Social Exclusion Theory, provide foundational insights into the multifaceted nature of digital inequalities. Empirical literature explores the literature on various dimensions of the digital divide, such as gender, age, rural-urban, and income disparities, thus offering a comprehensive understanding of the barriers and challenges faced by different demographic groups.

3.1 Theoretical Literature

3.1.1 The Capability Approach

Amartya Sen's Capability Approach provides a comprehensive framework for understanding the digital divide in Kenya. This approach emphasizes that well-being should be measured by individuals' capabilities—what they can do or be—rather than merely by their resources or utilities (Sen, 1999). In the context of the digital divide, the Capability Approach highlights that providing physical access to digital tools is insufficient if individuals lack the skills, education, or social environments necessary to use these tools effectively (Kleine, 2010). For instance, having a smartphone is less valuable if one does not have the digital literacy to navigate online services or the financial capability to afford data plans. Therefore, policies aimed at bridging the digital divide in Kenya ought to focus not only on providing access but also on enhancing digital literacy, offering relevant educational programmes, and ensuring supportive environments that allow individuals to fully use digital technologies.

3.1.2 Social Exclusion Theory

The Social Exclusion Theory provides another critical lens for examining the digital divide in Kenya. This theory explores how certain groups are systematically excluded from full participation in social, economic, and political life due to barriers that prevent them from accessing the necessary resources and opportunities (Warschauer, 2003). In the digital realm, these barriers can include lack of infrastructure, unaffordable costs, inadequate digital skills, and socio-cultural factors that hinder technology adoption. Applying Social Exclusion Theory to the digital divide highlights how digital inequalities reinforce existing social inequalities in Kenya, particularly among rural populations, low-income groups, the elderly, and women (Murithi and Yoo, 2021). These groups often face compounded barriers that limit their digital inclusion, requiring comprehensive strategies that tackle multiple dimensions of exclusion.

3.2 Empirical Literature

In this section, the study explores existing literature on the digital divide in the context of the types of digital divide, including gender, age, rural-urban, and income levels and existing indices. The digital divide refers to the gap that exists between those who have access to and use digital technologies, such as the Internet, computers, and smartphones, and those who do not (Sparks, 2013). This gap can be influenced by various factors, including geographic location, socio-economic status, age, and education level (Vassilakopoulou and Hustad, 2021). Extant literature has shown that the digital divide is not simply about access to technology but also encompasses disparities in usage and quality of digital technologies.

3.2.1 Gender digital divide

The gender digital divide in Kenya significantly impacts women's access to technology and digital resources. According to the GSMA Mobile Gender Gap Report (2021), women in Kenya are 39 per cent less likely than men to have access to mobile Internet and 23 per cent less likely to own a smartphone. This disparity is exacerbated by socio-cultural barriers, including discrimination and harmful social norms, which limit women's opportunities to engage with digital platforms (World Wide Web Foundation, 2020). Murithi and Yoo (2021) highlight that in educational settings, the lack of digital literacy among female teachers further perpetuates this divide, as they struggle to implement technology in classrooms effectively. Programmes such as LakeHub's FemiDev aim to bridge this gap by providing digital literacy training specifically for women, yet challenges remain in addressing the underlying barriers to access and participation (Borgen Project, 2022).

In addition, the COVID-19 pandemic underscored the importance of digital skills for economic survival, as many women working in low-paying manual jobs were disproportionately affected by job losses during lockdowns (UNDP, 2021). The pandemic further widened the gender digital divide, as women often lack the necessary digital skills to transition to remote work or online business opportunities. This situation emphasizes the urgent need for targeted interventions that not only focus on providing access to technology but also enhance women's digital literacy and confidence in using these tools for economic empowerment.

3.2.2 Age digital divide

The age digital divide is another critical factor influencing access to digital technologies in Kenya. Younger populations generally exhibit higher levels of digital literacy and technology use compared to older generations. Ndung'u and Waema (2011) found that younger individuals are more likely to use the Internet for educational and economic purposes, while older adults often face challenges due to limited exposure to technology and digital skills. A study by Van Deursen

and Van Dijk (2014) in the Netherlands revealed significant barriers to digital participation among older adults, including lack of training and support. This trend is mirrored in Kenya, where older populations may lack the necessary skills to navigate online platforms, leading to increased social exclusion and reduced access to essential services.

Moreover, the digital literacy gap between younger and older generations can have profound implications for social cohesion and community engagement. Research by Helsper and Van Deursen (2017) indicates that older adults are less likely to engage with digital technologies, which can hinder their ability to access important information and services. In Kenya, where a significant portion of the population is elderly, addressing the age digital divide is crucial for ensuring that all citizens can participate in the digital economy and access essential services.

3.2.3 Rural-urban divide

The rural-urban digital divide in Kenya is pronounced, with urban areas enjoying significantly better access to digital infrastructure and services compared to rural communities. A report by the Centre for Intellectual Property and Information Technology Law (CIPIT, 2023) highlights that while urban dwellers have greater access to high-speed Internet and advanced ICT services, rural populations often rely on basic mobile connectivity, limiting their ability to engage with digital platforms effectively. Research conducted by the World Wide Web Foundation (2020) indicates that rural populations face compounded barriers, including lack of infrastructure, unaffordable costs, and inadequate digital skills, which further exacerbate their exclusion from the digital economy.

Additionally, literature has shown that the digital divide manifests in education, where rural youths tend to use technology primarily for entertainment rather than for productive or educational purposes (Laskar, 2023). This gap not only hinders economic opportunities but also exacerbates existing inequalities, as rural communities miss out on the benefits of the digital economy. Addressing the rural-urban digital divide requires targeted investments in infrastructure and policies that promote digital inclusion for marginalized communities.

3.2.4 Income-level digital divide

Income levels play a crucial role in determining access to digital technologies in Kenya. Households with higher incomes are more likely to afford Internet services and digital devices, creating a significant divide between affluent and low-income populations. Research by the Alliance for Affordable Internet (A4AI, 2021) indicates that affordability is a primary barrier to Internet access, particularly for low-income households. The lack of affordable data plans and devices prevents many from participating in the digital economy. Additionally, a study by the World Bank (2022) found that economic disparities in access to technology contribute to a cycle of poverty, as those without digital access are increasingly excluded from educational and employment opportunities that require digital skills.

Moreover, the economic implications of the income-related digital divide extend beyond individual households. A report by the International Telecommunication Union (ITU, 2021) highlights that those countries with higher levels of digital inclusion experience greater economic growth and improved quality of life. Therefore, addressing income disparities in access to digital technologies is essential for fostering inclusive economic development in Kenya.

3.3 Key Literature Gaps

Despite the growing body of literature on the digital divide in Kenya, several gaps remain that this study aims to address. There is a notable lack of local studies that specifically focuses on the unique challenges faced by different demographic groups, particularly in rural areas. While international studies provide valuable insights, they may not fully capture the complexities of the Kenyan context.

Additionally, while existing research highlights the importance of digital literacy and access to technology, there is need for more empirical studies that evaluate the effectiveness of specific interventions aimed at bridging the digital divide. By focusing on targeted programmes and policies. This study aims to contribute to the development of evidence-based strategies that can effectively address the digital divide in Kenya and promote equitable access to digital technologies for all citizens (Annex 2 – Table 28 details more on the gaps).

3.4 Indexes on Digital Divide

Table 3.1 on existing indices related to the digital divide provides a comparative overview of key global indices, highlighting their metrics, construction methods, strengths, weaknesses, and relevance to Kenya. The indices, such as the Global Digital Divide Index (GDI), ICT Development Index (IDI), Networked Readiness Index (NRI), Digital Opportunity Index (DOI), and Affordability Index, vary in focus from global digital inequality to affordability and infrastructure. While some indices offer comprehensive global coverage and well-established methodologies, others may oversimplify complex local contexts or rely heavily on national-level data, which can mask disparities within countries. Despite these limitations, each index provides valuable insights into different aspects of the digital divide, with relevance to Kenya's unique challenges and opportunities in the digital landscape.

Table 3.1: Existing indices related to digital divide

Index Name	Authors	Key Metrics/ Variables	Construction	Strengths	Weaknesses	Relevance to Kenya
Global Digital Divide Index (GDI) (2004)	Chen and Wellman (concept)	Internet penetration Affordability Digital skills	Composite index based on multiple indicators	Directly addresses digital divide Considers multiple facets of digital inequality Allows for global comparisons	May oversimplify complex local contexts Less established than some other indices Methodology may not capture all relevant factors for developing countries	High: Provides a framework for understanding Kenya's position in the global digital divide landscape
ICT Development Index (IDI) (2023)	International Telecommunication Union (ITU)	Access Use Skills	Composite index using 11 indicators; Normalization, weighting, and aggregation	Comprehensive global coverage Well-established methodology Allows for tracking progress over time	May not capture nuanced local issues Aggregation might mask disparities within countries Heavily relies on national-level data	High: Offers a standardized way to compare Kenya's ICT development with other countries and track progress
Network Readiness Index (NRI) (WEF, 2023)	World Economic Forum and INSEAD	Infrastructure Affordability Skills Usage (individuals, businesses, government)	Composite index with 4 main categories and sub-indices	Holistic approach to digital readiness Considers both technical and human factors Includes governance and policy aspects	Complex methodology Changes over time make long-term comparisons challenging May not fully capture informal sector dynamics	High: Provides insights into Kenya's overall digital ecosystem, including policy and business environments

Digital Opportunity Index (DOI) (2023)	International Telecommunication Union (ITU)	Access to ICTs Usage intensity Enabling environment	Composite index of 11 indicators in 3 categories	Focused on opportunities, not just access Considers enabling environment Relevant for developing countries	Discontinued in 2007 May use outdated indicators Lacks recent data for comparison	Moderate: While outdated, its framework could inform the development of a Kenya-specific index
Affordability Index (2021)	Alliance for Affordable Internet (A4AI)	Internet costs Income levels Policy and regulatory environment	Composite score based on infrastructure, access, and affordability sub-indices	Focuses on a critical barrier to adoption Includes policy assessment Relevant for developing countries	Narrow focus on affordability May not capture other important aspects of the digital divide Limited historical data	Very High: Affordability is a key issue in Kenya, making this index particularly relevant

4. Methodology

4.1 Introduction

The methodology outlines the theoretical framework, digital divide framework, and analytical approach used in constructing a composite digital divide index for Kenya. It emphasizes the importance of sensitivity analyses and robustness checks to ensure the index's reliability and validity.

4.2 Theoretical Framework

This study adopts Amartya Sen's Capability Approach and Social Exclusion Theory to examine Kenya's digital divide. The Capability Approach emphasizes not just access to digital tools but the ability to effectively use them, focusing on indicators such as digital literacy programmes, access to educational resources, and affordability of services relative to income.

The Social Exclusion Theory highlights structural barriers and socio-cultural factors that exclude certain groups from the digital economy, guiding the selection of indicators such as geographical disparities in infrastructure, gender inequalities, and economic constraints. Together, these theories inform the construction of a composite digital divide index tailored to Kenya's context.

4.3 Digital Divide Framework

This study draws from the key global indexes related to the digital divide discussed in Table 3.1 to construct a relevant framework for Kenya's digital landscape. The selected framework integrates insights from existing indices such as the Global Digital Divide Index (GDI), ICT Development Index (IDI), and Affordability Index, ensuring that both access and usage disparities are addressed comprehensively.

Building on van Dijk and Hacker's (2003) categorization of digital divide dimensions—access, use, and outcomes—the study emphasizes two core forms: disparity of access and disparity of use. This approach is in line with the Global Digital Divide Index's focus on multiple facets of digital inequality and the Affordability Index's attention to economic barriers. The framework measures access and usage of ICTs across various socio-economic, demographic, and geographic groups in Kenya as follows:

- **Demographic divide:** Disparity of digital divide based on gender; that is, male and female; and in terms of age, that is, youth (18-34 years) and non-youth (35+ years).
- **Geographic divides:** Disparity of digital divide among rural-urban residents.
- **Socio-economic:** Disparity of digital divide based on income level. Income levels refer to the average personal monthly income and are categorized as: Low-income group (individuals earning Ksh 24,000 and below); High income

group (individuals earning more than Ksh 24,000). The cut-off of Ksh 24,000 aligns closely with the threshold defined by the Kenya National Bureau of Statistics for the lower income group, which categorizes households earning Ksh 23,670 and below as low-income (KNBS, 2017).

The digital divide is assessed across the pillars of Kenya's Digital Economy Blueprint (2019), including digital infrastructure, digital government, digital business, digital skills and values, and innovation-driven entrepreneurship. This pillar-based framework, aligned with existing global indices, offers a holistic view of how disparities manifest in Kenya's evolving digital economy.

4.4 Digital Divide Pillars and Indicators

The indicators for measuring the digital divide in Kenya are aligned with the pillars of the digital economy (Table 4.1) and assess disparities across the 47 counties. The four forms of the divide are analyzed at the county level, with national scores derived from county averages. The rural-urban divide excludes Mombasa and Nairobi City (KNBS, 2019), as they are entirely urban, and their scores are assumed to be optimal (1).

Urban areas, characterized by high population density, advanced infrastructure, and diverse economies, contrast with rural areas, which have lower population density, less developed infrastructure, and economies based on agriculture or natural resources. Lastly, the indicator on innovations hosted in Huduma Whitebox applies only to the gender digital divide.

Table 4.1: Description of indicators for digital divide across the forms of divide

Pillars	Indicator	Measurement	Form of Divide	Data sources
Digital Infrastructure	Ownership of mobile phone	Percentage of individuals with a mobile phone	Age, Gender, Rural-urban, Income level	KDHS 2022
	Ownership of smart phone	Percentage of individuals with a smart phone	Age, Gender, Rural-urban, Income level	KDHS 2022
	Ownership of functional TV	Percentage of individuals with a functional TV	Age, Gender, Rural-urban, Income level	KDHS 2022
	Mobile Internet	Percentage of households with access to mobile Internet	Age, Gender, Rural-urban, Income level	FinAccess 2021
	Fixed Internet	Percentage of households with access to fixed Internet	Age, Gender, Rural-urban, Income level	FinAccess 2021

Digital Government	Individuals using Internet to access government services	Percentage of individuals using Internet to access government services	Age, Gender, Rural-urban, Income level	FinAccess 2021
	Digital ID	Percentage of individuals with digital IDs (e.g., Huduma number)	Age, Gender, Rural-urban, Income level	FinAccess 2021
Digital Business	Usage of mobile money	Percentage of households using mobile money	Age, Gender, Rural-urban, Income level	FinAccess 2021
	Financial transactions	Percentage of those who used a mobile phone for financial transactions in the last 12 months	Age, Gender, Rural-urban, Income level	KDHS 2022
	Usage of mobile money to pay for monthly bills e.g. rent, electricity, water, TV, water	Percentage of individuals using mobile money to pay for monthly bills e.g. rent, electricity, water, TV, water	Age, Gender, Rural-urban, Income level	FinAccess 2021
	E-commerce	Percentage of households that engage in e-commerce	Age, Gender, Rural-urban, Income level	FinAccess 2021
Digital Skills and Values	Ownership of laptop/ computer	Percentage of individuals with a laptop/ computer	Age, Gender, Rural-urban, Income level	FinAccess 2021
	Internet usage	Percentage of individuals using Internet	Age, Gender, Rural-urban, Income level	KDHS 2022
	Level of education attained by households	Highest level of education attained by households	Age, Gender, Rural-urban, Income level	FinAccess 2021
Innovation-Driven Entrepreneurship	Innovations hosted in the Whitebox	Number of innovations hosted in the Whitebox	Gender	ICTA reports

	Access to credit/loans for business purposes	Percentage of households with access to credit/loans for business purposes	Age, Gender, Rural-urban, Income level	FinAccess 2021

4.5 Constructing the Digital Divide Index (DDI)

The Digital Divide Index (DDI) is essential for addressing the complex, multidimensional nature of the digital divide. It provides a comprehensive, measurable assessment, enabling comparisons across regions and demographic groups. The DDI helps quantify disparities, guiding informed policy making, resource allocation, and identifying best practices (van Deursen and Helsper, 2018; Robinson et al., 2020). It also allows for monitoring progress and evaluating interventions effectively (Gómez-Barroso et al., 2021).

4.5.1 Steps for constructing the digital divide index

The DDI is built through a systematic process that captures the digital divide in Kenya across various demographic and geographic groups. The key steps include:

Identification and categorization of DDI indicators

Indicators are drawn from Kenya's digital economy pillars: digital infrastructure, digital government, digital business, digital skills, and innovation-driven entrepreneurship. These are categorized by the four forms of digital divide: gender, age, rural-urban, and income levels (Table 4.2).

Sub-indices calculation for digital divide

The calculation of sub-indices for each form of the digital divide is based on the five defined pillars of the digital economy per county. To ascertain the existence of a digital divide among different categories (for instance, gender), the study follows these steps:

1. **Calculate ratios:** The ratio is computed using the score of the disadvantaged group relative to that of the advantaged group. That is, dividing the score of the potentially disadvantaged group (e.g., females, individuals aged 35 and above, low-income groups, and rural residents) by the score of the potentially advantaged group.
2. **Response rate calculation:** The response rate for each indicator (for example, mobile ownership) is calculated as the proportion of individuals who responded 'yes' out of the total interviewed in that county.
3. **Weight calculation:** A weight for each county is computed as the ratio of its response rate to the average response rate across all counties. This adjustment ensures that counties with higher response rates contribute more significantly to the final scores.

4. **Indicator score determination:** The indicator score for each county is determined by multiplying the weight by the parity score for that indicator. This adjustment reflects the relative importance of each county's response rate in the overall assessment.

5. **Final indicator score computation:** The final indicator score is calculated using the Distance to Frontier method, where the frontier is defined as the county with the highest weighted score (the weight multiplied by the parity score), and the worst is set to 0.

$$Score = (Worst\text{-}y)/(Worst\text{-}Frontier) \quad (1)$$

Where is the data point for each indicator, Worst represents the worst performance and frontier indicates the target/best practice. The scoring spans from zero (0) to one (1). This approach provides insight into the extent to which each form of divide deviates from the best practice.

The pillar score per divide is determined using an arithmetic average of its weighted indicator scores expressed as:

$$Pillar\ Score\ per\ Divide = (Weighted\ Indicato1_{norm} + \ldots Weighted\ Indicato\ N_{norm})/N \quad (2)$$

where the weighted indicators are the adjusted values for each indicator, and N is the number of indicators.

This approach offers a more nuanced assessment of the digital divide by incorporating response rates, providing a weighted perspective on digital inclusion and disparities across counties. The Digital Divide Index (DDI) scores are categorized into distinct ranges to clearly highlight counties with varying levels of digital inequality, facilitating targeted policy interventions:

- **Low Digital Divide (High Performance):** Scores between 0.75 and 1.00
- **Moderate Digital Divide:** Scores between 0.50 and 0.74
- **High Digital Divide:** Scores between 0.25 and 0.49
- **Very High Digital Divide (Low Performance):** Scores between 0.00 and 0.24

The classification facilitates a nuanced understanding of digital inequality across counties in Kenya. This approach aligns with global research that emphasizes the spectrum of digital access and the varying degrees of inequality experienced by different populations. For instance, van Dijk (2020) argues that digital inequality is not a binary issue but exists along a continuum, necessitating a classification system that reflects the complexity of digital divides. By categorizing DDI scores, stakeholders can better identify regions that require targeted interventions and resources, ultimately fostering a more equitable digital landscape.

Pillar composite index calculation involves the use of a simple arithmetic mean (Equation 3).

$$\textit{Pillar Sub Index} = (\textit{gender divide} + \textit{age divide} + \textit{rural-urban divide} + \textit{income divide})/4 \quad (3)$$

Overall digital divide index calculation

Pillar composite indices are calculated using the arithmetic mean of the four divides (gender, age, rural-urban, and income). The overall DDI per county is the simple average of the five pillar indices. This method is straightforward and easy to interpret, but future iterations may consider weighted averages to reflect the relative importance of each pillar in the Kenyan context. Equation 4 shows the formula for computing the index per county:

$$\textit{County DDI} = (\textit{infrastructure index} + \textit{government index} + \textit{business index} + \textit{skills index} + \textit{innovation index})/5 \quad (4)$$

The composite Digital Divide Index (DDI) offers a high-level measure of the country's overall digital divide, while the sub-indices reveal critical disparities across demographic groups, socio-economic levels, and geographic regions. This multidimensional approach provides a thorough understanding of digital inequality in Kenya, supporting informed decision-making and effective resource allocation to address specific gaps.

4.6 Data Sources

The study used a desktop review to gather data for each indicator across the various forms of the digital divide in Kenyan counties. The data sources included the Kenya Demographic and Health Survey (KDHS) 2022, FinAccess 2021, and ICTA reports.

4.7 Robustness Checks

This section details the sensitivity analyses and robustness checks conducted to validate the composite index and its sub-indices. To ensure the reliability and consistency of the digital divide sub-indices, Principal Component Analysis (PCA) was performed. PCA, as described in Annex 3, helps to verify the dimensionality and stability of the data by examining the variance explained by each principal component. This test ensures that the indicators used in constructing the index are statistically reliable and robust for accurate index computation.

5. Results and Discussion

5.1 Kenya's Composite Digital Divide Index

The average Digital Divide Index (DDI) score for Kenya is 0.45, indicating a significant digital divide across the nation. This score highlights that Kenya faces a high digital divide, with the most notable disparities occurring in the rural-urban (0.40) and income-level (0.44) divides, followed by gender and age divides. These divides show how socio-economic and geographic factors influence digital access across the country, with the rural-urban divide being the most prevalent type of digital inequality. As noted by van Dijk (2020), infrastructure deficits significantly contribute to the digital divide, particularly in rural areas where poor connectivity limits access to digital resources. This insufficient infrastructure is a critical barrier that must be addressed to ensure equitable digital access across different regions. Furthermore, Robinson et al. (2015) highlight the economic barriers that exacerbate digital inequality, emphasizing that income disparities often prevent marginalized groups from accessing digital technologies. Additionally, Hilbert (2011) points out that socio-cultural norms, including gender roles, play a significant role in creating digital disparities, especially for women in developing countries. These norms can limit women's access to technology, underscoring the need for policies that promote digital inclusion and gender equality.

Table 5.1: Composite DDI scores across counties

County/Divide	Gender	Age	Rural-Urban	Income Level	Composite Divide	Rank
Baringo	0.37	0.40	0.28	0.31	0.34	37
Bomet	0.40	0.40	0.30	0.31	0.35	36
Bungoma	0.52	0.47	0.40	0.45	0.46	22
Busia	0.54	0.56	0.35	0.42	0.47	21
Elgeyo Marakwet	0.38	0.46	0.30	0.38	0.38	30
Embu	0.61	0.63	0.49	0.53	0.56	12
Garissa	0.24	0.27	0.16	0.32	0.25	41
Homa Bay	0.38	0.44	0.31	0.37	0.37	31
Isiolo	0.41	0.43	0.27	0.35	0.36	34
Kajiado	0.52	0.64	0.46	0.59	0.55	13
Kakamega	0.46	0.57	0.41	0.48	0.48	20
Kericho	0.59	0.54	0.39	0.42	0.49	19
Kiambu	0.74	0.78	0.76	0.74	0.75	3
Kilifi	0.36	0.39	0.24	0.33	0.33	38
Kirinyaga	0.59	0.67	0.68	0.64	0.65	5
Kisii	0.58	0.60	0.44	0.50	0.53	15

Kisumu	0.51	0.47	0.40	0.44	0.46	23
Kitui	0.36	0.32	0.24	0.31	0.31	39
Kwale	0.43	0.41	0.25	0.32	0.35	35
Laikipia	0.64	0.63	0.58	0.72	0.64	6
Lamu	0.45	0.45	0.34	0.38	0.41	28
Machakos	0.60	0.60	0.53	0.62	0.59	9
Makueni	0.59	0.51	0.41	0.47	0.49	18
Mandera	0.22	0.16	0.14	0.23	0.19	46
Marsabit	0.22	0.25	0.17	0.23	0.22	45
Meru	0.44	0.49	0.34	0.42	0.42	27
Migori	0.39	0.44	0.30	0.32	0.36	33
Mombasa	0.65	0.75	1.00	0.72	0.78	2
Murang'a	0.59	0.63	0.59	0.53	0.59	11
Nairobi City	0.70	0.90	1.00	0.85	0.86	1
Nakuru	0.60	0.63	0.53	0.59	0.59	10
Nandi	0.51	0.52	0.51	0.51	0.51	16
Narok	0.43	0.45	0.25	0.34	0.37	32
Nyamira	0.40	0.43	0.43	0.34	0.40	29
Nyandarua	0.62	0.65	0.64	0.59	0.62	7
Nyeri	0.68	0.71	0.69	0.71	0.70	4
Samburu	0.32	0.36	0.19	0.29	0.29	40
Siaya	0.50	0.45	0.38	0.45	0.45	25
Taita Taveta	0.54	0.60	0.52	0.54	0.55	14
Tana River	0.25	0.23	0.23	0.21	0.23	43
Tharaka Nithi	0.48	0.49	0.36	0.45	0.45	26
Trans Nzoia	0.50	0.56	0.44	0.52	0.50	17
Turkana	0.15	0.14	0.07	0.13	0.12	47
Uasin Gishu	0.64	0.68	0.55	0.60	0.62	8
Vihiga	0.53	0.48	0.38	0.42	0.45	24
Wajir	0.26	0.26	0.18	0.25	0.24	42
West Pokot	0.27	0.25	0.14	0.25	0.23	44
Country Score	0.47	0.49	0.40	0.44	0.45	

5.2 Digital Divides in Kenya

This sub-section discusses the various types of digital divides—gender, age, rural-urban, and income—highlighting how each affects different groups within Kenya. By analyzing these divides, we can gain a comprehensive understanding of the digital landscape and identify targeted interventions to address disparities.

5.2.1 Gender divide

The gender digital divide in Kenya reveals substantial disparities in digital access between men and women, with an average score of 0.47. This aligns with global observations that highlight pronounced gender inequalities in ICT access, particularly in developing countries.

Counties such as Kiambu (0.74), Nairobi City (0.70), and Nyeri (0.68) stand out for their efforts in narrowing this gap, benefiting from urbanization, which typically offers greater economic opportunities and educational access for women. These regions also enjoy progressive social norms that encourage women's participation in the digital space. The presence of tech hubs and innovation centres, especially in Nairobi, fosters inclusive digital ecosystems that empower women to engage with technology more effectively.

Conversely, many counties, including Kisumu (0.46), Kilifi (0.38), and Baringo (0.34), fall into the high digital divide category (0.25-0.49). Here, women face significant barriers to accessing digital technologies, exacerbated by lower literacy rates, limited economic independence, and domestic responsibilities. Traditional gender roles often restrict women's ability to engage with technology, while economic constraints hinder their capacity to purchase devices or pay for Internet access.

The situation is even more dire in counties such as Turkana (0.15), Mandera (0.22), and Marsabit (0.22), which fall into the very high divide category (0.00-0.24). In these areas, the intersection of poverty, cultural barriers, and inadequate infrastructure creates formidable obstacles to women's digital inclusion. Traditional lifestyles and nomadic patterns complicate efforts to provide consistent digital access, and extreme poverty means that when resources are available, they are often controlled by men, further marginalizing women's access to technology.

5.2.2 Age divide

The age digital divide in Kenya, with an average score of 0.49, reveals significant disparities in digital access and usage among different age groups. This trend mirrors global patterns identified by van Dijk (2020), which highlight that older individuals often encounter greater challenges in adopting and using digital technologies.

Counties such as Nairobi City (0.90), Kiambu (0.85), Mombasa (0.80), and Nyeri (0.75) excel in this area, achieving scores that place them in the low digital divide category (0.75-1.00). Their success can be attributed to several factors. Urban environments typically offer better access to technology education and support systems for older adults, as noted by Czaja et al. (2006). Nairobi, recognized as a tech hub, provides numerous initiatives aimed at bridging the generational technology gap. The blend of urban and semi-urban settings in these counties facilitates inter-generational learning, where younger individuals assist older adults in acquiring digital skills, fostering a more inclusive digital ecosystem.

In contrast, counties such as Kakamega (0.57), Busia (0.56), and Nakuru (0.53) fall into the moderate digital divide category (0.50-0.74). These areas struggle to provide equitable digital access and skills across age groups. Factors such as lower digital literacy among older adults, limited access to technology training, and a lack of perceived relevance of digital technologies contribute to this divide, as highlighted by Friemel (2016).

The situation is particularly dire in counties such as Turkana (0.14), Mandera (0.16), and Tana River (0.23), which exhibit the largest age-related digital divides, categorizing them in the very high divide range (0.00-0.24). These regions face compounded challenges, including inadequate educational opportunities, poor infrastructure, and economic constraints that disproportionately affect older populations.

5.2.3 Rural-urban divide

The rural-urban digital divide in Kenya, with an average score of 0.40, represents the most pronounced digital disparity in the country. This trend aligns with global observations by Salemink et al. (2017), which highlight that rural areas consistently lag urban centres in terms of digital infrastructure and adoption.

Urban counties such as Nairobi City and Mombasa score a perfect 1.00, indicating no rural-urban divide within these regions. Their success is attributed to their fully urban nature, characterized by well-developed infrastructure and widespread availability of digital services. As Graham (2008) notes, large urban centres often serve as "digital oases," benefiting from concentrated investments in ICT infrastructure and a critical mass of tech-savvy users. This creates a self-reinforcing cycle of digital advancement, where economic and technological growth attracts further investments.

Counties such as Kiambu (0.76), Kirinyaga (0.68), and Nyeri (0.69) exhibit moderate performance, benefiting from a blend of urban centres and well-connected rural areas. Their proximity to major cities facilitates better infrastructure development and digital connectivity. Philip et al. (2017) argues that these "peri-urban" areas experience spillover effects from urban centres, leading to improved digital access and increased digital literacy among residents. Additionally, agricultural technology initiatives in these counties help bridge the rural-urban digital gap, enhancing connectivity for farming communities.

Conversely, many counties fall into the high digital divide category (0.25-0.49), including Machakos (0.53), Nakuru (0.53), and Uasin Gishu (0.55). These regions face challenges in providing equal digital access across urban and rural areas. Salemink et al. (2017) suggest that lower population density in rural areas often makes infrastructure investments less economically viable for private companies. Uneven economic development between urban centres and outlying regions exacerbates disparities in digital access and adoption.

Counties such as Turkana (0.07), Mandera (0.14), and West Pokot (0.14) experience severe rural-urban divides, falling into the very high divide category (0.00-0.24).

These areas struggle with geographical isolation, poor infrastructure, and limited economic resources, which hinder consistent digital access. Robinson, Cotten, and Ono (2015) highlight that in such regions, broader issues of poverty, low education levels, and inadequate basic infrastructure compound the challenges of digital exclusion. Additionally, nomadic lifestyles in some counties complicate efforts to establish stable digital infrastructure, further marginalizing these populations.

5.2.4 Income-level divide

The income-level digital divide in Kenya, with an average score of 0.44, highlights the profound impact of economic disparities on digital access and usage. This finding aligns with global insights from van Dijk (2005), who posits that income inequality is a fundamental driver of digital inequality, perpetuating a cycle where higher incomes lead to better access to digital resources and, consequently, improved economic opportunities.

Nairobi City stands out with a score of 0.85, categorizing it in the high-performance bracket (0.75-1.00) and indicating minimal income-based digital inequality. This success can be attributed to several factors. Warschauer (2004) notes that urban centres with diverse economies provide a variety of digital access points and services tailored to different income levels. As Kenya's economic hub, Nairobi benefits from higher average incomes and a competitive digital services market, making technology more accessible across income brackets. The presence of numerous tech startups and innovation hubs further fosters a culture of digital inclusion, creating affordable solutions for a broader audience.

Counties such as Kiambu (0.74), Nyeri (0.71), and Laikipia (0.72) demonstrate moderate income-level divides (0.50-0.74). These counties benefit from relatively strong local economies and policies promoting digital inclusion. Galperin (2010) suggests that regions with diversified economies and a robust middle class tend to experience smaller digital divides. The coexistence of agricultural and industrial sectors, along with proximity to urban centres, facilitates more equitable access to digital technologies.

In contrast, many counties fall into the high digital divide category (0.25-0.49), including Siaya (0.45), Meru (0.42), and Kilifi (0.33). These areas struggle to provide equitable digital access across income levels. Hargittai and Hinnant (2008) argue that the digital divide encompasses not only access to technology but also the quality of that access and the skills necessary to use it effectively. In these counties, significant income disparities often prevent large segments of the population from affording quality devices or reliable Internet access. Limited initiatives to support lower-income residents, such as public access points or subsidized Internet programmes, further entrench this divide.

Counties such as Turkana (0.13), Tana River (0.21), and Mandera (0.23) exhibit the largest income-based digital divides, falling into the very high divide category (0.00-0.24). These regions grapple with high poverty rates, limited economic opportunities, and a lack of affordable digital services. Pearce and Rice (2013) emphasize that in such resource-constrained environments, the cost

of digital access constitutes a significant portion of household income, making it prohibitively expensive for many. In these areas, subsistence economies often view digital technologies as luxury items rather than essential tools for economic participation and social inclusion.

5.3 Manifestation of Digital Divide Across the Pillars

In this sub-section, the study delves into discussing the manifestation of digital divide under the five pillars of the digital economy.

5.3.1 Digital divide manifestation in the digital infrastructure pillar

The digital infrastructure pillar reveals significant disparities across Kenya's counties, with an average country index score of 0.45, indicating a high overall digital divide. This aligns with findings from Lwoga and Sangeda (2019), who emphasize the crucial role of infrastructure in digital inclusion across East African countries. This index incorporates indicators such as mobile ownership, smartphone ownership, TV ownership, mobile Internet access, and fixed Internet availability (Annex 1 – Tables 10-13), crucial for assessing foundational elements of digital connectivity and access that support participation in the digital economy.

Nairobi City (0.95), Mombasa (0.82), and Kiambu (0.77) emerge as the top-performing counties, highlighting lower digital divides across all dimensions. Their success can be attributed to factors such as urbanization, economic development, and strategic investments in digital infrastructure. As noted by Mwim and Kritzinger (2016), urban areas often benefit from better digital infrastructure and higher socio-economic status, contributing to reduced digital divides.

Conversely, counties such as Turkana (0.13), West Pokot (0.22), and Mandera (0.22) exhibit the highest digital divides, reflecting significant challenges in digital infrastructure access and usage. These disparities align with Salemink et al.'s (2017) observations on rural-urban digital divides, where remote and economically disadvantaged areas often lag in digital development.

Table 5.2: Digital infrastructure pillar performance per divide

County/Divide	Gender	Age	Rural-Urban	Income Level	Average, Pillar Divide	Rank
Baringo	0.34	0.33	0.22	0.28	0.29	39
Bomet	0.36	0.32	0.24	0.33	0.31	38
Bungoma	0.53	0.36	0.39	0.40	0.42	26
Busia	0.57	0.58	0.40	0.42	0.49	14
Elgeyo Marakwet	0.43	0.36	0.29	0.42	0.38	31

Embu	0.51	0.45	0.50	0.44	0.48	17
Garissa	0.30	0.23	0.15	0.32	0.25	44
Homa Bay	0.40	0.40	0.34	0.37	0.38	32
Isiolo	0.43	0.49	0.28	0.41	0.40	29
Kajiado	0.70	0.72	0.56	0.61	0.65	5
Kakamega	0.51	0.55	0.40	0.42	0.47	18
Kericho	0.55	0.45	0.39	0.37	0.44	23
Kiambu	0.89	0.67	0.88	0.64	0.77	3
Kilifi	0.39	0.35	0.30	0.31	0.34	33
Kirinyaga	0.67	0.58	0.69	0.55	0.62	7
Kisii	0.62	0.54	0.40	0.40	0.49	16
Kisumu	0.48	0.42	0.45	0.48	0.46	19
Kitui	0.30	0.27	0.21	0.34	0.28	40
Kwale	0.42	0.34	0.25	0.31	0.33	35
Laikipia	0.64	0.42	0.53	0.65	0.56	11
Lamu	0.53	0.41	0.39	0.43	0.44	24
Machakos	0.53	0.44	0.46	0.54	0.49	15
Makueni	0.55	0.35	0.40	0.40	0.43	25
Mandera	0.23	0.19	0.14	0.32	0.22	46
Marsabit	0.32	0.24	0.18	0.31	0.26	41
Meru	0.47	0.42	0.32	0.36	0.39	30
Migori	0.39	0.32	0.27	0.30	0.32	37
Mombasa	0.91	0.70	1.00	0.66	0.82	2
Murang'a	0.75	0.60	0.73	0.55	0.66	4
Nairobi City	0.99	0.93	1.00	0.88	0.95	1
Nakuru	0.71	0.55	0.63	0.55	0.61	9
Nandi	0.49	0.38	0.49	0.42	0.44	21
Narok	0.40	0.37	0.23	0.33	0.33	34
Nyamira	0.48	0.35	0.43	0.35	0.40	27
Nyandarua	0.66	0.58	0.69	0.55	0.62	8
Nyeri	0.67	0.51	0.65	0.54	0.59	10
Samburu	0.36	0.38	0.16	0.40	0.32	36
Siaya	0.60	0.39	0.41	0.43	0.46	20
Taita Taveta	0.61	0.53	0.53	0.51	0.54	13
Tana River	0.28	0.27	0.19	0.28	0.26	43
Tharaka Nithi	0.50	0.37	0.32	0.42	0.40	28
Trans Nzoia	0.68	0.57	0.50	0.48	0.56	12
Turkana	0.19	0.13	0.08	0.11	0.13	47

Uasin Gishu	0.74	0.72	0.58	0.49	0.63	6
Vihiga	0.57	0.41	0.40	0.39	0.44	22
Wajir	0.29	0.23	0.19	0.33	0.26	42
West Pokot	0.27	0.19	0.12	0.31	0.22	45
Country Score	0.52	0.43	0.41	0.43	0.45	

Gender divide: The gender divide (country score 0.52) shows moderate disparities, with Nairobi City (0.99) and Mombasa (0.91) demonstrating near gender parity in digital infrastructure access. However, counties such as Turkana (0.19) and Mandera (0.23) reveal substantial gender gaps. Opiyo and K'Akumu (2006) attribute such disparities to cultural norms, education levels, and economic factors affecting women's access to digital technologies.

Age divide: The age divide (country score 0.43) indicates challenges in ensuring equitable access across age groups. While Nairobi City (0.93) shows minimal age-related disparities, counties such as Turkana (0.13) and West Pokot (0.19) face significant challenges. Blažič and Blažič (2020) suggest that factors such as digital literacy and age-specific needs contribute to these divides.

Rural-urban divide: The rural-urban divide (country score 0.41) emerges as the most pronounced, with Nairobi City and Mombasa scoring 1.00, in stark contrast to Turkana (0.08) and West Pokot (0.12). This aligns with Salemink et al.'s (2017) findings on the persistent nature of rural-urban digital divides, often driven by infrastructure availability and economic development disparities.

Income-level divide: The income level divide (country score 0.43) reflects economic inequalities in digital access. Nairobi City (0.88) and Mombasa (0.66) show lower income-related divides, while Turkana (0.11) faces severe challenges. Fuchs and Horak (2008) emphasize the role of affordability and resource access in perpetuating income-related digital divides.

5.3.2 Digital divide manifestation in the digital government pillar

The composite digital divide index for digital government across Kenyan counties incorporates indicators such as access to government services and digital ID ownership (Annex 1 – Tables 14-17), which are crucial for assessing the citizens' ability to engage with and benefit from digital government initiatives. The digital government pillar reveals significant disparities across Kenya's counties, with an average country score of 0.34, indicating a high overall digital divide in government services access and usage. This aligns with findings from Mawela, Ochara, and Twinomurinzi (2017), who emphasize the importance of stakeholder engagement, leadership, and strategic planning in successful e-government implementation.

Laikipia (0.71), Kisii (0.62), and Nairobi City (0.61) emerge as the top-performing counties, showcasing lower digital divides across most dimensions in digital government services (Table 5.3). Their success can be attributed to factors such as effective e-government initiatives, better infrastructure, and higher digital literacy among citizens. As noted by Ondego and Moturi (2016), initiatives like the

e-Citizen portal have played a significant role in improving access to government services in well-performing areas.

Conversely, counties like Turkana (0.05), Wajir (0.16), and Kwale (0.17) exhibit the highest digital divides in government services, reflecting significant challenges in digital government access and usage. These disparities align with Okunola, Rowley, and Johnson's (2017) observations on rural-urban digital divides, where remote and economically disadvantaged areas often lag in digital government adoption.

Table 5.3: Digital government pillar performance per divide

County/Divide	Gender	Age	Rural-Urban	Income Level	Average, Pillar Divide	Rank
Baringo	0.39	0.42	0.35	0.25	0.35	23
Bomet	0.57	0.57	0.38	0.21	0.44	11
Bungoma	0.41	0.50	0.39	0.34	0.41	12
Busia	0.17	0.46	0.23	0.32	0.30	29
Elgeyo Marakwet	0.17	0.26	0.19	0.15	0.19	41
Embu	0.57	0.46	0.44	0.36	0.46	10
Garissa	0.13	0.26	0.21	0.26	0.22	39
Homa Bay	0.18	0.23	0.22	0.07	0.18	44
Isiolo	0.28	0.34	0.22	0.10	0.24	38
Kajiado	0.21	0.26	0.19	0.31	0.24	36
Kakamega	0.16	0.40	0.40	0.27	0.31	27
Kericho	0.83	0.47	0.39	0.31	0.50	8
Kiambu	0.41	0.50	0.34	0.34	0.40	13
Kilifi	0.31	0.30	0.14	0.31	0.26	31
Kirinyaga	0.30	0.38	0.56	0.32	0.39	15
Kisii	0.73	0.58	0.63	0.55	0.62	2
Kisumu	0.27	0.28	0.24	0.21	0.25	34
Kitui	0.33	0.21	0.32	0.18	0.26	32
Kwale	0.17	0.21	0.15	0.13	0.17	45
Laikipia	0.63	0.55	0.73	0.92	0.71	1
Lamu	0.39	0.40	0.21	0.12	0.28	30
Machakos	0.59	0.42	0.54	0.47	0.50	7
Makueni	0.23	0.31	0.37	0.10	0.26	33
Mandera	0.44	0.14	0.13	0.26	0.24	37
Marsabit	0.13	0.32	0.18	0.10	0.18	42
Meru	0.30	0.25	0.30	0.33	0.30	28

Migori	0.47	0.53	0.34	0.21	0.39	16
Mombasa	0.20	0.50	1.00	0.40	0.52	5
Murang'a	0.35	0.31	0.32	0.26	0.31	26
Nairobi City	0.22	0.69	1.00	0.54	0.61	3
Nakuru	0.44	0.45	0.30	0.27	0.36	21
Nandi	0.39	0.35	0.55	0.54	0.46	9
Narok	0.67	0.44	0.25	0.16	0.38	18
Nyamira	0.37	0.38	0.50	0.20	0.36	22
Nyandarua	0.57	0.51	0.52	0.44	0.51	6
Nyeri	0.59	0.55	0.64	0.46	0.56	4
Samburu	0.50	0.43	0.36	0.21	0.37	19
Siaya	0.45	0.37	0.36	0.41	0.40	14
Taita Taveta	0.30	0.42	0.46	0.28	0.36	20
Tana River	0.27	0.09	0.28	0.08	0.18	43
Tharaka Nithi	0.44	0.40	0.46	0.23	0.38	17
Trans Nzoia	0.20	0.23	0.21	0.20	0.21	40
Turkana	0.07	0.02	0.02	0.11	0.05	47
Uasin Gishu	0.26	0.32	0.33	0.36	0.31	25
Vihiga	0.39	0.34	0.27	0.25	0.32	24
Wajir	0.23	0.22	0.10	0.09	0.16	46
West Pokot	0.32	0.23	0.26	0.18	0.25	35
Country Score	0.36	0.37	0.36	0.28	0.34	

Gender divide: The gender divide (country score 0.36) shows moderate disparities, with Kericho (0.83) and Kisii (0.73) demonstrating better gender parity in digital government access. However, counties such as Turkana (0.07) and Garissa (0.13) reveal substantial gender gaps. These disparities may be attributed to socio-cultural factors and varying levels of digital literacy among genders.

Age divide: The age divide (country score 0.37) indicates challenges in ensuring equitable access across age groups. While Nairobi City (0.69) shows lower age-related disparities, counties such as Turkana (0.02) and Tana River (0.09) face significant challenges. Okunola et al. (2017) suggest that factors such as education, income, and exposure to technology contribute to these age-related divides.

Rural-urban divide: The rural-urban divide (country score 0.36) emerges as a significant factor, with Nairobi City and Mombasa scoring 1.00, in stark contrast to Turkana (0.02) and Wajir (0.10). This aligns with Okunola et al.'s (2017) findings on the persistent nature of rural-urban digital divides, often driven by infrastructure availability and socio-economic factors.

Income-level divide: The income level divide (country score 0.28) reflects economic inequalities in digital government access. Laikipia (0.92) and Kisii (0.55) show lower income-related divides, while Homa Bay (0.07) and Tana

River (0.08) face severe challenges. Mawela et al. (2017) emphasize the role of affordability, education, and employment opportunities in perpetuating income-related digital divides in e-government access.

5.3.3 Digital divide manifestation in the digital business pillar

Table 5.4 highlights the digital business landscape, with composite indices reflecting the usage of digital financial services and e-commerce – measured using indicators such as mobile money usage, use of mobile phones for financial transactions, mobile money use to pay bills, and engagement in e-commerce (Annex 1 – Tables 18-21). The country score for this pillar stands at 0.55, indicating a moderate overall digital divide in digital business participation. The table highlights disparities across gender, age, rural-urban, and income dimensions, reflecting the varied levels of digital engagement across counties. Counties such as Nairobi City (0.92), Kiambu (0.88), and Nyeri (0.85) excel in digital business performance, likely due to robust infrastructure and high digital literacy rates. These regions have successfully mitigated inequalities in digital business usage across different demographics, supported by their economic resources and urban settings, which facilitate greater access to digital tools and platforms (Mawela et al., 2017). In contrast, counties such as Turkana (0.17), Mandera (0.26), and West Pokot (0.25) display significant digital business divides, necessitating targeted interventions to address these disparities.

Table 5.4: Digital business pillar performance per divide

County/Divide	Gender	Age	Rural-Urban	Income Level	Average, Pillar Divide	Rank
Baringo	0.53	0.40	0.42	0.34	0.43	35
Bomet	0.51	0.40	0.41	0.33	0.41	37
Bungoma	0.63	0.48	0.46	0.46	0.51	29
Busia	0.67	0.63	0.44	0.44	0.54	24
Elgeyo Marakwet	0.59	0.57	0.42	0.40	0.49	30
Embu	0.91	0.81	0.55	0.57	0.71	8
Garissa	0.33	0.30	0.19	0.36	0.30	44
Homa Bay	0.62	0.61	0.44	0.47	0.53	27
Isiolo	0.50	0.49	0.40	0.38	0.44	32
Kajiado	0.76	0.73	0.58	0.63	0.67	13
Kakamega	0.65	0.63	0.52	0.48	0.57	21
Kericho	0.78	0.67	0.44	0.39	0.57	20
Kiambu	0.98	0.85	0.87	0.83	0.88	2
Kilifi	0.51	0.48	0.32	0.37	0.42	36

Kirinyaga	0.83	0.86	0.83	0.73	0.81	5
Kisii	0.68	0.63	0.51	0.46	0.57	19
Kisumu	0.69	0.64	0.47	0.50	0.58	17
Kitui	0.60	0.42	0.35	0.34	0.43	34
Kwale	0.48	0.41	0.33	0.35	0.39	39
Laikipia	0.88	0.61	0.62	0.63	0.69	12
Lamu	0.61	0.57	0.48	0.47	0.53	28
Machakos	0.81	0.67	0.71	0.61	0.70	9
Makueni	0.68	0.55	0.58	0.50	0.58	18
Mandera	0.26	0.27	0.25	0.25	0.26	45
Marsabit	0.35	0.30	0.25	0.37	0.32	41
Meru	0.64	0.64	0.46	0.44	0.54	23
Migori	0.48	0.52	0.39	0.33	0.43	33
Mombasa	0.88	0.83	1.00	0.75	0.86	3
Murang'a	0.74	0.77	0.71	0.54	0.69	11
Nairobi City	0.88	0.91	1.00	0.91	0.92	1
Nakuru	0.81	0.74	0.59	0.64	0.69	10
Nandi	0.73	0.53	0.63	0.50	0.60	16
Narok	0.47	0.43	0.36	0.36	0.40	38
Nyamira	0.51	0.47	0.47	0.38	0.46	31
Nyandarua	0.82	0.84	0.73	0.58	0.74	7
Nyeri	0.92	0.91	0.82	0.75	0.85	4
Samburu	0.34	0.43	0.23	0.26	0.31	43
Siaya	0.67	0.52	0.48	0.51	0.55	22
Taita Taveta	0.84	0.66	0.57	0.60	0.67	14
Tana River	0.35	0.32	0.27	0.32	0.31	42
Tharaka Nithi	0.62	0.62	0.49	0.44	0.54	25
Trans Nzoia	0.69	0.71	0.58	0.55	0.63	15
Turkana	0.24	0.20	0.13	0.12	0.17	47
Uasin Gishu	0.87	0.88	0.62	0.70	0.77	6
Vihiga	0.68	0.52	0.48	0.48	0.54	26
Wajir	0.41	0.38	0.32	0.32	0.36	40
West Pokot	0.35	0.30	0.16	0.20	0.25	46
Country Score	**0.63**	**0.58**	**0.50**	**0.47**	**0.55**	

Gender divide: When examining the specific dimensions of the digital divide, the gender divide appears relatively small on a national level, with a country score of 0.63, suggesting moderate inequality. However, disparities are evident in counties such as Turkana (0.24), Garissa (0.33), and Samburu (0.34), where traditional gender roles and cultural norms may limit women's access to digital business

opportunities (Hilbert, 2011). These findings are consistent with literature that highlights the persistence of gender gaps in technology usage, particularly in regions with strong patriarchal structures (Hilbert, 2011; Robinson et al., 2015).

Age divide: The age divide, with a country score of 0.58, reflects moderate disparities, with counties such as Wajir (0.38) and Kilifi (0.48) facing notable challenges. These variations could be attributed to differences in digital literacy, access to technology, and familiarity with digital platforms among different age groups (van Dijk, 2020). Younger populations in urban areas, such as Nairobi and Kiambu, often exhibit higher digital business engagement due to better access to education and technology. In contrast, older individuals in rural areas may struggle with digital adoption, highlighting the need for age-targeted interventions, such as educational programmes and accessible technologies designed for older adults, to bridge this divide (Okunola et al., 2017).

Rural-urban divide: The rural-urban divide is a significant barrier to digital business participation, with a country score of 0.50, indicating a high disparity. Counties such as Nairobi (1.00), Mombasa (1.00), and Kiambu (0.87) perform well due to their advanced infrastructure and concentrated economic activities, which facilitate digital business growth. Conversely, rural counties such as Turkana (0.13), West Pokot (0.16), and Samburu (0.23) face infrastructural challenges that hinder digital access and participation (van Dijk, 2020). This divide underscores the necessity of enhancing rural infrastructure and connectivity to create a more balanced digital ecosystem across the country.

Income-level divide: The income level divide is another critical aspect, with a country score of 0.47, indicating high inequality. Wealthier counties, such as Nairobi and Kiambu, enjoy better access to digital business opportunities due to higher income levels and access to resources. In contrast, lower-income counties such as Wajir (0.32) and Tana River (0.31) require measures to improve digital accessibility for economically disadvantaged groups (Mawela et al., 2017). Addressing income disparities is essential for fostering an inclusive digital economy, as income affects access to technology, capital, and market opportunities, which are vital for digital business engagement.

The Kenyan government has made commendable efforts to support the growth of digital businesses and bridge the digital divide through initiatives such as the Ajira Digital Programme, which offers digital work opportunities and skills training to youth, and the Constituency Innovation Hubs project, which establishes digital innovation centres nationwide. Additionally, the Kenya Industry and Entrepreneurship Project (KIEP) provides grant funding and technical assistance to help SMEs adopt modern digital technologies. Despite these efforts, challenges such as limited infrastructure, low digital literacy, and socio-economic barriers persist in some counties, hindering the full realization of digital business potential. Comparing the digital business index to global benchmarks, Kenya ranked 93rd out of 139 countries in the business usage sub-index of the WEF Network Readiness Index 2021, with a score of 41.3/100. This highlights the need for continued improvement in business ICT adoption nationally, to enhance Kenya's competitive position in the global digital economy.

5.3.4 Digital divide manifestation in the digital skills and values

Table 5.5 presents the performance of Kenyan counties in the Digital Skills Pillar, focusing on access to digital education and training. The composite index varies from 0.08 to 0.94, with a country score of 0.43, indicating a moderate level of digital divide in digital skills acquisition. This index encompasses factors such as computer ownership, Internet usage, and education level (Annex 1 – Tables 22-25), which are crucial for evaluating digital skills and values among citizens.

Counties such as Nairobi City (0.94), Mombasa (0.86), and Kiambu (0.86) demonstrate relatively low levels of digital divide in digital skills, reflecting better educational infrastructure and access to digital training. Conversely, counties such as Mandera (0.10) and Turkana (0.08) exhibit high digital skills divides, highlighting the need for targeted interventions to enhance digital literacy and skills training in these regions.

Table 5.5: Digital skills and values pillar performance per divide

County/Divide	Gender	Age	Rural-Urban	Income Level	Average, Pillar Divide	Rank
Baringo	0.36	0.40	0.19	0.24	0.30	36
Bomet	0.31	0.30	0.21	0.21	0.26	38
Bungoma	0.51	0.41	0.38	0.37	0.42	23
Busia	0.54	0.51	0.29	0.35	0.42	22
Elgeyo Marakwet	0.43	0.53	0.31	0.30	0.39	25
Embu	0.63	0.62	0.47	0.49	0.55	14
Garissa	0.27	0.18	0.10	0.35	0.22	39
Homa Bay	0.46	0.41	0.21	0.38	0.37	28
Isiolo	0.57	0.35	0.15	0.28	0.34	32
Kajiado	0.57	0.73	0.39	0.67	0.59	11
Kakamega	0.60	0.58	0.33	0.56	0.52	15
Kericho	0.49	0.45	0.32	0.42	0.42	21
Kiambu	0.85	0.86	0.85	0.89	0.86	2
Kilifi	0.37	0.37	0.15	0.21	0.27	37
Kirinyaga	0.69	0.61	0.63	0.68	0.65	5
Kisii	0.53	0.51	0.26	0.40	0.43	20
Kisumu	0.52	0.47	0.41	0.46	0.47	17
Kitui	0.34	0.21	0.12	0.20	0.22	40
Kwale	0.38	0.53	0.25	0.27	0.36	30
Laikipia	0.63	0.69	0.53	0.58	0.61	9

Lamu	0.47	0.37	0.25	0.37	0.36	29
Machakos	0.67	0.63	0.50	0.72	0.63	7
Makueni	0.56	0.51	0.31	0.41	0.45	19
Mandera	0.11	0.06	0.06	0.16	0.10	46
Marsabit	0.19	0.17	0.05	0.12	0.13	45
Meru	0.48	0.46	0.30	0.31	0.39	26
Migori	0.37	0.35	0.22	0.29	0.31	35
Mombasa	0.71	0.93	1.00	0.80	0.86	3
Murang'a	0.62	0.65	0.46	0.48	0.55	13
Nairobi City	0.85	1.00	1.00	0.91	0.94	1
Nakuru	0.67	0.63	0.51	0.68	0.62	8
Nandi	0.56	0.54	0.39	0.34	0.46	18
Narok	0.35	0.44	0.19	0.30	0.32	34
Nyamira	0.38	0.39	0.29	0.25	0.33	33
Nyandarua	0.69	0.58	0.55	0.60	0.60	10
Nyeri	0.73	0.64	0.71	0.84	0.73	4
Samburu	0.23	0.25	0.05	0.15	0.17	41
Siaya	0.36	0.40	0.26	0.38	0.35	31
Taita Taveta	0.60	0.64	0.49	0.60	0.58	12
Tana River	0.21	0.17	0.21	0.08	0.17	42
Tharaka Nithi	0.49	0.37	0.24	0.41	0.38	27
Trans Nzoia	0.54	0.53	0.39	0.55	0.50	16
Turkana	0.15	0.10	0.04	0.04	0.08	47
Uasin Gishu	0.66	0.65	0.64	0.66	0.65	6
Vihiga	0.47	0.45	0.35	0.35	0.41	24
Wajir	0.21	0.12	0.11	0.16	0.15	44
West Pokot	0.22	0.19	0.05	0.17	0.16	43
Country Score	0.48	0.47	0.34	0.41	0.43	

Gender divide: Gender divide scores range from 0.11 (Mandera) to 0.85 (Nairobi City and Kiambu), with a country score of 0.48. This suggests a moderate gender gap in digital skills and values overall. Counties such as Nairobi City (0.85), Kiambu (0.85), and Mombasa (0.71) show strong performance in bridging this gap, indicating better access to digital resources and skills among women. In contrast, Mandera (0.11), Turkana (0.15), and Marsabit (0.19) have notably lower scores, reflecting significant gender disparities that need to be addressed through targeted programmes.

Age divide: The age divide in the skills and values pillar of Kenya's digital economy reveals significant disparities across counties, with scores ranging from a low of 0.06 in Mandera to a high of 1.00 in Nairobi City, and an overall country score of 0.47. This indicates a high age divide, suggesting that younger populations

are generally more adept at navigating the digital landscape compared to older generations. Urban areas such as Nairobi (1.00), Mombasa (0.93), and Kiambu (0.86) showcase strong digital engagement among youth, likely due to better access to technology and education. In contrast, counties such as Mandera (0.06), Turkana (0.10), and Wajir (0.12) face significant challenges, particularly among older individuals who often lack the skills to use digital technologies effectively.

Rural-urban divide: The rural-urban digital divide reveals pronounced differences in digital access and engagement, with urban areas significantly outperforming rural regions. Urban counties such as Nairobi and Mombasa achieve perfect scores of 1.00, reflecting high levels of Internet penetration and digital literacy, largely due to superior infrastructure, educational opportunities, and economic resources. In stark contrast, rural counties such as Turkana (0.04), Marsabit (0.05), and Wajir (0.11) face substantial barriers, including inadequate infrastructure, high costs of Internet access, and lower digital literacy rates, which hinder their ability to engage with digital technologies effectively. This divide not only limits economic opportunities for rural populations but also deepens social inequalities, as urban residents increasingly benefit from digital services while rural communities remain marginalized. Bridging the rural-urban digital divide requires comprehensive strategies that focus on enhancing digital infrastructure in rural areas, providing affordable Internet access, and implementing targeted digital literacy initiatives to empower rural populations and integrate them into the digital economy.

Income-level divide: The income level digital divide in Kenya's digital economy is marked by significant disparities, with scores ranging from 0.04 in Turkana to 0.91 in Nairobi City, illustrating a stark contrast in digital skills and access between high-income and low-income populations. High-income counties such as Nairobi (0.91), Kiambu (0.89), and Nyeri (0.84) exhibit strong digital engagement, benefiting from better access to advanced digital devices, high-speed Internet, and educational resources that enhance their digital literacy. Conversely, low-income counties such as Turkana (0.04), Marsabit (0.12), and Mandera (0.16) struggle with limited access to technology and lower levels of digital skills, primarily due to the high costs associated with digital devices and Internet services. This divide is exacerbated by insufficient educational opportunities that foster digital literacy among low-income communities. Addressing this income level divide necessitates targeted interventions, including subsidized access to digital technologies, affordable Internet services, and comprehensive digital literacy programmes tailored for low-income populations, ensuring equitable participation in the digital economy.

The Kenyan government has implemented various initiatives to improve digital skills and values across the population. The Digital Literacy Programme (DLP), launched in 2013, aims to equip primary school students with digital skills by providing laptops and training teachers (Mwangi, 2017). The Ajira Digital Programme, established in 2016, focuses on providing digital skills training and online work opportunities for youth. These initiatives have likely contributed to the better performance of some counties in digital skills and values. However,

ongoing efforts are essential to address disparities and ensure broader digital inclusivity.

5.3.5 Digital divide manifestation in the innovation-driven entrepreneurship

Table 5.6 evaluates the digital divide in innovation-driven entrepreneurship across Kenyan counties, focusing on access to digital tools and platforms for business innovation. The composite index ranges from 0.18 to 0.88, with a country score of 0.51, indicating a moderate overall digital divide in this area. This index includes indicators such as the number of innovation hubs and access to credit/ loans for business purposes (Annex 1 – Tables 26-27). It provides a detailed view of the digital entrepreneurship landscape, though the assessment is limited by the number of indicators and the lack of data for some dimensions. Notably, innovation was only applied to the gender divide, limiting the study's ability to fully capture the innovation environment.

Counties such as Nairobi City (0.88), Kiambu (0.86), and Mombasa (0.83) show low levels of digital divide, reflecting strong digital ecosystems and access to innovative resources. Conversely, counties such as Mandera (0.12), Marsabit (0.19), and Turkana (0.18) exhibit a very high digital divide, highlighting the need for targeted support to boost digital entrepreneurship in these regions.

Table 5.6: Innovation-driven entrepreneurship pillar performance per divide

County/Divide	Gender	Age	Rural-Urban	Income Level	Average, Pillar Divide	Rank
Baringo	0.22	0.45	0.22	0.42	0.33	39
Bomet	0.22	0.43	0.24	0.47	0.34	38
Bungoma	0.50	0.62	0.39	0.67	0.55	20
Busia	0.76	0.62	0.40	0.59	0.59	17
Elgeyo Marakwet	0.29	0.59	0.29	0.63	0.45	29
Embu	0.41	0.83	0.50	0.77	0.63	12
Garissa	0.17	0.35	0.15	0.33	0.25	43
Homa Bay	0.26	0.54	0.34	0.53	0.42	32
Isiolo	0.25	0.47	0.28	0.55	0.39	34
Kajiado	0.38	0.75	0.56	0.73	0.61	16
Kakamega	0.36	0.72	0.40	0.67	0.54	21
Kericho	0.32	0.65	0.39	0.63	0.50	27
Kiambu	0.56	1.00	0.88	1.00	0.86	2
Kilifi	0.24	0.48	0.30	0.47	0.37	35
Kirinyaga	0.46	0.92	0.69	0.93	0.75	6

Kisii	0.36	0.71	0.40	0.68	0.54	22
Kisumu	0.59	0.55	0.45	0.54	0.53	23
Kitui	0.24	0.50	0.21	0.48	0.36	37
Kwale	0.73	0.54	0.25	0.53	0.51	25
Laikipia	0.42	0.86	0.53	0.82	0.66	9
Lamu	0.25	0.52	0.39	0.51	0.42	31
Machakos	0.41	0.81	0.46	0.78	0.62	14
Makueni	0.91	0.82	0.40	0.92	0.76	4
Mandera	0.07	0.14	0.14	0.14	0.12	47
Marsabit	0.11	0.23	0.18	0.23	0.19	45
Meru	0.33	0.68	0.32	0.67	0.50	26
Migori	0.24	0.48	0.27	0.45	0.36	36
Mombasa	0.54	0.79	1.00	1.00	0.83	3
Murang'a	0.50	0.84	0.73	0.85	0.73	7
Nairobi City	0.56	0.96	1.00	1.00	0.88	1
Nakuru	0.39	0.77	0.63	0.82	0.65	10
Nandi	0.39	0.81	0.49	0.74	0.61	15
Narok	0.28	0.55	0.23	0.55	0.40	33
Nyamira	0.26	0.55	0.43	0.53	0.44	30
Nyandarua	0.36	0.72	0.69	0.76	0.63	11
Nyeri	0.47	0.96	0.65	0.94	0.75	5
Samburu	0.19	0.34	0.16	0.41	0.27	40
Siaya	0.43	0.58	0.41	0.51	0.48	28
Taita Taveta	0.35	0.73	0.53	0.74	0.59	18
Tana River	0.14	0.29	0.19	0.30	0.23	44
Tharaka Nithi	0.35	0.68	0.32	0.74	0.52	24
Trans Nzoia	0.38	0.75	0.50	0.84	0.62	13
Turkana	0.12	0.25	0.08	0.25	0.18	46
Uasin Gishu	0.66	0.85	0.58	0.79	0.72	8
Vihiga	0.56	0.66	0.40	0.61	0.56	19
Wajir	0.17	0.36	0.19	0.36	0.27	41
West Pokot	0.18	0.37	0.12	0.36	0.26	42
Country Score	**0.37**	**0.62**	**0.41**	**0.62**	**0.51**	

Gender divide: Gender divide scores range from 0.07 to 0.91, with a country score of 0.37. The high scores in Makueni (0.91), Uasin Gishu (0.66), and Nairobi City (0.56) indicate effective gender-inclusive business policies. Conversely, lower scores in regions such as Mandera (0.07), Garissa (0.17), and West Pokot (0.18) highlight significant disparities. This reflects varying levels of gender parity in access to innovation and entrepreneurial resources across different counties.

Age divide: Age divide scores range from 0.23 to 0.96, with a country score of 0.62. The high scores in Nairobi City (0.96), Laikipia (0.86), and Makueni (0.82) reflect strong support for various age groups in entrepreneurial activities. In contrast, the lower scores in Mandera (0.14) and Marsabit (0.23) highlight significant gaps, suggesting that targeted age-specific entrepreneurial support is needed in these regions.

Rural-urban divide: Rural-urban divide scores range from 0.08 (Turkana) to 1.00 (Nairobi City), with a country score of 0.41. Urban centres such as Nairobi City (1.00) and Mombasa (1.00) excel, demonstrating robust infrastructure and access to resources. Conversely, rural counties such as Turkana (0.08) face considerable challenges, indicating that there are critical disparities in infrastructure and access between urban and rural areas.

Income-level divide: Income level divide scores vary from 0.14 to 1.00, with a country score of 0.62. High-performing counties such as Kiambu (1.00) and Mombasa (1.00) showcase inclusive business environments. However, counties such as Mandera (0.14) and Marsabit (0.23) demonstrate significant challenges related to income disparities, indicating a need for tailored strategies to support low-income entrepreneurs.

These results reflect the effect of various government initiatives aimed at fostering innovation-driven entrepreneurship, such as the Kenya Digital Blueprint 2019, which outlines a vision for a digital economy. Programmes such as the Ajira Digital Programme and the development of Konza Technopolis may have contributed to higher scores in access to credit and business resources.

Despite these advancements, the significant variations between counties—particularly in the overall composite index and gender divide—highlight the need for targeted interventions. Policies should focus on reducing regional disparities and promoting gender equality in access to innovations. Expanding the range of indicators used in future assessments could provide a more comprehensive view of the innovation ecosystem across all divides.

6. Conclusion and Policy Recommendations

6.1 Conclusion

This study aimed to conduct a comprehensive assessment of the digital divide in Kenya by constructing a composite Digital Divide Index (DDI) that incorporates the five pillars of the digital economy while identifying disparities across gender, age, rural-urban, and income levels. The findings reveal a significant digital divide in Kenya, with an overall DDI score of 0.45, highlighting substantial inequalities across the nation.

The analysis indicates that the most pronounced disparities exist in the rural-urban divide (0.40) and income-level divide (0.44), with gender and age divides also contributing to the overall inequality. These findings underscore the critical role of socio-economic and geographic factors in influencing digital access and usage across the country.

The interplay between the various pillars and types of divides reveals that addressing the digital divide requires a multifaceted approach. For instance, rural areas face significant challenges in digital infrastructure, which limits access to government services, digital business opportunities, and skills development. Similarly, income disparities exacerbate the digital divide, preventing marginalized groups from accessing essential digital resources.

Digital infrastructure

The digital infrastructure pillar reveals a high digital divide, with a country score of 0.45. Significant disparities are evident, especially between rural and urban areas, where urban regions have far superior infrastructure. The gender divide shows moderate differences, with notable gaps in rural areas, while the age divide presents challenges, particularly in areas with low infrastructure development. Income level disparities also contribute to uneven access to digital infrastructure.

Digital government

The digital government pillar reveals a high digital divide with a country score of 0.34, indicating notable disparities in access to digital government services. The gender divide shows moderate disparities, with greater parity in some areas but severe gaps elsewhere. The age divide and rural-urban divide also highlight significant challenges, particularly in rural and economically disadvantaged regions. Income level disparities further compound the divide, underscoring the need for targeted interventions to enhance digital government access.

Digital business

The digital business pillar shows a moderate overall digital divide, with a country score of 0.55. Gender disparities are moderate nationally but are more pronounced in areas such as Turkana and Garissa where traditional norms limit women's digital business opportunities. The age divide reflects moderate challenges, with younger populations in urban areas exhibiting higher engagement compared to older individuals in rural regions. The rural-urban divide is significant, with urban centres showing strong digital business performance compared to struggling rural

areas. Income level disparities also influence digital business participation, with economically developed counties having better access and opportunities than lower-income regions.

Digital skills and values

The Digital Skills Pillar reveals a moderate digital divide, with a country score of 0.43. Disparities are most pronounced in rural areas and among lower-income groups. Gender and age divides also show moderate disparities, with some counties demonstrating considerable gaps in digital skills across different demographics. Addressing these divides requires targeted interventions to improve digital literacy and access in underserved regions.

Innovation-driven entrepreneurship

The Innovation-Driven Entrepreneurship Pillar reveals a low overall digital divide, with a country score of 0.51. This indicates that access to digital tools and platforms for business innovation is relatively equitable. However, disparities remain, particularly between urban and rural areas, with urban centres showing much better access. The gender divide shows moderate differences, with significant gaps in some regions reflecting varying levels of gender inclusivity in entrepreneurship. The age divide is also moderate, suggesting that age-specific support for digital entrepreneurship is needed in certain areas. Income level disparities further influence access, with wealthier regions benefiting from more inclusive business environments compared to lower-income areas.

6.2 Policy Recommendations

Digital infrastructure

- Community access networks: Advocate for the establishment and support of Community Access Networks (CANs) through favourable licensing frameworks, enabling local communities to build and manage their digital infrastructure. This approach can enhance connectivity in underserved rural areas.
- Increase USF investments: The Communications Authority of Kenya (CA) needs to increase investments from the Universal Service Fund (USF) to extend digital infrastructure into underserved rural areas. This includes deploying community broadband networks and establishing e-learning centres.
- Affordable Internet packages: The Ministry of Information, Communications, and the Digital Economy (MICDE), in collaboration with the private sector, needs to develop affordable Internet packages and device subsidies for low-income households to help reduce cost barriers to digital services.
- Targeted outreach programmes: To mitigate gender and age disparities, the Ministry of ICDE could consider implementing targeted outreach and support programmes to ensure equal access to digital infrastructure for women and older adults, including community workshops and subsidized devices.

Digital government

- Expansion of Huduma centres: To address the rural-urban divide, the Huduma Kenya programme needs to prioritize the establishment of additional Huduma centres in rural counties to improve access to government services for marginalized and underserved populations.
- Low-cost digital financial services: The Ministry of ICDE could collaborate with the private sector to develop and promote low-cost digital financial services, such as mobile money and online banking, tailored to the needs of low-income households.
- Improving access for women and older adults: The Ministry of ICDE, alongside the Ministry of Labour, Social Security and Services, and gender-focused NGOs, could develop programmes to improve digital government access for women and older adults.
- E-Citizen accessibility: Develop strategies to reduce costs associated with accessing e-Citizen services, including the use of PUSH messages for initiating payments, to enhance access for rural populations.

Digital business

- Digital business incubators: The Ministry of Investments, Trade and Industry, in partnership with local business development agencies, needs to establish digital business incubators and accelerators in rural areas to provide training, mentorship, and access to digital tools.
- Financial incentives for SMEs: Introduce financial incentives such as grants, low-interest loans, and tax breaks for small and medium-sized enterprises (SMEs) that adopt digital business practices, encouraging businesses, especially in rural areas, to transition to digital platforms.
- E-Commerce platforms: Support the creation and expansion of e-commerce platforms that connect rural businesses with wider markets. Government and private sector partnerships can facilitate the development of regional online marketplaces where rural entrepreneurs can sell their products and services.

Digital skills and values

- Targeted digital literacy programmes for women: The Ministry of ICDE could partner with the Ministry of Labour and Social Protection to develop and implement targeted digital literacy programmes for women, focusing on enhancing their digital skills and promoting their participation in the digital economy.
- Free or subsidized digital skills training: The Ministry of Education, together with NGOs and community organizations, needs to provide free or subsidized digital skills training for low-income individuals to enhance their participation in the digital economy.
- Digital skills training for older populations: The Ministry of Education could expand the Digital Literacy Programme (DLP) to include digital skills training

for older populations, ensuring they have the necessary knowledge and competencies to effectively use digital technologies.

Innovation and entrepreneurship

- Regional innovation hubs: To bridge the rural-urban divide, the Ministry of ICDE could consider establishing regional innovation hubs and incubation centres outside major urban areas, providing support and resources for startups and entrepreneurs in underserved regions.
- Funding and mentorship for women-led startups: The Ministry of ICDE could launch targeted funding and mentorship programmes for women-led startups and tech enterprises, fostering their growth and success in the digital economy.
- Support for low-income entrepreneurs: The Ministry of ICDE, alongside financial institutions and venture capital firms, could develop funding and support programmes for low-income entrepreneurs to improve access to digital tools and innovative resources.

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Annexes

Annex 1: Digital divide across the Indicators per Divide

Digital Infrastructure Pillar

Annex Table 1: Gender digital infrastructure divide

County	Mobile ownership	Smartphone ownership	TV ownership	Mobile Internet	Fixed Internet
Baringo	0.79	0.39	0.43	0.07	0.00
Bomet	0.82	0.41	0.33	0.24	0.00
Bungoma	0.79	0.59	0.54	0.72	0.00
Busia	0.85	0.57	0.79	0.52	0.15
Elgeyo Marakwet	0.85	0.61	0.55	0.11	0.04
Embu	0.87	0.75	0.88	0.08	0.00
Garissa	0.82	0.28	0.38	0.02	0.00
Homa Bay	0.86	0.46	0.41	0.24	0.02
Isiolo	0.89	0.33	0.58	0.14	0.20
Kajiado	0.96	0.68	0.67	0.83	0.53
Kakamega	0.82	0.59	0.65	0.49	0.00
Kericho	0.89	0.58	0.80	0.35	0.15
Kiambu	0.97	1.00	1.00	0.84	0.63
Kilifi	0.81	0.49	0.45	0.18	0.00
Kirinyaga	0.93	0.81	0.82	0.73	0.07
Kisii	0.83	0.77	0.75	0.68	0.08
Kisumu	0.88	0.63	0.53	0.31	0.08
Kitui	0.85	0.40	0.22	0.05	0.00
Kwale	0.85	0.46	0.47	0.30	0.00
Laikipia	0.91	0.66	0.83	0.78	0.00
Lamu	0.86	0.40	0.52	0.74	0.12
Machakos	0.95	0.69	0.93	0.09	0.00
Makueni	0.93	0.83	0.77	0.21	0.00
Mandera	0.99	0.04	0.10	0.03	0.00
Marsabit	0.82	0.19	0.28	0.28	0.00
Meru	0.86	0.59	0.53	0.29	0.06
Migori	0.79	0.47	0.36	0.31	0.03
Mombasa	1.00	0.91	0.97	0.87	0.79

Murang'a	0.94	0.86	0.87	0.98	0.08
Nairobi City	1.00	0.98	0.98	1.00	1.00
Nakuru	0.95	0.78	0.85	0.55	0.40
Nandi	0.83	0.73	0.50	0.38	0.00
Narok	0.76	0.37	0.52	0.36	0.00
Nyamira	0.82	0.47	0.49	0.59	0.03
Nyandarua	0.95	0.66	0.83	0.84	0.00
Nyeri	0.95	0.88	0.83	0.44	0.24
Samburu	0.81	0.33	0.21	0.13	0.34
Siaya	0.91	0.52	0.68	0.87	0.00
Taita Taveta	0.89	0.63	0.64	0.79	0.13
Tana River	0.82	0.30	0.26	0.04	0.00
Tharaka Nithi	0.88	0.76	0.47	0.30	0.09
Trans Nzoia	0.89	0.67	0.81	0.71	0.29
Turkana	0.60	0.15	0.07	0.13	0.00
Uasin Gishu	0.91	0.81	0.97	0.82	0.18
Vihiga	0.87	0.68	0.68	0.62	0.00
Wajir	0.96	0.27	0.12	0.08	0.00
West Pokot	0.70	0.29	0.25	0.13	0.00
Country Score	**0.87**	**0.57**	**0.59**	**0.43**	**0.12**

Annex Table 2: Age digital infrastructure divide

County	Mobile ownership	Smartphone ownership	TV ownership	Mobile Internet	Fixed Internet
Baringo	0.85	0.34	0.45	0.00	0.00
Bomet	0.87	0.38	0.33	0.00	0.00
Bungoma	0.89	0.45	0.48	0.00	0.00
Busia	0.90	0.40	0.44	1.00	0.16
Elgeyo Marakwet	0.88	0.28	0.53	0.14	0.00
Embu	0.79	0.82	0.62	0.02	0.00
Garissa	0.83	0.21	0.11	0.00	0.00
Homa Bay	0.93	0.35	0.42	0.26	0.03
Isiolo	0.91	0.35	0.31	0.24	0.65
Kajiado	0.97	0.80	0.73	0.69	0.45
Kakamega	0.87	0.83	0.59	0.45	0.00

Kericho	0.84	0.51	0.64	0.12	0.16
Kiambu	0.94	0.82	0.88	0.47	0.23
Kilifi	0.82	0.44	0.32	0.16	0.00
Kirinyaga	0.86	0.61	0.91	0.39	0.11
Kisii	0.83	0.54	0.62	0.60	0.12
Kisumu	0.93	0.26	0.57	0.33	0.51
Kitui	0.88	0.21	0.24	0.00	0.00
Kwale	0.89	0.52	0.30	0.00	0.00
Laikipia	0.88	0.52	0.68	0.00	0.00
Lamu	0.92	0.25	0.45	0.38	0.03
Machakos	0.91	0.69	0.61	0.00	0.00
Makueni	0.91	0.44	0.42	0.00	0.00
Mandera	0.88	0.03	0.05	0.00	0.00
Marsabit	0.81	0.07	0.31	0.00	0.00
Meru	0.86	0.54	0.43	0.23	0.03
Migori	0.81	0.21	0.31	0.25	0.03
Mombasa	1.00	1.00	0.80	0.63	0.06
Murang'a	0.90	0.56	0.81	0.65	0.06
Nairobi City	1.00	1.00	1.00	0.95	0.70
Nakuru	0.93	0.45	0.66	0.44	0.25
Nandi	0.85	0.55	0.49	0.00	0.00
Narok	0.84	0.43	0.59	0.00	0.00
Nyamira	0.84	0.38	0.55	0.00	0.00
Nyandarua	0.95	0.52	0.84	0.58	0.00
Nyeri	0.91	0.63	0.73	0.24	0.05
Samburu	0.81	0.18	0.16	0.20	0.01
Siaya	0.94	0.46	0.56	0.00	0.00
Taita Taveta	0.95	0.35	0.73	0.47	0.14
Tana River	0.96	0.25	0.17	0.00	0.00
Tharaka Nithi	0.88	0.41	0.43	0.08	0.07
Trans Nzoia	0.86	0.62	0.55	0.77	0.03
Turkana	0.45	0.13	0.07	0.00	0.00
Uasin Gishu	0.90	0.83	0.92	0.55	0.41
Vihiga	0.83	0.63	0.59	0.00	0.00
Wajir	0.98	0.10	0.07	0.00	0.00
West Pokot	0.56	0.22	0.15	0.02	0.00
Country Score	**0.87**	**0.46**	**0.50**	**0.24**	**0.09**

Annex Table 3: Rural-urban digital infrastructure divide

County	Mobile ownership	Smartphone ownership	TV ownership	Mobile Internet	Fixed Internet
Baringo	0.64	0.17	0.17	0.12	0.00
Bomet	0.72	0.19	0.14	0.15	0.00
Bungoma	0.64	0.49	0.40	0.40	0.03
Busia	0.73	0.34	0.44	0.33	0.18
Elgeyo Marakwet	0.66	0.34	0.34	0.07	0.06
Embu	0.72	0.68	0.83	0.03	0.24
Garissa	0.63	0.08	0.02	0.01	0.00
Homa Bay	0.73	0.25	0.43	0.16	0.11
Isiolo	0.71	0.13	0.08	0.15	0.33
Kajiado	0.81	0.29	0.25	0.54	0.90
Kakamega	0.74	0.45	0.43	0.35	0.01
Kericho	0.77	0.42	0.44	0.17	0.15
Kiambu	0.93	0.92	0.98	0.57	1.00
Kilifi	0.59	0.10	0.15	0.10	0.58
Kirinyaga	0.95	0.93	0.95	0.41	0.23
Kisii	0.68	0.37	0.41	0.44	0.09
Kisumu	0.84	0.57	0.68	0.12	0.04
Kitui	0.71	0.18	0.13	0.02	0.00
Kwale	0.70	0.26	0.16	0.06	0.09
Laikipia	0.84	0.55	0.67	0.55	0.03
Lamu	0.67	0.28	0.42	0.28	0.29
Machakos	0.88	0.53	0.72	0.15	0.00
Makueni	0.93	0.66	0.27	0.16	0.00
Mandera	0.66	0.02	0.00	0.00	0.00
Marsabit	0.73	0.06	0.03	0.10	0.00
Meru	0.79	0.35	0.23	0.16	0.07
Migori	0.68	0.15	0.32	0.16	0.04
Murang'a	1.00	1.00	1.00	1.00	1.00
Nakuru	1.00	0.86	0.73	0.49	0.59
Nandi	1.00	1.00	1.00	1.00	1.00
Narok	0.92	0.77	0.51	0.21	0.73
Nyamira	0.82	0.83	0.37	0.42	0.00
Nyandarua	0.63	0.23	0.23	0.05	0.00

Nyeri	0.73	0.39	0.40	0.52	0.12
Samburu	0.91	0.57	0.95	1.00	0.03
Siaya	0.90	1.00	1.00	0.29	0.05
Taita Taveta	0.63	0.06	0.03	0.06	0.00
Tana River	0.85	0.32	0.32	0.45	0.10
Tharaka Nithi	0.83	0.53	0.58	0.44	0.27
Trans Nzoia	0.70	0.13	0.07	0.03	0.00
Turkana	0.76	0.42	0.35	0.05	0.00
Uasin Gishu	0.81	0.47	0.39	0.70	0.15
Vihiga	0.37	0.02	0.01	0.02	0.00
Wajir	0.77	0.68	0.85	0.39	0.20
West Pokot	0.76	0.50	0.52	0.20	0.00
Country Score	**0.65**	**0.28**	**0.00**	**0.01**	**0.00**

Annex Table 4: Income level digital infrastructure divide

County	Mobile ownership	Smartphone ownership	TV ownership	Mobile Internet	Fixed Internet
Baringo	0.61	0.45	0.33	0.01	0.00
Bomet	0.66	0.59	0.36	0.03	0.00
Bungoma	0.74	0.61	0.58	0.09	0.00
Busia	0.69	0.75	0.50	0.12	0.05
Elgeyo Marakwet	0.71	1.00	0.34	0.03	0.00
Embu	0.75	0.69	0.78	0.00	0.00
Garissa	0.79	0.59	0.21	0.02	0.00
Homa Bay	0.72	0.53	0.56	0.04	0.01
Isiolo	0.77	0.67	0.31	0.04	0.26
Kajiado	0.92	0.97	0.60	0.22	0.34
Kakamega	0.69	0.82	0.51	0.06	0.00
Kericho	0.76	0.39	0.61	0.02	0.05
Kiambu	0.95	0.79	1.00	0.17	0.27
Kilifi	0.65	0.46	0.39	0.02	0.01
Kirinyaga	0.89	0.76	0.96	0.13	0.02
Kisii	0.67	0.55	0.57	0.20	0.04
Kisumu	0.75	0.87	0.69	0.05	0.02
Kitui	0.70	0.74	0.24	0.00	0.00
Kwale	0.75	0.42	0.33	0.04	0.00

Laikipia	0.86	0.64	0.76	1.00	0.00
Lamu	0.76	0.81	0.44	0.05	0.07
Machakos	0.88	0.94	0.84	0.02	0.00
Makueni	0.85	0.65	0.47	0.02	0.00
Mandera	0.99	0.55	0.04	0.01	0.00
Marsabit	0.74	0.47	0.29	0.07	0.00
Meru	0.74	0.55	0.47	0.03	0.00
Migori	0.61	0.43	0.42	0.04	0.01
Mombasa	1.00	0.97	0.89	0.13	0.30
Murang'a	0.95	0.75	0.72	0.14	0.17
Nairobi City	1.00	0.91	0.97	0.85	0.67
Nakuru	0.88	0.73	0.78	0.09	0.29
Nandi	0.69	0.77	0.58	0.06	0.00
Narok	0.57	0.72	0.37	0.01	0.00
Nyamira	0.66	0.61	0.35	0.11	0.00
Nyandarua	0.88	0.80	0.92	0.18	0.00
Nyeri	0.90	0.65	0.88	0.06	0.21
Samburu	0.65	0.90	0.19	0.01	0.25
Siaya	0.81	0.54	0.61	0.17	0.01
Taita Taveta	0.77	0.95	0.68	0.09	0.05
Tana River	0.74	0.43	0.21	0.00	0.00
Tharaka Nithi	0.82	0.64	0.58	0.03	0.04
Trans Nzoia	0.82	0.80	0.54	0.15	0.10
Turkana	0.35	0.13	0.07	0.01	0.00
Uasin Gishu	0.82	0.62	0.86	0.13	0.03
Vihiga	0.76	0.56	0.60	0.07	0.00
Wajir	0.96	0.57	0.10	0.01	0.00
West Pokot	0.47	0.83	0.23	0.01	0.00
Country Score	**0.77**	**0.67**	**0.53**	**0.10**	**0.07**

Digital Government Divide

Annex Table 5: Gender digital government divide

County	Access to government services	Digital ID
Mombasa	0.57	0.21
Taita Taveta	0.84	0.31
Embu	0.65	0.18

Kirinyaga	0.16	0.17
Nandi	0.22	0.13
Baringo	0.42	0.72
Siaya	0.05	0.20
Kisii	0.24	0.11
Bomet	0.20	0.37
Kericho	0.14	0.27
Nairobi City	0.12	0.20
Nakuru	0.98	0.68
Kitui	0.36	0.45
Mandera	0.37	0.25
Trans Nzoia	0.16	0.44
Laikipia	0.46	1.00
Nyeri	0.28	0.26
Uasin Gishu	0.29	0.37
Kajiado	0.19	0.15
Nyandarua	0.55	0.70
Machakos	0.18	0.59
Tharaka Nithi	0.45	0.73
Kiambu	0.15	0.32
Kakamega	0.39	0.49
Wajir	0.02	0.23
Bungoma	0.10	0.50
Vihiga	0.42	0.52
Lamu	0.16	0.25
Migori	0.24	0.46
Makueni	0.28	0.17
Narok	0.33	0.54
Meru	0.67	0.10
Busia	1.00	0.34
Kisumu	0.29	0.45
Marsabit	0.55	0.60
Elgeyo Marakwet	0.30	0.88
Murang'a	0.45	0.54
Isiolo	0.69	0.21
Homa Bay	0.34	0.26
Kwale	0.18	0.36
Garissa	0.22	0.66

West Pokot	0.24	0.16
Samburu	0.06	0.07
Nyamira	0.35	0.16
Turkana	0.40	0.39
Tana River	0.13	0.32
Kilifi	0.48	0.17
Country Score	**0.35**	**0.38**

Annex Table 6: Age digital government divide

County	Access to government services	Digital ID
Baringo	0.58	0.25
Bomet	0.54	0.61
Bungoma	0.71	0.30
Busia	0.62	0.31
Elgeyo Marakwet	0.26	0.26
Embu	0.23	0.68
Garissa	0.17	0.35
Homa Bay	0.28	0.18
Isiolo	0.40	0.28
Kajiado	0.24	0.28
Kakamega	0.41	0.38
Kericho	0.43	0.50
Kiambu	0.57	0.43
Kilifi	0.37	0.22
Kirinyaga	0.17	0.59
Kisii	0.31	0.85
Kisumu	0.40	0.15
Kitui	0.17	0.24
Kwale	0.20	0.22
Laikipia	0.43	0.66
Lamu	0.38	0.43
Machakos	0.20	0.65
Makueni	0.24	0.39
Mandera	0.11	0.17
Marsabit	0.51	0.14
Meru	0.13	0.36

Migori	0.49	0.57
Mombasa	0.47	0.53
Murang'a	0.11	0.52
Nairobi City	0.68	0.70
Nakuru	0.35	0.55
Nandi	0.60	0.09
Narok	0.41	0.47
Nyamira	0.39	0.37
Nyandarua	0.33	0.69
Nyeri	0.21	0.89
Samburu	0.36	0.49
Siaya	0.43	0.31
Taita/Taveta	0.41	0.44
Tana River	0.07	0.11
Tharaka Nithi	0.23	0.57
Trans Nzoia	0.21	0.25
Turkana	0.03	0.02
Uasin Gishu	0.49	0.15
Vihiga	0.30	0.38
Wajir	0.16	0.28
West Pokot	0.28	0.17
Country Score	**0.34**	**0.39**

Annex Table 7: Rural-urban digital government divide

County	Access to government services	Digital ID
Baringo	0.60	0.11
Bomet	0.38	0.38
Bungoma	0.60	0.18
Busia	0.25	0.22
Elgeyo Marakwet	0.28	0.10
Embu	0.13	0.74
Garissa	0.19	0.24
Homa Bay	0.29	0.15
Isiolo	0.22	0.22
Kajiado	0.16	0.23
Kakamega	0.40	0.39

Kericho	0.28	0.51
Kiambu	0.39	0.29
Kilifi	0.12	0.16
Kirinyaga	0.39	0.74
Kisii	0.26	1.00
Kisumu	0.26	0.21
Kitui	0.32	0.32
Kwale	0.10	0.20
Laikipia	0.45	1.00
Lamu	0.19	0.23
Machakos	0.35	0.72
Makueni	0.32	0.42
Mandera	0.13	0.12
Marsabit	0.05	0.32
Meru	0.12	0.48
Migori	0.29	0.40
Mombasa	1.00	1.00
Murang'a	0.17	0.46
Nairobi City	1.00	1.00
Nakuru	0.22	0.37
Nandi	0.78	0.33
Narok	0.14	0.36
Nyamira	0.44	0.56
Nyandarua	0.33	0.72
Nyeri	0.38	0.91
Samburu	0.26	0.46
Siaya	0.40	0.31
Taita Taveta	0.47	0.45
Tana River	0.32	0.24
Tharaka Nithi	0.36	0.56
Trans Nzoia	0.23	0.20
Turkana	0.02	0.02
Uasin Gishu	0.45	0.20
Vihiga	0.15	0.39
Wajir	0.13	0.07
West Pokot	0.29	0.23
Country Score	0.32	0.40

Annex Table 8: Income level digital government divide

County	Access to government services	Digital ID
Baringo	0.17	0.33
Bomet	0.26	0.17
Bungoma	0.38	0.29
Busia	0.37	0.27
Elgeyo Marakwet	0.26	0.04
Embu	0.24	0.48
Garissa	0.42	0.10
Homa Bay	0.10	0.05
Isiolo	0.07	0.14
Kajiado	0.47	0.15
Kakamega	0.22	0.33
Kericho	0.18	0.43
Kiambu	0.32	0.37
Kilifi	0.35	0.27
Kirinyaga	0.11	0.53
Kisii	0.31	0.79
Kisumu	0.23	0.19
Kitui	0.18	0.19
Kwale	0.13	0.14
Laikipia	0.84	1.00
Lamu	0.10	0.15
Machakos	0.38	0.55
Makueni	0.13	0.08
Mandera	0.42	0.10
Marsabit	0.00	0.19
Meru	0.02	0.65
Migori	0.17	0.25
Mombasa	0.34	0.45
Murang'a	0.10	0.41
Nairobi City	0.51	0.57
Nakuru	0.23	0.31
Nandi	1.00	0.07
Narok	0.03	0.28
Nyamira	0.21	0.18
Nyandarua	0.47	0.41

Nyeri	0.19	0.73
Samburu	0.21	0.21
Siaya	0.68	0.15
Taita Taveta	0.32	0.23
Tana River	0.07	0.10
Tharaka Nithi	0.22	0.25
Trans Nzoia	0.11	0.30
Turkana	0.08	0.13
Uasin Gishu	0.62	0.10
Vihiga	0.32	0.19
Wajir	0.12	0.06
West Pokot	0.27	0.08
Country Score	**0.27**	**0.29**

Digital Business Divide

Annex Table 9: Gender digital business divide

County	Mobile money usage	Used a mobile phone for financial transactions	Mobile money use to pay bills	Engaged in e-commerce
Baringo	0.84	0.45	0.51	0.33
Bomet	0.79	0.48	0.38	0.39
Bungoma	0.76	0.66	0.65	0.47
Busia	0.85	0.61	0.65	0.56
Elgeyo Marakwet	0.83	0.64	0.61	0.30
Embu	0.91	0.80	0.92	0.99
Garissa	0.66	0.31	0.19	0.17
Homa Bay	0.84	0.53	0.61	0.49
Isiolo	0.91	0.56	0.30	0.24
Kajiado	0.94	0.80	0.69	0.63
Kakamega	0.82	0.73	0.58	0.48
Kericho	0.88	0.67	0.99	0.59
Kiambu	0.96	1.00	1.00	0.95
Kilifi	0.80	0.58	0.30	0.35
Kirinyaga	0.91	0.92	0.83	0.68
Kisii	0.82	0.77	0.61	0.53

Kisumu	0.92	0.56	0.67	0.60
Kitui	0.84	0.47	0.78	0.31
Kwale	0.82	0.52	0.29	0.27
Laikipia	0.86	0.85	0.84	1.00
Lamu	0.88	0.44	0.49	0.64
Machakos	0.89	0.76	0.94	0.65
Makueni	0.92	0.83	0.56	0.41
Mandera	0.90	0.07	0.03	0.05
Marsabit	0.81	0.13	0.21	0.24
Meru	0.83	0.76	0.51	0.47
Migori	0.77	0.43	0.43	0.29
Mombasa	0.96	0.87	0.87	0.81
Murang'a	0.94	0.79	0.69	0.54
Nairobi City	1.00	0.97	0.81	0.74
Nakuru	0.91	0.81	0.83	0.69
Nandi	0.82	0.98	0.44	0.67
Narok	0.68	0.52	0.39	0.26
Nyamira	0.77	0.51	0.51	0.24
Nyandarua	0.79	0.76	0.74	1.00
Nyeri	0.97	0.87	0.96	0.87
Samburu	0.74	0.34	0.16	0.12
Siaya	0.88	0.59	0.72	0.49
Taita Taveta	0.86	0.76	0.83	0.92
Tana River	0.75	0.25	0.21	0.17
Tharaka Nithi	0.87	0.61	0.51	0.48
Trans Nzoia	0.91	0.78	0.47	0.62
Turkana	0.59	0.17	0.08	0.11
Uasin Gishu	0.92	0.88	0.88	0.80
Vihiga	0.87	0.67	0.61	0.55
Wajir	0.90	0.45	0.20	0.10
West Pokot	0.62	0.42	0.22	0.15
Country Score	**0.84**	**0.62**	**0.57**	**0.50**

Annex Table 10: Age digital business divide

County	Mobile money usage	Used a mobile phone for financial transactions	Mobile money use to pay bills	Engaged in e-commerce
Baringo	0.81	0.42	0.38	0.00
Bomet	0.87	0.35	0.36	0.00
Bungoma	0.93	0.59	0.39	0.00
Busia	0.91	0.59	0.54	0.47
Elgeyo Marakwet	0.84	0.47	0.50	0.45
Embu	0.82	0.75	0.88	0.77
Garissa	0.64	0.33	0.24	0.00
Homa Bay	0.94	0.48	0.55	0.47
Isiolo	0.93	0.42	0.31	0.28
Kajiado	1.00	0.80	0.59	0.52
Kakamega	0.87	0.68	0.56	0.41
Kericho	0.84	0.58	0.70	0.56
Kiambu	0.89	1.00	0.81	0.71
Kilifi	0.81	0.41	0.37	0.31
Kirinyaga	0.91	0.92	0.81	0.79
Kisii	0.84	0.66	0.58	0.44
Kisumu	0.93	0.53	0.59	0.53
Kitui	0.88	0.40	0.40	0.00
Kwale	0.82	0.51	0.31	0.00
Laikipia	0.80	0.77	0.89	0.00
Lamu	0.88	0.47	0.54	0.38
Machakos	0.90	0.80	1.00	0.00
Makueni	0.91	0.73	0.56	0.00
Mandera	0.87	0.15	0.04	0.00
Marsabit	0.76	0.12	0.32	0.00
Meru	0.77	0.78	0.52	0.46
Migori	0.80	0.48	0.44	0.37
Mombasa	1.00	1.00	0.71	0.60
Murang'a	0.91	0.72	0.76	0.66
Nairobi City	1.00	1.00	0.91	0.72
Nakuru	0.85	0.69	0.75	0.65
Nandi	0.83	0.77	0.52	0.00

Narok	0.83	0.54	0.36	0.00
Nyamira	0.87	0.48	0.54	0.00
Nyandarua	0.88	0.71	0.94	0.83
Nyeri	0.90	0.81	0.94	1.00
Samburu	0.81	0.39	0.26	0.25
Siaya	0.95	0.54	0.59	0.00
Taita Taveta	0.87	0.62	0.67	0.49
Tana River	0.88	0.20	0.21	0.00
Tharaka Nithi	0.79	0.67	0.56	0.45
Trans Nzoia	0.86	0.69	0.69	0.58
Turkana	0.45	0.20	0.14	0.00
Uasin Gishu	0.87	0.81	0.94	0.89
Vihiga	0.86	0.66	0.56	0.00
Wajir	0.89	0.50	0.14	0.00
West Pokot	0.48	0.23	0.27	0.22
Country Score	**0.85**	**0.58**	**0.55**	**0.33**

Annex Table 11: Rural-urban digital business divide

County	Mobile money usage	Used a mobile phone for financial transactions	Mobile money use to pay bills	Engaged in e-commerce
Baringo	0.65	0.38	0.24	0.41
Bomet	0.73	0.39	0.21	0.33
Bungoma	0.58	0.63	0.31	0.30
Busia	0.72	0.61	0.21	0.22
Elgeyo Marakwet	0.63	0.58	0.28	0.17
Embu	0.74	0.84	0.33	0.29
Garissa	0.43	0.30	0.02	0.01
Homa Bay	0.71	0.52	0.28	0.25
Isiolo	0.91	0.40	0.16	0.13
Kajiado	0.89	0.61	0.47	0.34
Kakamega	0.70	0.70	0.37	0.32
Kericho	0.75	0.60	0.04	0.37
Kiambu	0.89	1.00	1.00	0.57
Kilifi	0.54	0.44	0.19	0.12
Kirinyaga	0.95	0.94	0.89	0.52

Kisii	0.67	0.70	0.33	0.33
Kisumu	0.79	0.59	0.32	0.20
Kitui	0.72	0.45	0.10	0.11
Kwale	0.66	0.46	0.08	0.11
Laikipia	0.74	0.81	0.35	0.57
Lamu	0.88	0.47	0.22	0.37
Machakos	0.83	0.84	0.37	0.78
Makueni	0.90	0.79	0.24	0.37
Mandera	0.82	0.17	0.02	0.00
Marsabit	0.71	0.18	0.03	0.07
Meru	0.79	0.63	0.25	0.16
Migori	0.67	0.43	0.23	0.21
Mombasa	1.00	1.00	1.00	1.00
Murang'a	1.00	0.86	0.61	0.38
Nairobi City	1.00	1.00	1.00	1.00
Nakuru	0.89	0.74	0.42	0.30
Nandi	0.84	0.81	0.32	0.53
Narok	0.54	0.48	0.29	0.13
Nyamira	0.71	0.55	0.30	0.33
Nyandarua	0.68	0.76	0.47	1.00
Nyeri	0.94	0.99	0.67	0.68
Samburu	0.52	0.24	0.11	0.05
Siaya	0.88	0.53	0.25	0.27
Taita Taveta	0.79	0.70	0.34	0.45
Tana River	0.73	0.24	0.07	0.06
Tharaka Nithi	0.76	0.68	0.37	0.14
Trans Nzoia	0.86	0.71	0.32	0.42
Turkana	0.37	0.13	0.01	0.01
Uasin Gishu	0.77	0.87	0.45	0.40
Vihiga	0.77	0.69	0.26	0.21
Wajir	0.91	0.32	0.03	0.01
West Pokot	0.33	0.16	0.09	0.06
Country Score	**0.75**	**0.59**	**0.32**	**0.32**

Annex Table 12: Income level digital business divide

County	Mobile money usage	Used a mobile phone For financial transactions	Mobile money use to pay bills	Engaged in e-commerce
Baringo	0.62	0.37	0.34	0.05
Bomet	0.61	0.38	0.26	0.05
Bungoma	0.66	0.60	0.47	0.10
Busia	0.68	0.59	0.29	0.21
Elgeyo Marakwet	0.67	0.55	0.29	0.08
Embu	0.79	0.79	0.53	0.19
Garissa	0.71	0.36	0.26	0.08
Homa Bay	0.67	0.52	0.35	0.34
Isiolo	0.80	0.42	0.18	0.10
Kajiado	0.88	0.72	0.51	0.40
Kakamega	0.68	0.70	0.40	0.13
Kericho	0.76	0.52	0.13	0.15
Kiambu	0.91	0.99	1.00	0.43
Kilifi	0.63	0.49	0.29	0.08
Kirinyaga	0.79	0.90	0.85	0.37
Kisii	0.64	0.66	0.43	0.12
Kisumu	0.80	0.59	0.42	0.20
Kitui	0.68	0.49	0.12	0.05
Kwale	0.68	0.55	0.12	0.08
Laikipia	0.76	0.78	0.55	0.42
Lamu	0.77	0.51	0.46	0.13
Machakos	0.79	0.84	0.59	0.22
Makueni	0.83	0.79	0.24	0.13
Mandera	0.84	0.15	0.02	0.02
Marsabit	0.71	0.63	0.09	0.04
Meru	0.70	0.58	0.37	0.11
Migori	0.60	0.41	0.20	0.13
Mombasa	1.00	0.97	0.69	0.32
Murang'a	0.86	0.81	0.30	0.18
Nairobi City	1.00	0.91	0.88	0.85
Nakuru	0.81	0.74	0.63	0.37
Nandi	0.66	0.70	0.43	0.20
Narok	0.49	0.54	0.32	0.07

Nyamira	0.61	0.54	0.29	0.07
Nyandarua	0.58	0.72	0.55	0.45
Nyeri	0.91	0.95	0.89	0.26
Samburu	0.53	0.33	0.14	0.05
Siaya	0.75	0.53	0.47	0.27
Taita Taveta	0.73	0.72	0.66	0.28
Tana River	0.68	0.26	0.30	0.03
Tharaka Nithi	0.74	0.61	0.26	0.14
Trans Nzoia	0.86	0.72	0.47	0.15
Turkana	0.35	0.10	0.02	0.02
Uasin Gishu	0.81	0.82	0.89	0.26
Vihiga	0.74	0.66	0.39	0.13
Wajir	0.89	0.30	0.06	0.04
West Pokot	0.37	0.27	0.12	0.05
Country Score	**0.72**	**0.60**	**0.39**	**0.18**

Digital Skills and Values

Annex Table 13: Gender digital skills and values divide

County	Computer ownership	Internet Usage	Education level
Baringo	0.42	0.27	0.38
Bomet	0.42	0.22	0.31
Bungoma	0.60	0.40	0.54
Busia	0.58	0.58	0.45
Elgeyo Marakwet	0.56	0.32	0.41
Embu	0.79	0.44	0.66
Garissa	0.33	0.24	0.24
Homa Bay	0.50	0.32	0.55
Isiolo	0.46	1.00	0.26
Kajiado	0.72	0.40	0.58
Kakamega	0.68	0.59	0.53
Kericho	0.60	0.31	0.56
Kiambu	0.95	0.67	0.92
Kilifi	0.46	0.28	0.38
Kirinyaga	0.89	0.50	0.70
Kisii	0.69	0.40	0.49
Kisumu	0.54	0.42	0.59

Kitui	0.46	0.22	0.33
Kwale	0.51	0.33	0.30
Laikipia	0.80	0.49	0.61
Lamu	0.50	0.36	0.54
Machakos	0.77	0.47	0.76
Makueni	0.77	0.42	0.47
Mandera	0.14	0.12	0.05
Marsabit	0.22	0.07	0.28
Meru	0.65	0.34	0.45
Migori	0.46	0.26	0.40
Mombasa	0.80	0.60	0.75
Murang'a	0.80	0.50	0.55
Nairobi City	0.95	0.60	1.00
Nakuru	0.73	0.61	0.66
Nandi	0.75	0.39	0.54
Narok	0.52	0.12	0.41
Nyamira	0.51	0.25	0.39
Nyandarua	0.69	0.52	0.84
Nyeri	0.91	0.50	0.78
Samburu	0.35	0.20	0.13
Siaya	0.52	0.17	0.39
Taita Taveta	0.70	0.47	0.63
Tana River	0.28	0.21	0.15
Tharaka Nithi	0.66	0.29	0.51
Trans Nzoia	0.71	0.35	0.55
Turkana	0.23	0.12	0.10
Uasin Gishu	0.80	0.35	0.84
Vihiga	0.62	0.29	0.48
Wajir	0.33	0.19	0.10
West Pokot	0.35	0.13	0.18
Country Score	**0.59**	**0.37**	**0.48**

Annex Table 14: Age digital skills and values divide

County	Computer ownership	Internet Usage	Education level
Baringo	0.32	0.54	0.34
Bomet	0.28	0.31	0.31
Bungoma	0.37	0.37	0.48
Busia	0.61	0.39	0.54
Elgeyo Marakwet	0.72	0.44	0.42
Embu	0.55	0.73	0.58
Garissa	0.26	0.16	0.13
Homa Bay	0.37	0.33	0.54
Isiolo	0.38	0.42	0.25
Kajiado	0.87	0.81	0.51
Kakamega	0.44	0.76	0.52
Kericho	0.42	0.38	0.55
Kiambu	0.90	0.77	0.92
Kilifi	0.44	0.34	0.33
Kirinyaga	0.57	0.46	0.80
Kisii	0.49	0.52	0.52
Kisumu	0.42	0.34	0.65
Kitui	0.16	0.24	0.23
Kwale	0.69	0.60	0.28
Laikipia	0.87	0.49	0.70
Lamu	0.39	0.36	0.36
Machakos	0.57	0.64	0.66
Makueni	0.66	0.44	0.44
Mandera	0.14	0.04	0.01
Marsabit	0.19	0.16	0.16
Meru	0.55	0.50	0.33
Migori	0.33	0.35	0.36
Mombasa	1.00	1.00	0.78
Murang'a	0.71	0.54	0.70
Nairobi City	1.00	1.00	1.00
Nakuru	0.72	0.52	0.66
Nandi	0.72	0.47	0.44
Narok	0.57	0.47	0.29

Nyamira	0.56	0.19	0.43
Nyandarua	0.53	0.48	0.74
Nyeri	0.58	0.59	0.73
Samburu	0.23	0.36	0.15
Siaya	0.42	0.34	0.46
Taita Taveta	0.89	0.43	0.61
Tana River	0.22	0.16	0.13
Tharaka Nithi	0.34	0.37	0.41
Trans Nzoia	0.54	0.51	0.55
Turkana	0.10	0.15	0.04
Uasin Gishu	0.55	0.71	0.69
Vihiga	0.47	0.45	0.44
Wajir	0.19	0.15	0.02
West Pokot	0.19	0.28	0.10
Country Score	**0.50**	**0.45**	**0.45**

Annex Table 15: Rural-urban digital skills and values divide

County	Computer ownership	Internet Usage	Education level
Baringo	0.32	0.09	0.17
Bomet	0.45	0.04	0.14
Bungoma	0.58	0.14	0.40
Busia	0.27	0.16	0.44
Elgeyo Marakwet	0.50	0.09	0.34
Embu	0.32	0.25	0.83
Garissa	0.10	0.16	0.02
Homa Bay	0.10	0.10	0.43
Isiolo	0.08	0.28	0.08
Kajiado	0.43	0.49	0.25
Kakamega	0.42	0.15	0.43
Kericho	0.40	0.13	0.44
Kiambu	0.70	0.88	0.98
Kilifi	0.13	0.16	0.15
Kirinyaga	0.55	0.39	0.95
Kisii	0.26	0.12	0.41

Kisumu	0.30	0.26	0.68
Kitui	0.18	0.04	0.13
Kwale	0.48	0.10	0.16
Laikipia	0.50	0.41	0.67
Lamu	0.10	0.23	0.42
Machakos	0.30	0.49	0.72
Makueni	0.49	0.17	0.27
Mandera	0.10	0.08	0.00
Marsabit	0.03	0.08	0.03
Meru	0.54	0.14	0.23
Migori	0.23	0.10	0.32
Mombasa	1.00	1.00	1.00
Murang'a	0.43	0.24	0.73
Nairobi City	1.00	1.00	1.00
Nakuru	0.40	0.62	0.51
Nandi	0.63	0.16	0.37
Narok	0.24	0.10	0.23
Nyamira	0.36	0.12	0.40
Nyandarua	0.52	0.18	0.95
Nyeri	0.76	0.37	1.00
Samburu	0.07	0.06	0.03
Siaya	0.32	0.12	0.32
Taita Taveta	0.54	0.36	0.58
Tana River	0.44	0.12	0.07
Tharaka Nithi	0.26	0.10	0.35
Trans Nzoia	0.53	0.25	0.39
Turkana	0.04	0.06	0.01
Uasin Gishu	0.63	0.42	0.85
Vihiga	0.39	0.15	0.52
Wajir	0.08	0.24	0.00
West Pokot	0.06	0.04	0.04
Country Score	**0.37**	**0.24**	**0.41**

Annex Table 16: Income level digital skills and values divide

County	Computer ownership	Internet Usage	Education level
Baringo	0.25	0.18	0.28
Bomet	0.23	0.15	0.23
Bungoma	0.35	0.32	0.43
Busia	0.35	0.30	0.38
Elgeyo Marakwet	0.24	0.31	0.35
Embu	0.46	0.40	0.60
Garissa	0.25	0.62	0.17
Homa Bay	0.46	0.26	0.43
Isiolo	0.49	0.17	0.19
Kajiado	0.69	0.78	0.54
Kakamega	0.74	0.52	0.43
Kericho	0.47	0.24	0.54
Kiambu	1.00	0.77	0.91
Kilifi	0.17	0.21	0.25
Kirinyaga	0.73	0.64	0.67
Kisii	0.49	0.26	0.46
Kisumu	0.53	0.28	0.57
Kitui	0.19	0.20	0.20
Kwale	0.27	0.33	0.21
Laikipia	0.69	0.43	0.63
Lamu	0.46	0.30	0.35
Machakos	0.69	0.83	0.65
Makueni	0.47	0.39	0.37
Mandera	0.10	0.37	0.02
Marsabit	0.08	0.18	0.12
Meru	0.39	0.30	0.24
Migori	0.33	0.19	0.37
Mombasa	0.74	0.97	0.70
Murang'a	0.38	0.50	0.56
Nairobi City	0.83	0.91	1.00
Nakuru	0.79	0.66	0.60
Nandi	0.22	0.45	0.34
Narok	0.21	0.37	0.33
Nyamira	0.18	0.21	0.36
Nyandarua	0.69	0.41	0.70

Nyeri	0.80	0.92	0.79
Samburu	0.18	0.19	0.09
Siaya	0.42	0.37	0.36
Taita Taveta	0.70	0.56	0.53
Tana River	0.07	0.06	0.12
Tharaka Nithi	0.40	0.38	0.45
Trans Nzoia	0.67	0.51	0.48
Turkana	0.06	0.02	0.03
Uasin Gishu	0.71	0.62	0.64
Vihiga	0.43	0.26	0.35
Wajir	0.24	0.19	0.06
West Pokot	0.25	0.14	0.12
Country Score	**0.44**	**0.40**	**0.41**

Innovation-driven Entrepreneurship

Annex Table 17: Gender innovation-driven entrepreneurship divide

County	Innovations	Access to credit/loans for business purposes
Baringo	0.00	0.44
Bomet	0.00	0.44
Bungoma	0.37	0.62
Busia	0.91	0.61
Elgeyo Marakwet	0.00	0.58
Embu	0.00	0.83
Garissa	0.00	0.35
Homa Bay	0.00	0.52
Isiolo	0.00	0.49
Kajiado	0.00	0.77
Kakamega	0.00	0.71
Kericho	0.00	0.63
Kiambu	0.12	1.00
Kilifi	0.00	0.48
Kirinyaga	0.00	0.92
Kisii	0.00	0.71
Kisumu	0.63	0.56
Kitui	0.00	0.48
Kwale	0.92	0.54

Laikipia	0.00	0.84
Lamu	0.00	0.51
Machakos	0.00	0.83
Makueni	1.00	0.81
Mandera	0.00	0.14
Marsabit	0.00	0.23
Meru	0.00	0.67
Migori	0.00	0.48
Mombasa	0.21	0.86
Murang'a	0.17	0.84
Nairobi	0.17	0.95
Nakuru	0.00	0.78
Nandi	0.00	0.77
Narok	0.00	0.55
Nyamira	0.00	0.52
Nyandarua	0.00	0.71
Nyeri	0.00	0.94
Samburu	0.00	0.37
Siaya	0.33	0.54
Taita Taveta	0.00	0.71
Tana River	0.00	0.29
Tharaka Nithi	0.00	0.71
Trans Nzoia	0.00	0.75
Turkana	0.00	0.24
Uasin Gishu	0.49	0.83
Vihiga	0.47	0.66
Wajir	0.00	0.35
West Pokot	0.00	0.36
Country Score	**0.12**	**0.62**

Annex Table 18: Other divides – Access to credit/loans for business purposes

County	Age Divide	Rural-Urban Divide	Income Level Divide
Baringo	0.45	0.37	0.42
Bomet	0.43	0.40	0.47
Bungoma	0.62	0.54	0.67

Busia	0.62	0.55	0.59
Elgeyo Marakwet	0.59	0.48	0.63
Embu	0.83	0.72	0.77
Garissa	0.35	0.28	0.33
Homa Bay	0.54	0.47	0.53
Isiolo	0.47	0.41	0.55
Kajiado	0.75	0.67	0.73
Kakamega	0.72	0.68	0.67
Kericho	0.65	0.58	0.63
Kiambu	1.00	1.00	1.00
Kilifi	0.48	0.37	0.47
Kirinyaga	0.92	0.99	0.93
Kisii	0.71	0.62	0.68
Kisumu	0.55	0.57	0.54
Kitui	0.50	0.42	0.48
Kwale	0.54	0.46	0.53
Laikipia	0.86	0.82	0.82
Lamu	0.52	0.42	0.51
Machakos	0.81	0.79	0.78
Makueni	0.82	0.85	0.92
Mandera	0.14	0.10	0.14
Marsabit	0.23	0.22	0.23
Meru	0.68	0.66	0.67
Migori	0.48	0.44	0.45
Mombasa	0.79	1.00	1.00
Murang'a	0.84	0.93	0.85
Nairobi	0.96	1.00	1.00
Nakuru	0.77	0.77	0.82
Nandi	0.81	0.82	0.74
Narok	0.55	0.48	0.55
Nyamira	0.55	0.50	0.53
Nyandarua	0.72	0.73	0.76
Nyeri	0.96	0.95	0.94
Samburu	0.34	0.30	0.41
Siaya	0.58	0.54	0.51
Taita Taveta	0.73	0.72	0.74
Tana River	0.29	0.26	0.30
Tharaka Nithi	0.68	0.63	0.74

Trans Nzoia	0.75	0.71	0.84
Turkana	0.25	0.16	0.25
Uasin Gishu	0.85	0.74	0.79
Vihiga	0.66	0.60	0.61
Wajir	0.36	0.25	0.36
West Pokot	0.37	0.24	0.36
Country Score	**0.62**	**0.58**	**0.62**

Annex 2: Summary of Literature Matrix

Annex Table 19: Summary of literature matrix

Authors	Focus/ Theme	Methodology	Key Findings	Recommendations	Critique/ Gaps
Sparks (2013)	Digital Divide Overview	Literature Review	The digital divide is influenced by geographic location, socio-economic status, age, and education level. Disparities exist not only in access but also in usage and quality of digital technologies	Address gaps in access and usage through targeted interventions	Limited focus on specific demographic or geographic differences within the digital divide
Vassilakopoulou and Hustad (2021)	General Factors Influencing Digital Divide	Literature Review	The digital divide includes both access to technology and disparities in its usage and quality, affected by various socio-economic factors	Enhance policies addressing both access and usage disparities	Does not specify the impact of interventions or effectiveness of policies
GSMA Mobile Gender Gap Report (2021)	Gender Digital Divide	Report Analysis	Women in Kenya are less likely to access mobile Internet and smartphones due to socio-cultural barriers. This digital divide is exacerbated by limited digital literacy	Implement digital literacy training and address socio-cultural barriers	Limited data on long-term impacts of current programmes on bridging the gender digital divide

World Wide Web Foundation (2020)	Gender Digital Divide	Report Analysis	Socio-cultural barriers, including discrimination, hinder women's access to technology. Educational settings show lack of digital literacy among female teachers	Support women's digital literacy and address socio-cultural barriers to technology use	Needs more focus on longitudinal studies to assess programme effectiveness over time
Murithi and Yoo (2021)	Gender Digital Divide	Empirical Study	Female teachers struggle with digital literacy, affecting technology integration in classrooms. Programmes such as FemiDev are in place, but challenges remain	Increase support for female teachers and enhance digital literacy programmes	More evidence needed on the effectiveness of interventions and long-term impacts
UNDP (2021)	Gender Digital Divide	Report Analysis	The COVID-19 pandemic has worsened the gender digital divide, with women disproportionately affected by job losses and lacking digital skills for remote work	Focus on enhancing women's digital skills for economic empowerment and remote work opportunities	No comprehensive analysis of pandemic-related impacts on different sectors or long-term economic outcomes
Ndung'u and Waema (2011)	Age Digital Divide	Empirical Study	Younger individuals in Kenya use the Internet more for educational and economic purposes, while older adults face barriers due to limited digital skills and exposure	Develop targeted digital skills training for older adults to improve their digital participation	Lack of data on the effectiveness of existing training programmes for older adults
Van Deursen and Van Dijk (2014)	Age Digital Divide	Empirical Study	Older adults face significant barriers to digital participation due to lack of training and support, a trend observed in Kenya as well	Increase training and support for older adults to enhance digital participation	Needs more context-specific data for Kenya and comparison with other regions
Helsper and Van Deursen (2017)	Age Digital Divide	Empirical Study	Older adults engage less with digital technologies, affecting their access to essential services and information	Develop initiatives to promote digital engagement among older adults	Limited focus on socio-cultural factors affecting digital engagement in older populations

CIPIT (2023)	Rural-Urban Divide	Report Analysis	Urban areas have better access to advanced ICT services compared to rural areas, where basic mobile connectivity is prevalent	Invest in rural digital infrastructure and promote digital inclusion policies	Limited data on specific barriers faced by rural populations and the effectiveness of interventions
Laskar (2023)	Rural-Urban Divide	Empirical Study	Rural youths use technology primarily for entertainment rather than educational or productive purposes, widening the digital divide	Develop programmes that promote educational and productive use of technology among rural youths	Limited data on the impact of such programmes and their scalability in rural areas
A4AI (2021)	Income-Level Divide	Report Analysis	Higher income households can afford digital services and devices, creating a divide between affluent and low-income populations	Enhance affordability of data plans and devices for low-income households	Insufficient analysis of the effectiveness of affordability measures and their impact on the digital divide
World Bank (2022)	Income-Level Divide	Report Analysis	Economic disparities in access to technology contribute to a cycle of poverty, excluding low-income individuals from opportunities requiring digital skills	Focus on reducing economic barriers to digital access and promoting inclusive growth	Needs more detailed examination of specific economic barriers and effective intervention strategies
ITU (2021)	Income-Level Divide	Report Analysis	Countries with higher digital inclusion experience better economic growth and quality of life	Prioritize digital inclusion to support economic development and quality of life improvements	Limited data on the impact of specific digital inclusion programmes on economic growth
European Commission (2023)	Digital performance in EU countries	Composite index	Identifies gaps in digital development	Focus on improving connectivity and digital skills	Limited to EU countries
ITU (2023)	Global benchmarking of ICT development	Composite index	Highlights digital divide between developed and developing countries	Address access, use, and skills	May not capture local issues
IMD (2023)	Adoption and exploration of digital technologies	Composite index	Strong infrastructure and policies improve performance	Strengthen digital infrastructure and policies	Focuses on competitiveness over inclusivity

WEF (2023)	Networked readiness for economic and social development	Composite index	Comprehensive view of digital readiness	Improve infrastructure, affordability, and skills	Requires more focus on inclusivity

Annex Table 20: Principal Component Analysis

Principal Component Analysis (PCA) is a technique used to reduce the dimensionality of data while retaining as much of the original information as possible. PCA transforms the data into new variables, called principal components, which are linear combinations of the original variables. The key outputs of PCA include eigenvalues, which measure the variance explained by each component, and eigenvectors, which indicate the direction of maximum variance. The importance of each variable is determined by the absolute value of its coefficient in the principal components. This annex provides an overview of PCA results for each pillar, illustrating how these components simplify and summarize the data.

Digital infrastructure

The analysis of the digital infrastructure data, as presented in Annex Table 21, reveals that the first principal component (Comp1) has an eigenvalue greater than 1, explaining a significant 92.8 per cent of the variation. This indicates that gender disparities are the most influential factor contributing to the digital divide in infrastructure, as Comp1 is strongly correlated with gender differences. The second principal component (Comp2) accounts for an additional 3.6 per cent of the variance and is primarily associated with age, highlighting the effect of age-related factors on access to digital infrastructure. While Comp3 and Comp4 together explain the remaining variance; they show that rural-urban disparities and income levels also play essential roles in the digital divide.

These findings underscore the multifaceted nature of digital infrastructure disparities in Kenya. Each divide—gender, age, rural-urban, and income level—contributes uniquely to the digital divide, making them all critical for computing the Digital Divide Index.

Annex Table 21: Principal Component Analysis - digital infrastructure

Principal components (Correlation)			Principal components (Eigenvectors)				
Component	Eigenvalue	Cumulative	Indicator	Comp1	Comp2	Comp3	Comp4
Comp1	3.711	0.928	Gender	0.510	-0.126	-0.314	-0.791
Comp2	0.146	0.964	Age	0.494	-0.735	0.363	0.291
Comp3	0.110	0.992	Rural-urban	0.503	0.238	-0.634	0.538

Comp4	0.034	1.000	Income Level	0.493	0.623	0.607	-0.021

Digital government

Annex Table 22 reveals that two principal components account for 85.0 per cent of the variance, highlighting key factors driving disparities in access to digital government services. The first principal component, explaining 67.4 per cent of the variance, shows a strong positive relationship with gender, indicating that men may have better access to digital government services than women, thereby highlighting a significant gender divide. The second component, accounting for 17.6 per cent of the variance, is positively associated with age, suggesting that older populations have more access to these services compared to younger individuals, pointing to an age-related disparity.

Additionally, while the rural-urban and income divides contribute less to the variance, they still underscore the challenges faced by rural areas and lower-income groups in accessing digital government services. Urban areas tend to have more developed digital infrastructure, and higher-income levels are often linked to better access to these services. Therefore, all indicators are suitable for computing the DDI for the digital government pillar, providing a comprehensive view of the disparities across gender, age, rural-urban, and income dimensions.

Annex Table 22: Principal Component Analysis - Digital government

Principal components (Correlation)			**Principal components (Eigenvectors)**				
Component	Eigenvalue	Cumulative	Indicator	Comp1	Comp2	Comp3	Comp4
Comp1	2.696	0.674	Gender	0.421	0.839	0.135	0.318
Comp2	0.705	0.850	Age	0.538	0.046	-0.619	-0.570
Comp3	0.406	0.952	Rural-urban	0.521	-0.483	-0.204	0.673
Comp4	0.193	1.000	Income Level	0.512	-0.246	0.746	-0.346

Digital business

Annex Table 23 reveals that the first principal component, with an eigenvalue greater than 1, accounts for 93.1 per cent of the variance in digital business access. This component shows a strong positive relationship with gender, indicating that men have better access to digital business opportunities, highlighting a significant gender divide.

The second principal component, although contributing less to the variance, indicates a positive relationship with age, rural-urban, and income levels. This suggests that youth, urban areas and higher-income groups have greater access to digital business resources. These factors illustrate that disparities in digital business access are shaped by gender, age, rural-urban location, and income, making all indicators suitable for computing the Digital Divide Index for this pillar.

Annex Table 23: Principal Component Analysis - Digital business

Principal components (Correlation)			**Principal components (Eigenvectors)**				
Component	Eigenvalue	Cumulative	Indicator	Comp1	Comp2	Comp3	Comp4
Comp1	3.725	0.931	Gender	0.499	0.521	-0.653	0.233
Comp2	0.138	0.966	Age	0.500	0.470	0.721	-0.100
Comp3	0.075	0.985	Rural-urban	0.499	-0.595	0.127	0.618
Comp4	0.062	1.000	Income Level	0.503	-0.394	-0.195	-0.744

Digital skills

Annex Table 24 shows that the first two principal components have eigenvalues greater than 1, collectively explaining 91.9 per cent of the variance in the data. The first principal component is strongly associated with gender, indicating a significant gender divide in digital skills. The second component reflects age disparities, with youth likely having better digital skills.

Additionally, the third and fourth components suggest that rural-urban differences and income levels also contribute to disparities in digital skills access, though to a lesser extent. These findings highlight the influence of gender, age, rural-urban location, and income on digital skills, validating all indicators for computing the Digital Divide Index in this area.

Annex Table 24: Principal Component Analysis - Digital skills

Principal components (Correlation)	Principal components (Eigenvectors)						
Component	Eigenvalue	Cumulative	Indicator	Comp1	Comp2	Comp3	Comp4
Comp1	3.729	0.932	Gender	0.500	-0.629	-0.168	0.570
Comp2	0.114	0.961	Age	0.501	-0.249	0.641	-0.525
Comp3	0.101	0.986	Rural-urban	0.498	0.718	0.237	0.425
Comp4	0.057	1.000	Income Level	0.500	0.164	-0.710	-0.467

Innovation-driven entrepreneurship

Annex Table 25 reveals that the first two principal components have eigenvalues greater than 1, explaining 97.1 per cent of the variance. The first principal component shows a strong positive relationship with gender, indicating a significant gender divide in innovation-driven entrepreneurship. The second component highlights age disparities, suggesting that young people might be more engaged in entrepreneurship.

The third and fourth components also point to rural-urban and income-related differences, contributing to the overall disparities in this area. These findings confirm that all indicators are relevant for computing the Digital Divide Index for innovation-driven entrepreneurship.

Annex Table 25: Principal Component Analysis - innovation-driven entrepreneurship

Principal components (Correlation)			**Principal components (Eigenvectors)**				
Component	Eigenvalue	Cumulative	Indicator	Comp1	Comp2	Comp3	Comp4
Comp1	3.344	0.836	Gender	0.434	0.878	0.201	0.007
Comp2	0.470	0.954	Age	0.529	-0.148	-0.519	0.655
Comp3	0.159	0.993	Rural-urban	0.497	-0.419	0.753	0.101
Comp4	0.026	1.000	Income Level	0.533	-0.178	-0.350	-0.749

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