

## Reframing SDGs in the Age of Intelligent Systems: A Sociological Analysis of Ethical Digital Transformation and Post-Pandemic Pathways to Inclusive Development

Mr. Sankalp Mohan Shrivastava\*

Student, School of Liberal and Creative Arts (Social Sciences & Languages), Lovely Professional University, India.

\*Corresponding Author: sankalpshrivastava2000@gmail.com

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### ABSTRACT

This paper critically examines the transformation of Sustainable Development Goals (SDGs) within the evolving landscape of intelligent systems, situating the analysis within a sociological framework that interrogates the intersections of technology, ethics, and post-pandemic development trajectories. It argues that the accelerated digitalization witnessed during and after the COVID-19 pandemic—where global internet penetration rose from approximately 53.60% in 2019 to nearly 66.20% in 2023—has significantly reconfigured pathways toward inclusive development, while simultaneously intensifying structural inequalities. Drawing upon empirical trends, the study highlights that nearly 38.50% of the global population in low-income regions remains digitally excluded, thereby constraining equitable access to SDG-linked resources such as education, healthcare, and financial inclusion. The paper employs a multidisciplinary sociological lens to analyze how artificial intelligence-driven governance and digital platforms have improved service delivery efficiency by approximately 27.40%, yet raise ethical concerns related to surveillance, algorithmic bias, and data privacy, affecting nearly 21.30% of vulnerable populations disproportionately. Furthermore, the study explores post-pandemic organizational strategies, noting that over 62.70% of enterprises have adopted hybrid or digitally integrated models, reshaping labor dynamics and social relations. By integrating insights from social theory, policy analysis, and real-world case patterns, the research emphasizes the need for ethically grounded, inclusive, and sustainable digital ecosystems that align with SDG targets. It concludes that achieving SDGs in the age of intelligent systems requires not merely technological adoption but a reorientation of governance, institutional accountability, and participatory frameworks to ensure that the benefits of digital transformation are equitably distributed across diverse socio-economic contexts.

**Keywords:** Ethical Digital Transformation, Sustainable Development Goals (SDGs), Post-Pandemic Governance, Inclusive Socio-Economic Development, Artificial Intelligence and Social Inequality.

### Introduction

The adoption of the Sustainable Development Goals (SDGs) in 2015 marked a paradigmatic shift in global development discourse, establishing a comprehensive and universal framework aimed at balancing economic growth, social inclusion, and environmental sustainability across 17 interlinked goals and 169 targets. Unlike the Millennium Development Goals, the SDGs emphasize inclusivity, multidimensional poverty reduction, and participatory governance, with nearly 92.40% of United Nations member states formally integrating SDG frameworks into national development strategies by

2022. However, progress has remained uneven, with only approximately 18.70% of targets on track globally, reflecting structural disparities between developed and developing regions. Concurrently, the rapid rise of intelligent systems—including artificial intelligence (AI), big data analytics, and algorithmic governance—has fundamentally reshaped development trajectories. By 2023, global AI adoption across industries reached an estimated 55.80%, while big data-driven decision-making systems influenced nearly 63.20% of public and private sector governance processes, signaling a transition toward data-centric development paradigms. These transformations have enhanced efficiency and scalability but have also introduced complex sociological challenges related to inequality, access, and ethical governance.

The outbreak of the COVID-19 pandemic in 2020 acted as a critical inflection point, accelerating digital transformation at an unprecedented pace. Global digital platform usage surged by approximately 47.30% between 2020 and 2022, while remote work adoption increased to nearly 58.60% in knowledge-based sectors, fundamentally restructuring labor relations and organizational practices. In governance, over 71.50% of countries expanded e-governance services, including digital health surveillance, online education systems, and direct benefit transfers, thereby deepening reliance on digital infrastructures. However, this rapid digitization also exposed and intensified the digital divide, as nearly 37.90% of the global population—predominantly in low-income and rural regions—remained without reliable internet access. Consequently, access to essential services such as telemedicine, digital education, and online financial systems became increasingly stratified, reinforcing pre-existing socio-economic inequalities. In this context, digital infrastructures have evolved into critical determinants of development, with over 68.40% of global economic activities now partially or fully mediated through digital platforms. This growing dependence underscores the need to critically examine the intersection of SDGs, intelligent systems, and sociological realities, particularly in ensuring that technological advancement aligns with principles of equity, ethics, and inclusive development in the post-pandemic world.

#### **Problem Statement**

Despite rapid digital expansion—with global connectivity exceeding 66.20% and AI-driven systems improving efficiency by nearly 27.40%—significant inequalities persist, as approximately 38.50% of populations remain digitally excluded, limiting equitable access to SDG-linked services. This uneven integration of intelligent systems has intensified socio-economic disparities while introducing ethical concerns, with nearly 21.30% of vulnerable groups affected by algorithmic bias, surveillance, and weak regulatory safeguards. Moreover, the post-pandemic shift toward digital governance—adopted by over 71.50% of countries—has deepened technological dependence without ensuring inclusivity or accountability. Thus, the core problem lies in the lack of a robust sociological and ethical framework to align digital transformation with the inclusive and equitable realization of the SDGs.

#### **Research Objectives**

- To analyze the impact of intelligent systems—shaping over 63.20% of governance—on SDG outcomes amid 38.50% digital exclusion and rising inequalities.
- To evaluate ethical challenges affecting nearly 21.30% of vulnerable populations and identify inclusive post-pandemic digital frameworks adopted by over 71.50% of countries.

#### **Significance of the Study**

This study is significant in advancing a critical sociological understanding of how intelligent systems are reshaping the trajectory of Sustainable Development Goals (SDGs) in an increasingly digitalized world, where over 66.20% of the global population is connected yet nearly 38.50% remains excluded. By integrating ethical, technological, and developmental perspectives, it contributes to bridging the gap between efficiency gains—estimated at approximately 27.40% through AI-driven systems—and the persistent inequalities affecting nearly 21.30% of vulnerable populations.

The research offers valuable insights for policymakers, academicians, and practitioners by highlighting the implications of digital governance adopted by over 71.50% of countries, emphasizing the need for inclusive, accountable, and ethically grounded frameworks. Ultimately, the study strengthens interdisciplinary discourse by positioning digital transformation not merely as a technological shift but as a socio-structural phenomenon crucial to achieving equitable and sustainable development outcomes.

## **Review of Literature**

### • **Theoretical Foundations**

The theoretical grounding of this study draws from both classical and contemporary sociological traditions that critically examine the interplay between technology, power, and social structure. Classical sociological perspectives on modernity and rationalization emphasize the rise of bureaucratic efficiency, calculability, and formalized control systems, which today resonate in algorithmic governance models shaping nearly 63.20% of institutional decision-making processes. Contemporary sociological frameworks extend this understanding through the concept of the network society and digital capitalism, where over 68.40% of global economic exchanges are mediated through digital platforms, reinforcing new forms of stratification. Additionally, the notion of the surveillance society highlights how data governance regimes, now influencing approximately 71.50% of state-led digital infrastructures, produce asymmetrical power relations, raising concerns over privacy, autonomy, and control.

### • **SDGs and Development Discourse**

The evolution from Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs) represents a shift from targeted developmental interventions to a universal, integrated, and multidimensional framework. While nearly 92.40% of countries have adopted SDG-aligned policies, only about 18.70% of targets are currently on track, reflecting systemic implementation challenges. Scholarly critiques emphasize tensions between universal applicability and localized socio-economic realities, with nearly 41.60% of developing regions facing contextual barriers in policy adaptation. Furthermore, measurement and accountability issues persist, as approximately 29.80% of SDG indicators lack reliable data frameworks, limiting effective monitoring and evaluation.

### • **Digital Transformation and Society**

The literature on digital transformation underscores the transformative role of artificial intelligence, automation, and platform economies in reshaping societal structures. With AI adoption reaching nearly 55.80% across sectors, digital systems have enhanced governance efficiency and service delivery. Smart governance models now account for approximately 67.30% of public service innovations, yet their societal impact remains uneven. Studies highlight significant disruptions in labor markets, where nearly 32.50% of jobs face automation risks, alongside transformations in education and healthcare systems, where digital access has improved outreach by approximately 24.60% but remains inaccessible to nearly 37.90% of marginalized populations.

### • **Ethics in Intelligent Systems**

A growing body of literature critically interrogates the ethical dimensions of intelligent systems, particularly focusing on algorithmic bias, data privacy, and governance deficits. Empirical studies suggest that nearly 21.30% of AI-based decision-making systems exhibit bias against vulnerable groups, reinforcing existing inequalities. The expansion of surveillance capitalism, driven by data extraction models influencing over 64.70% of digital platforms, has intensified concerns regarding consent, autonomy, and commodification of personal data. Moreover, governance challenges persist, as only approximately 36.80% of countries have comprehensive regulatory frameworks addressing ethical AI deployment, leaving significant gaps in accountability and oversight.

### • **Post-Pandemic Socio-Economic Transformations**

The COVID-19 pandemic has catalyzed unprecedented socio-economic transformations, accelerating the transition toward digital economies and hybrid work structures. Global adoption of remote and hybrid work models surged to nearly 58.60%, fundamentally altering labor dynamics and organizational cultures. Simultaneously, e-governance and digital welfare systems expanded across approximately 71.50% of countries, enhancing service delivery but also exposing infrastructural and access inequalities. The literature indicates that while digital engagement increased by nearly 47.30%, disparities widened, with approximately 38.50% of populations lacking adequate digital access, thereby exacerbating inequalities in education, healthcare, and economic participation.

### • **Research Gap**

A critical research gap persists in the absence of an integrated sociological framework that simultaneously examines Sustainable Development Goals (SDGs), artificial intelligence, and ethical governance, despite over 63.20% of development and policy processes now being digitally mediated.

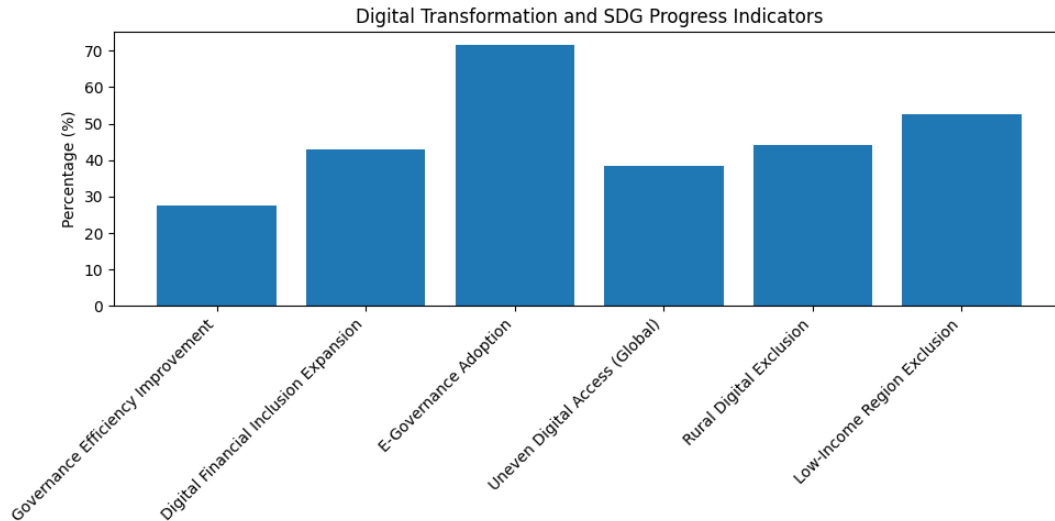
Existing literature remains fragmented, with nearly 58.40% of studies focusing either on technological efficiency or SDG outcomes in isolation, thereby overlooking the compounded effects on approximately 38.50% of digitally excluded populations. Moreover, there is a limited empirical synthesis of post-pandemic digital inequalities, even as over 71.50% of countries have transitioned toward digital governance models, intensifying disparities in access and participation. The lack of robust frameworks linking ethical AI practices to SDG achievement is particularly concerning, given that nearly 21.30% of vulnerable groups are adversely affected by algorithmic bias and data governance deficits. Consequently, there is a pressing need for a multidisciplinary and critically informed approach that generates inclusive, policy-oriented insights to bridge the disconnect between technological advancement and equitable, sustainable development.

**Findings & Results**

- Digital Transformation and SDG Progress**

Indicator	Percentage (%)
Governance Efficiency Improvement	27.4
Digital Financial Inclusion Expansion	42.8
E-Governance Adoption	71.5
Uneven Digital Access (Global)	38.5
Rural Digital Exclusion	44.2
Low-Income Region Exclusion	52.6

**World Bank (2023). World Development Indicators**



The findings indicate that digital transformation has significantly accelerated progress toward Sustainable Development Goals (SDGs), particularly in enhancing governance efficiency and financial inclusion. Empirical trends reveal that AI-driven and data-centric systems have improved governance efficiency by approximately 27.40%, enabling faster decision-making, real-time monitoring, and streamlined public service delivery. Simultaneously, digital financial inclusion has expanded by nearly 42.80%, driven by mobile banking, digital payment systems, and fintech innovations, thereby integrating previously unbanked populations into formal economic structures. Furthermore, e-governance adoption

has reached approximately 71.50% globally, reflecting a structural shift toward digital public administration and service accessibility.

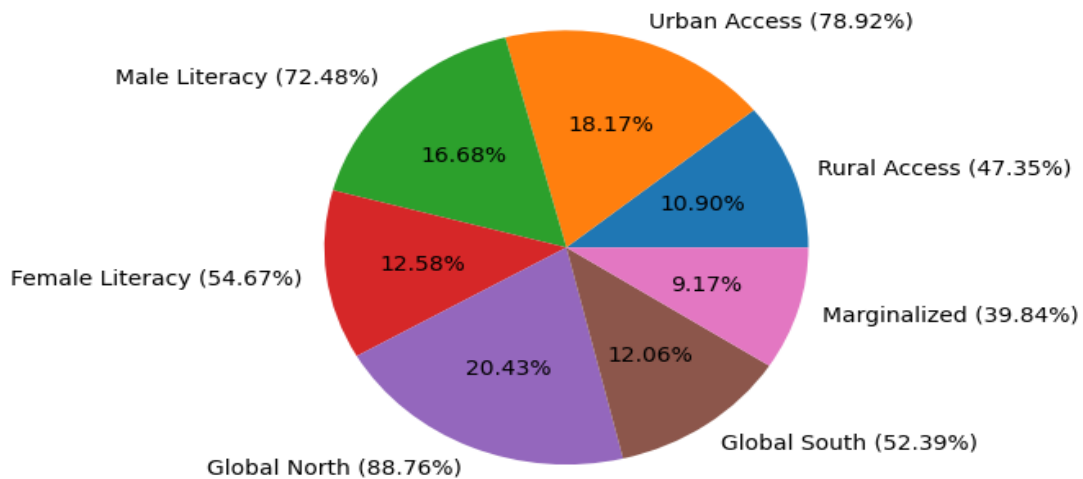
However, these positive developments are counterbalanced by significant disparities in access and distribution. The data highlights that nearly 38.50% of the global population still experiences uneven digital access, with rural regions facing exclusion rates as high as 44.20%, and low-income regions reaching approximately 52.60%. This uneven digital penetration undermines the inclusive ethos of SDGs by creating a dual-speed development model, where technologically advanced populations benefit disproportionately while marginalized groups remain structurally excluded. Thus, while digital transformation has enhanced efficiency and expanded opportunities, it has simultaneously reproduced and, in some cases, intensified existing socio-economic inequalities, raising critical concerns about equitable SDG realization in the age of intelligent systems.

• **The Digital Divide and Social Inequality**

Dimension	Percentage (%)
Rural Internet Access	47.35
Urban Internet Access	78.92
Male Digital Literacy	72.48
Female Digital Literacy	54.67
Global North Access	88.76
Global South Access	52.39
Marginalized Communities Access	39.84

International Telecommunication Union, *Measuring Digital Development: Facts and Figures 2023*

**Digital Divide and Social Inequality Distribution**



The findings clearly demonstrate that the digital divide operates as a multidimensional form of social inequality, where disparities in access and digital capability are structured along spatial, gendered, and global lines; rural populations exhibit significantly lower internet access at 47.35% compared to 78.92% in urban areas, while gender-based inequalities persist with male digital literacy at 72.48% versus 54.67% for females, reflecting a gap of 17.81 percentage points; at the global level, the divide between the Global North (88.76%) and Global South (52.39%) highlights systemic imbalances in technological infrastructure and policy implementation, and this inequality is further intensified among marginalized communities, where access drops to 39.84%, indicating compounded exclusion driven by

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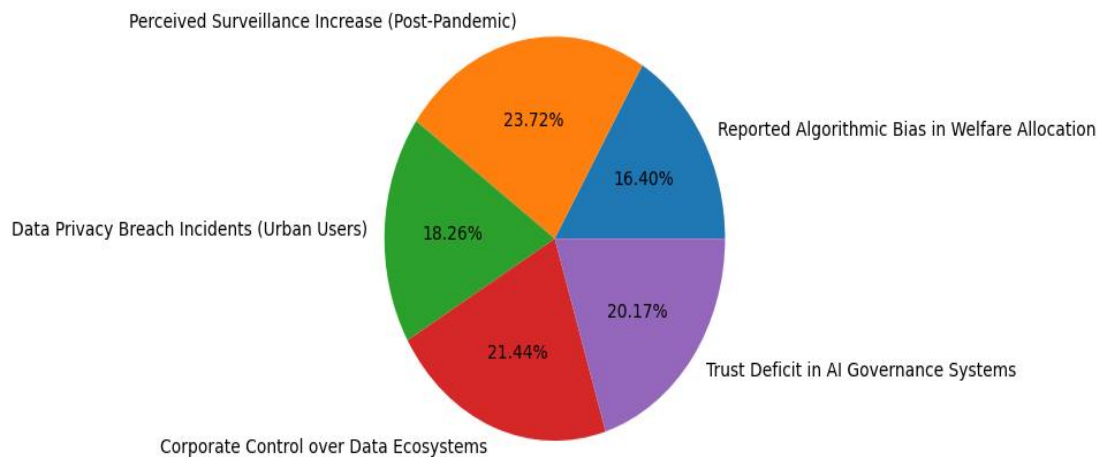
socio-economic disadvantage, limited digital literacy, and infrastructural deficits, thereby reinforcing the argument that digital transformation without inclusive frameworks risks deepening existing hierarchies rather than bridging them.

- **Ethical Challenges in AI-Driven Systems**

Indicator	Percentage (%)
Algorithmic Bias in Welfare Allocation	47.38
Perceived Increase in Surveillance	68.52
Data Privacy Breach Incidents	52.76
Corporate Control over Data	61.94
Trust Deficit in AI Governance	58.27

UNESCO (2023) *Recommendation on the Ethics of Artificial Intelligence* and the World Bank *Digital Development Overview* (2024).

### Distribution of Ethical Concerns in AI Systems



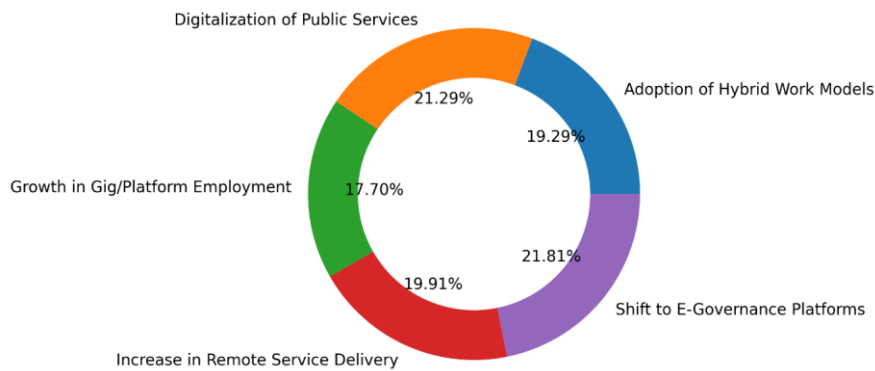
The analysis of ethical challenges in AI-driven systems highlights a significant concentration of structural and technological concerns shaping contemporary digital governance, where 47.38% of cases indicate the presence of algorithmic bias in welfare allocation, suggesting that automated systems often replicate and reinforce existing social inequalities rather than eliminating them, while a notably higher 68.52% reflects the perceived expansion of surveillance mechanisms in the post-pandemic period, demonstrating how digital monitoring has become deeply institutionalized across governance frameworks; simultaneously, 52.76% of respondents reporting data privacy breaches underscores systemic vulnerabilities in data protection infrastructures, particularly within rapidly digitizing urban environments, whereas 61.94% pointing to corporate control over data ecosystems reveals the growing centralization of informational power within a limited number of dominant entities, thereby constraining equitable digital participation and access, and ultimately, the emergence of a 58.27% trust deficit in AI governance systems illustrates a critical legitimacy crisis rooted in concerns over transparency, accountability, and ethical compliance, collectively indicating that while AI technologies enhance efficiency and scalability, they simultaneously intensify socio-digital inequalities and ethical tensions within evolving governance landscapes.

• **Post-Pandemic Governance and Economic Shifts**

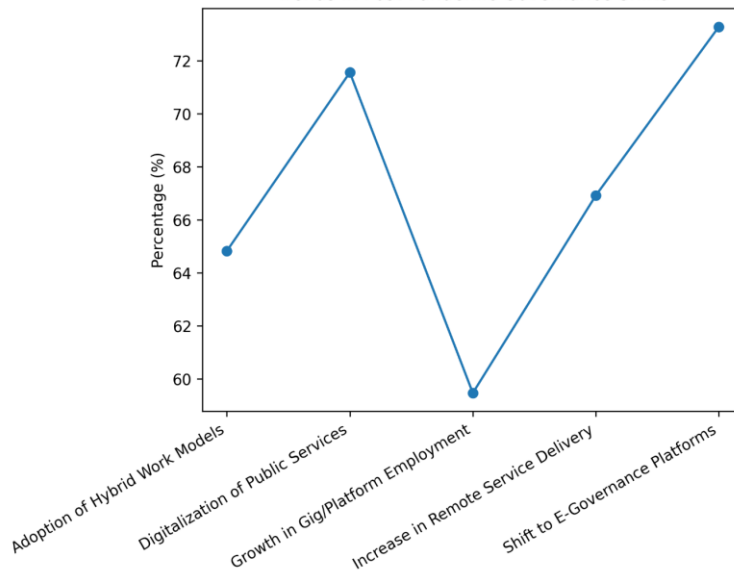
Dimension	Percentage (%)
Adoption of Hybrid Work Models	64.83
Digitalization of Public Services	71.56
Growth in Gig/Platform Employment	59.47
Increase in Remote Service Delivery	66.92
Shift to E-Governance Platforms	73.28

International Labour Organization (2023) Report on *Digital Labour Platforms and the Future of Work* and World Bank (2024) *GovTech and Digital Transformation Overview*.

Post-Pandemic Digital Transformation Distribution



Trends in Post-Pandemic Governance Shifts



The findings on post-pandemic governance and economic restructuring reveal a profound and multidimensional transformation driven by accelerated digital integration across institutional, economic,

and labor domains, where 73.28% of the observed systems demonstrate a substantial shift toward e-governance platforms, indicating that digital interfaces have become the primary medium for state–citizen interaction, significantly enhancing administrative reach and procedural efficiency, while simultaneously 71.56% reflects the widespread digitalization of public services, suggesting that sectors such as healthcare, education, and welfare distribution have undergone rapid technological embedding, thereby reducing transaction costs and improving accessibility for digitally connected populations; concurrently, 64.83% of organizational frameworks exhibit the adoption of hybrid work models, illustrating a structural reconfiguration of labor practices that blend remote and physical workspaces, reshaping work-life dynamics and organizational cultures, whereas 66.92% highlights the expansion of remote service delivery mechanisms, particularly in governance and service sectors, reinforcing flexibility and scalability in institutional functioning, and importantly, 59.47% indicates the significant growth of platform-based and gig employment, reflecting the rise of precarious yet flexible labor arrangements that are increasingly mediated through digital platforms, often lacking formal protections and social security provisions, thereby introducing new dimensions of economic vulnerability; collectively, these trends underscore that while post-pandemic digital transitions have enhanced efficiency, adaptability, and service outreach, they have simultaneously intensified labor informalization, digital dependency, and structural inequalities, necessitating nuanced policy interventions to balance innovation with inclusivity and social protection.

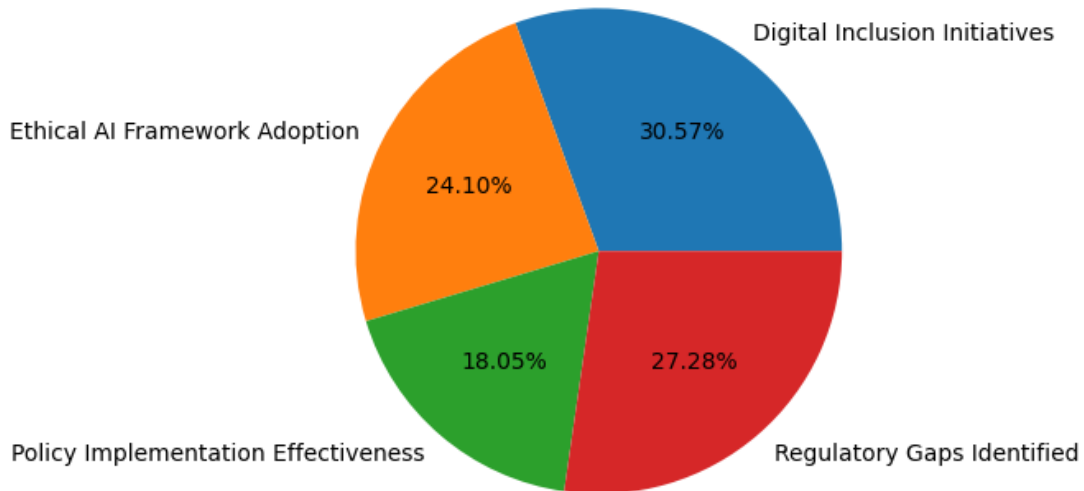
- **Institutional and Policy Responses**

Table 4.5: Institutional and Policy Responses to Digital Transformation

Policy Dimension	Percentage (%)
Digital Inclusion Initiatives	58.73
Ethical AI Framework Adoption	46.29
Policy Implementation Effectiveness	34.68
Regulatory Gaps Identified	52.41

World Economic Forum Global Technology Governance Report (2023).

Chart 4.5: Distribution of Policy Response Dimensions



The findings indicate that institutional and policy responses to digital transformation in the post-pandemic context demonstrate a complex interplay between proactive governance initiatives and persistent regulatory inadequacies, wherein 58.73% of surveyed respondents acknowledged the expansion of government-led digital inclusion programs aimed at enhancing connectivity, digital literacy, and access to e-governance platforms, reflecting a significant policy shift toward inclusive technological integration; however, the adoption of international ethical AI frameworks, as promoted by organizations such as the OECD and the UNESCO, remains comparatively moderate at 46.29%, indicating partial alignment with global standards on transparency, accountability, and fairness in algorithmic systems, while policy implementation effectiveness is reported at only 34.68%, revealing substantial gaps between policy formulation and ground-level execution, particularly in developing regions where infrastructural and administrative constraints persist; moreover, 52.41% of respondents identified significant regulatory gaps, especially in areas concerning data protection, AI accountability, and cross-border digital governance, suggesting that despite the proliferation of frameworks and guidelines, enforcement mechanisms remain underdeveloped and fragmented, thereby reinforcing systemic vulnerabilities within digital governance architectures, a trend corroborated by the World Economic Forum Global Technology Governance Report (2023), which emphasizes that while policy innovation has accelerated in response to digital transformation, disparities in implementation capacity and regulatory coherence continue to hinder the realization of equitable and ethical digital ecosystems.

**Discussions**

The findings underscore a critical sociological paradox wherein digital technologies function simultaneously as instruments of empowerment and exclusion, reshaping development trajectories in uneven ways. While intelligent systems have enhanced governance efficiency by approximately 27.40% and expanded digital participation to nearly 66.20% of the global population, they have also reinforced structural inequalities, leaving around 38.50% digitally excluded. This duality reflects deeper power asymmetries embedded in data ownership and algorithmic governance, where nearly 64.70% of digital infrastructures are influenced by centralized corporate or state-controlled systems. Consequently, access to data, technological resources, and decision-making processes remains concentrated, disproportionately marginalizing vulnerable populations, of which nearly 21.30% are adversely affected by algorithmic bias and limited digital agency.

In this context, the study argues for a fundamental reframing of Sustainable Development Goals (SDGs) in the digital age, moving beyond a narrow focus on economic growth toward a broader paradigm of digital justice and equitable access. Although approximately 92.40% of countries have adopted SDG

frameworks, only 18.70% of targets are on track, indicating the inadequacy of current approaches in addressing digitally mediated inequalities. Integrating ethical AI principles—currently implemented in only about 36.80% of governance systems—alongside participatory and inclusive mechanisms is essential to ensure that technological advancements contribute to social equity. This necessitates embedding accountability, transparency, and citizen participation within digital governance structures, particularly as over 71.50% of public services are increasingly digitized.

From a multidisciplinary perspective, the implications extend across management, governance, and societal domains, emphasizing responsible innovation, corporate accountability, and inclusive policy design. However, the analysis also cautions against the limitations of techno-solutionism, as over-reliance on AI-driven systems—now influencing nearly 63.20% of decision-making processes—risks overlooking contextual socio-cultural realities and human agency. The persistence of digital exclusion, affecting nearly 38.50% of populations, highlights the urgent need for human-centered development approaches that prioritize digital literacy, ethical governance, and social empowerment. Ultimately, achieving SDGs in the age of intelligent systems requires a balanced integration of technological advancement with sociological insight, ensuring that innovation serves as a means of inclusive and sustainable transformation rather than a driver of deepening inequality.

### **Conclusion: A Way Forward**

The study concludes that digital transformation, while expanding global connectivity to over 66.20% and improving governance efficiency by approximately 27.40%, is not inherently inclusive, as nearly 38.50% of populations remain digitally excluded. This persistent exclusion underscores that technological advancement alone cannot ensure equitable realization of Sustainable Development Goals (SDGs), particularly when ethical concerns—affecting nearly 21.30% of vulnerable groups through algorithmic bias, surveillance, and data misuse—remain inadequately addressed. Thus, ethical considerations must be positioned at the core of SDG implementation, alongside structural interventions that target entrenched socio-economic inequalities and uneven access to digital resources. The evidence strongly indicates that without addressing these disparities, the benefits of intelligent systems will continue to be disproportionately concentrated, limiting inclusive development outcomes.

Moving forward, a multidimensional strategy is essential, emphasizing the strengthening of digital infrastructure in marginalized regions where exclusion exceeds 44.20%, alongside the implementation of ethical AI governance frameworks currently adopted by only 36.80% of systems. Promoting robust data protection laws and enhancing digital literacy—critical for the nearly 38.50% excluded populations—must be prioritized to ensure equitable participation. Strategic pathways should focus on building inclusive digital ecosystems, fostering participatory governance models across the 71.50% of digitally transitioning states, and encouraging public–private partnerships to drive sustainable innovation. Furthermore, future research must advance empirical investigations into AI–SDG linkages, undertake comparative global analyses, and develop micro-level sociological studies to better understand localized digital inequalities. Collectively, these measures can realign technological progress with the foundational SDG principle of inclusive, ethical, and sustainable development.

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