

Why addressing digital inequality should be a priority

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Abstract

This article addresses the multifaceted and far-reaching implications of digital inequality (DI), drawing upon emerging trends and examples. The aim is to sensitize policymakers, practitioners, and academics to issues surrounding DI and foster a common and deeper understanding among relevant stakeholders. While research has recognized digital inequality and its dimensions, it has not explicated its broader impact thoroughly, particularly in the current era of digital transformation. The information communication technology (ICT) domain has evolved significantly because of its strong interrelationship with many other sectors, encompassing critical issues such as ethics, inequality, leadership, social capital, governance, and management. There is still a considerable gap in understanding the complexities around digital inequality, which varies across different contexts. Reflecting on over 15 years of experience in information communication technology for development (ICT4D) as both a practitioner and researcher, the evolution of DI in terms of social transformation and its growing short- and long-term implications are discussed. Strategies and pathways for the future are presented, grouped into six areas: a call for a renewed philosophical shift and campaign for digital equality, policy interventions, inclusive technology solutions and services, holistic human capacity building, the universities' role, and the need for a multi-disciplinary approach to address DI.

KEYWORDS

digital divide, digital exclusion, digital inequality, digital transformation, social change, social transformation

1 | INTRODUCTION

At the beginning of the 21st century, the digital revolution offered the promise of addressing productivity, efficiency, and transparency by bridging inequalities between the information-rich and information-poor and the global north and south (Mandela, 1995). However, 27 years later, this reality has yet to emerge. Instead, the digital divide continues to maintain or increase the gap between the haves and have-nots in various global contexts. Such divergence is evident even within affluent countries among different demographics, generations (e.g., De Haan, 2003; Vassilakopoulou & Hustad, 2021), and ethnicities, with Australia's indigenous population providing one example (National Indigenous Australians Agency, 2021). Digital inequality (DI) is thus predicted to grow further in the future and is poised to become one of the most vital indicators of gaps in wealth and privilege (Pick & Sarkar, 2016).

Information communication technology's potential as a strategic tool in enabling development, productivity, and efficiency (with the broadest impact on business, organizations, and societies) has been well-recognized (Hanna, 2008; Heeks, 2002). However, this productivity often comes

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with a cost to other areas of humanity, relationships, and social justice, and the trade-offs are often expensive. The main concern is how the people (implementors) behind these tools utilize them, often ignoring any balance between the human and social aspects (e.g., social capital). As Tim Unwin has asserted, “Over the last twenty years, rather than reducing poverty, ICTs have actually increased inequality” (Unwin, 2017, p. 1). The implications of this view for marginalized populations will be unpacked in the subsequent sections.

The impact of digital inequality is inseparable from growing societal inequality, with the vast majority of the population, daily laborers and wayfarers, mostly powerless against a widespread surge in digital transformation. These individuals have little choice other than to accept their disadvantaged status in the race of haves and have-nots while the former become more affluent as a result of the empowerment enabled by technological triumphs. As Wilson (2022) has stated, “Missing out is inextricably linked to lack of privilege” (p. 2). This phenomenon is referred to as DI.

In the first-world societies, people can become so obsessed with the immediate gratification offered by technology that they tend to ignore the short- and long-term social, cultural, environmental, and power divides that may arise because of digitalization. Consequently, a cavity of inequality is slowly growing beneath the surface of apparent development, which remains unexplored and ignored. Fast-growing digital innovations show continuous upward trends and economic advantages, which is why many decision-makers and stakeholders are possibly reluctant to consider or address the by-product of growing inequality. As such, some pertinent questions arise: Will these technologies make our society more harmonious? Is the world's happiness index improving? Is technology helping to build social capital? Are global issues reducing? Unfortunately, these questions appear to lack due consideration from our innovators and policymakers.

Overall, relevant stakeholders, including the research community, have failed to sufficiently highlight the dire need to address this issue, which has motivated this opinion piece. The next two sections, respectively, explore the evolution of DI over the past decade and its implications in areas including development, social exclusion, digital transformation, and societal polarization. The last section provides some suggestions for tackling these issues.

2 | EVOLUTION OF DIGITAL INEQUALITY

Rather than the traditional concept of a digital divide, which primarily focused on “access or connectedness” to digital technology and the Internet (Rogers, 2001), digital inequality has emerged as a broad concept that encompasses multifaceted factors. The former perspective was widely critiqued for its narrow view and flawed rationalizations (DiMaggio & Hargittai, 2001; Unwin, 2017), with researchers defining the further evolution of this concept as the “second-degree digital divide” (skill and uses) and the “third-degree digital divide” (outcome) (Gomez, 2021; Scheerder et al., 2017). Currently, a more holistic definition of DI is evolving, the full reach of which is yet to be determined.

However, digital inequality can be broadly defined as a unique status quo where groups differing in characteristics such as socioeconomic background, age and gender are disadvantaged in terms of access, knowledge, competency, and costs with respect to digital resources. This phenomenon is also referred to as “digital exclusion” (e.g., Martin et al., 2016), although the latter term has more the meaning of a situation of deprivation of digital resources among some segment of society (e.g., see Warren, 2007).

Unfortunately, an instrumental view of the inequalities imposed by the digital divide predominantly exists in policies, discussions, and interventions among policymakers, including international agencies such as the ITU and OECD. This view is typically dominated by the idea of closing the gap by providing digital commodities to underprivileged populations and assuming that this will improve their digital aptitudes (Srivastava & Shainesh, 2015). Other contemporary researchers, however, argue that social inclusion and digital equality are crucial and go hand in hand with a sustainable society (Vassilakopoulou & Hustad, 2021). From this perspective, digital connectivity is not necessarily a remedy for addressing this social problem (Zheng & Walsham, 2021).

The adverse consequences of DI are many and are manifested in expanding inequalities in terms of education, health, life expectancy, and opportunities to a degree not yet fully understood. As economic and social divides are synergistic, we have to accept that as long as such divides persist, the digital divide cannot be bridged. While economists, social scientists, and politicians tend to use income as the primary yardstick for “inequality” and, subsequently, well-being, they can overlook associated social transformations.

According to Wiltshire (2001), change is a universal phenomenon of societies, whereas transformation implies a more radical change with more profound and far-reaching implications for societies within a relatively limited period. Social transformation is the process of change in values, norms and relationships. Today, social transformation is clearly impacted by the digital transformation of organizations and society and the resulting DI.

DiMaggio and Hargittai (2001) noted that in the past, students of social inequality paid little attention to changes in ICT and its overwhelming impact on social inequality and social justice. In short, social inequality cannot be addressed without considering DI's growth and evolving challenges, particularly in the 21st century.

Research has generally identified DI and its possible dimensions as knowledge, economic and social resources, attributes of technology, such as performance and reliability, and utility realization (DiMaggio & Hargittai, 2001; DiMaggio et al., 2004; Hsieh et al., 2008; Van Deursen, 2020; Van Deursen and Helsper, 2015; Van Dijk, 2006). Other pertinent issues to be considered are autonomy, support, the extent of use, online/offline

users, ICT effectiveness, and acceptable content (Loh & Chib, 2021). Buchi and Hargittai (2022) propose that the individuals' well-being should be measured through self-assessment as a possible construct of digital inequality studies. By contrast, Zheng and Walsham (2021) present DI as an intersectional problem that operates at the junctions of the multiple layers of differences in inclusion/exclusion. They propose using "intersectionality" to analyze the personal vulnerability and human experience shaped by relative positions within networks of power that portray the diversity of systematic societal injustices. Other approaches, such as Participatory Action Research (PAR) (e.g., Dedding et al., 2021) and the Capability approach (e.g., Anrijs et al., 2022), are also growing in popularity in their efforts to capture the lived experiences of unheard voices and collect evidence-based holistic data on digital inequality.

While DI has been addressed by different disciplinary and silo-based lenses focusing on partial or specific aspects of the phenomena, its holistic treatment with end-to-end connections and associated issues is yet to be fully explored. Existing studies have been small-scale and focused on case studies, which are incomplete in terms of influencing policy. Such studies are yet to draw upon the broader impact of DI, particularly in the current era of the fourth industrial revolution and beyond (Van Dijk, 2020). Due to the complexity and cross-disciplinary nature of the problem, it is essential to generate comprehensive, cumulative knowledge that is easily transferable to policy and practices. Section 4.6 elaborates on this point, outlining how an increase in multi-disciplinary research is required to expand our understanding of DI's long-term implications.

3 | GROWING IMPLICATIONS OF DI

The following subsections represent significant issues surrounding DI that are likely to have short- and long-term implications for society. The dimensions and gravity of the issues will hopefully provide insight and inspiration for relevant stakeholders.

3.1 | Threatening development efforts

While digitization and digital technology initiatives are increasingly being implemented globally, growing digital inequality and poverty are challenging various development efforts, including the United Nations Sustainable Development Goals (SDGs), particularly in the post-pandemic era (O'Sullivan et al., 2021). As an integrative approach, the 17 SDGs aim to achieve peace and prosperity by ending poverty and other deprivations, including reducing inequality. While some SDGs focus on enhancing marginalized groups' access to ICTs, the potential for other SDGs to bridge inequality within the community raises questions, as SDGs primarily focus on "economic growth" and "individuals," which can negatively impact marginalized people and communities. Of the 17 SDGs, only one (SDG 10) talks explicitly about inequality, while none of the ten related targets specifically mention the role of ICTs in addressing inequalities (Unwin, 2017).

In contrast, while internet access has been recognized as a human right by the United Nations (Reglitz, 2020) and as a basic need after food, shelter, health, and education in many regions of the world, 40% of the global population are yet to receive basic internet access (Johnson, 2021). This situation is paradoxical in the era of globalization considering the Internet's global nature. The notion and aspirations of a "global village" do not work when inequality is rising. Countries cannot afford peace without taking their neighbors and others along on this journey, focusing on global development. The recent World Economic Forum Global Risk Report indicated that there had been a significant turnaround as economies emerged from the shock of COVID-19. Consequently, "business risks emanating from these trends have been amplified by the crisis and include stagnation in advanced economies and lost potential in emerging and developing markets, the collapse of small businesses, widening the gaps between major and minor companies and reducing market dynamism, and exacerbation of inequality; making it harder to achieve long-term sustainable development" (McLennan, 2021, p. 9). The same report rated digital inequality as the fifth most concerning short-term threat to the world.

3.2 | Generational divide and social exclusion

Digital inequality and digital marginalization based on age, gender, disability, and ethnicity require deeper attention. Evidence has shown that digital exclusion exacerbates social exclusion among older generations, where regular use of digital products varies significantly and correlates with age (Steyaert & Gould, 2009). Accordingly, older citizens were found to have less access and, even when they do have access, they use less technology. In the developed world, older generations struggle to cope with a one-size-fits-all digital service delivery, leaving them technologically handicapped. This results in social isolation. During the COVID-19 pandemic, while societies adopted a "new normal" dominated by digital technologies in many areas of everyday life, vulnerable groups, particularly the older generation, continued to be disadvantaged. As Seifert (2020) noted, "If inclusion in society nowadays means active participation in the digital world, then older adults who are not online or not active on the internet are at risk of social exclusion" (p. 675). The 2015 Scottish Household Survey report found that depression, loneliness, and financial deficiency were all significantly higher among digitally excluded older people (Martin et al., 2016).

Digital marginalization is also prevalent among people with a disability and women in patriarchal societies. Generational and communication gaps, as well as gaps in perceived philosophy-of-life between digital migrants (born before the widespread use of digital tools) and digital natives (born in the digital era), create stark DIs within any society that affects social, physical, and emotional well-being. Social exclusion could thus become a potential barrier to a cohesive and just society, as well as to the people's well-being, relationships, and mental health.

3.3 | Polarization of society

Various digital innovations and applications are contributing to different forms of polarization, further intensifying societal inequality. Polarization of social class due to technology can be traced back to the industrial revolution and the process of automation, removing the middle class and producing considerable wage gaps (Maloney & Molina, 2016). Manual jobs are still slowly being eliminated, taking a significant toll on the working class.

The evolution of digital technology has also contributed to polarization in multiple other ways, particularly in the recent era. According to Dobbs et al. (2015), this modern digital transformation is 10 times faster than during the industrial revolution, with 300 times greater impact. Unfortunately, contemporary technology-driven economies largely operate under a “winner-takes-all” philosophy where a small segment of society, entrepreneurs, and businesses reap the benefits while others miss out (Patro & Raghunath, 2021). Growth and income statistics reveal how these changes have contributed to exponential inequality in global wealth, with the world's richest 1% owning 45% of global wealth compared to the bottom 50% of the world's adult population holding less than 1% (Davies et al., 2021).

Social media's contribution to the polarization of society has also been widely recognized (Ali et al., 2019). The emergence of a new form of polarization based on political, religious, and nationalist views, facilitated through social media technology, is creating a new dimension of DI with unique implications. While open social media platforms offer the potential to promote inclusiveness, transparency, and freedom of expression, these are often abused, resulting in division and conflict in societies exploiting the “Echo-Chamber Effect” (Boutyline & Willer, 2017). Social media has also increased manipulation through data analytics by targeting particular demographics, often using misinformation and “fake news” (Vicario et al., 2019). Even the integrity of democratic elections is now threatened, as happened in the wake of Trump's victory in the US presidential election through the involvement of big data companies like Cambridge Analytica (Venturini & Rogers, 2019). The power of a few giant social media outlets to shape public opinion and the impact of this reality on overall inequality represents another major concern. Failure to appropriately handle these delicate phenomena could be as destructive as wildfires, threatening social harmony, equality, and peace (Jakubowicz, 2017).

3.4 | Post-COVID syndrome of DI

A careful analysis of recent pandemic experiences suggests that many of the world's emerging problems are directly or indirectly implicated with DI. For example, Stephens and Mankee-Williams (2021) found that digital exclusion was a significant factor contributing to health inequality and socio-economic vulnerability in the UK during the pandemic.

A critical information gap, misinformation, and the so-called infodemic surrounding COVID-19 have signaled an escalating global divide (Jiang et al., 2021). According to the WHO (World Health Organization, 2021), 73% of global COVID-19 vaccine doses have been administered in just 10 countries, underscoring the stark global inequality (Buckwalter & Peterson, 2020). While these figures are not directly correlated with digital inequality, they have a close association with, and influence on, digital inequality, and vice versa.

COVID-19 vulnerability also depends on other inequality-related factors, such as social distancing (only maintained by some privileged classes compared to daily laborers living in densely populated areas). Once again, the “haves” were more empowered by technological access to accomplish many of their tasks digitally, maintain social connections with friends and family, and ensure better access to information surrounding COVID. The pandemic exposed an inequality in access to education in many developing countries, with educational institutions struggling to provide flexible ways of delivering education under highly challenging conditions. The sudden shift from physical to virtual classrooms led to a complete exclusion of underprivileged students, had detrimental outcomes, and added a new dimension of exclusion (Katz et al., 2021; Van Deursen, 2020).

3.5 | Innovations, trends, and digital transformation

One growing concern at present is the considerable threat posed by contemporary trends and emergent technologies, which often have adverse outcomes—particularly for poor and marginalized people. Heeks (2021) referred to the phenomenon as “adverse digital incorporation,” which facilitates unusual outcomes and “disproportionate extraction of value” for the less advantaged group (p. 772).

Rich elites and existing beneficiaries will continue to reap more benefits from the next generation of technologies, both as users and shareholders. Such entitlement and privilege often exacerbate exclusion among other segments of society (Lutz, 2019), particularly in many developing countries. In addition to basic flow-on effects, such as job losses for front-end workers and wealth and wage gap increases, a Bangladeshi study showed that new government digital service deliveries added additional learning and financial burdens for poor, illiterate citizens while benefiting the educated and wealthy, who were able to accomplish tasks from their comfort zone (Imran & Gregor, 2010). Such interventions, especially those mandated by governments, become compulsions known as “digital enforcement” against the end user's choice, leading to new forms of inequality and ethical violation (Diaz Andrade & Techatassanasoontorn, 2021). Research also suggests that in terms of interventions relating to the much-hyped potential of digital government, smart cities in poorer countries often become an “inevitable luxury” (Davison et al., 2000). Some scholars think that these random and over-hyped initiatives are unlikely to be major drivers of economic growth, while the significant resources invested in them could be better utilized in other areas to support poor people and their development (Unwin, 2017).

Cutting-edge technologies such as artificial intelligence (AI), robotics, wearables, and virtual and augmented reality are yet to realize their full societal and economic potential. However, one thing is becoming clear: these technologies are destined to exacerbate the existing inequality gap in several ways, laying the foundations for a storm of inequality.

Nevertheless, in a business context, the dominance of technological innovation and the pressure to adopt newer technologies continue to prevail. Organizations compete with their rivals to stay ahead of the game on the assumption that this is the major driver for achieving excellence and maintaining a competitive advantage. However, the hasty adoption of new technologies without careful analysis not only causes inequality but may also cause severe consequences and suffering for end-users. For example, Zou and Schiebinger (2018) uncovered how artificial intelligence (AI) applications may unintentionally introduce gender, ethnic, and cultural biases, leading to systematic discrimination among specific populations. They found that some commercial facial recognition systems misclassify gender with darker-skinned women compared with lighter-skinned women. Another instance of using deep learning to identify skin cancer from photographs revealed vulnerabilities and risks for dark-skinned people, as the algorithms were not tested on them.

Another cutting-edge technology, the Internet of Things (IoT), will also have a significant global impact (Chen et al., 2014) due to its growing application. However, its effects on developing countries and marginalized societies are still questionable, not only for privacy and security issues but also for in terms of the vast population's unequal access and benefits.

The debate around the advantages and disadvantages of these advanced technologies in the so-called fourth industrial revolution (or frontier technologies) has only just started. It is therefore likely to continue until society fully understands the short- and long-term consequences based on more case studies and data.

Recently, senior public officials, including several CIOs of government departments, attended a seminar organized by Australia's Public Sector Network. A well-established large IT company gave a presentation titled “AI (Artificial Intelligence) first approach” with a strong push to adopt AI in every aspect of their business process, painting a rosy future. What was noticeable, however, was that a broader narrative considering critical issues surrounding the short- and long-term implications of AI application for the diverse population was completely missing. The same tendency exists among many politicians in developing countries, where large numbers of computer gadgets (tablets and PCs) are provided to schools and their constituents to earn the voters' attention and show off signs of development. Unfortunately, teachers at these schools have been found to not even know how to use such gadgets (Unwin, 2017).

As the adoption of digital technologies expands rapidly, the people's rights, choices, and privacy, including inclusiveness, are consigned to monopolistic control by corporate giants or “digital barons” (Unwin, 2017). People's privacy and rights are then sacrificed for these large companies' profits, which is undoubtedly a big concern. Routine violations of digital rights, privacy, freedom of expression, and the right to information are being reported on a regular basis by various advocacy and human rights groups, including Amnesty International, raising a debate on data rights.

There are various other dark sides to digital technologies, including information overload, addiction, cyber-crime, cyber-bullying, internet pornography, techno-stress (D'Arcy et al., 2014), workplace surveillance, the endangerment of civil liberties, and work-life balance (Holland & Bardoel, 2016). Each of these adds to the adverse outcomes of DI and cannot be ignored when gauging the overall impact of digital technology on digital inequality (Wellisz, 2016).

Finally, the environmental impact of increasing ICT use—the IT industry accounts for up to 3.7% of global greenhouse gas (GHG) emissions (Folk, 2020)—is still not on the radar of the debate around climate change or related impact studies. This will have a detrimental impact on poor countries already affected by DI.

4 | A WAY FORWARD

To reduce inequality, policies need to be developed to direct the design, development, and delivery of digital services and solutions. A holistic approach involving multi-stakeholders of government, the private sector, and civil society must be taken to tackle this complex phenomenon. Below are some areas that need attention, as well as several recommendations.

4.1 | Philosophical shift—a campaign for digital equality

First and foremost, a philosophical shift in our approach regarding digital interventions is required. This needs to be accompanied by research, awareness, and an information campaign, particularly among policymakers and practitioners.

This philosophical shift demands a change of mindset from a technology-first or AI-first approach (the technocentric/instrumental view of ICT that still prevails among some policymakers and practitioners) to a “humanity first” or “people-first” approach. A similar shift is required from the traditional ROI and productivity mindset to one focused on building social capital.

Revisiting the default, western-dominated perspective and reconceptualizing it to expand concepts like “development” and “digital inequality,” which fail to capture the lived experiences and values of other cultures, genders, and regions, should be an essential part of this process. For example, the widely used concept of “development,” concerning economic growth, liberal democracy, and the free market, was constructed from the discourse of development organizations and is no longer appropriate for current ICT4D studies (Unwin, 2017). Researchers state that “development” should instead depict a fundamental moral and ethical agenda (Unwin, 2017; Walsham, 2012). Recently, Masiero (2022) reinforced the call for ICT4D researchers to reconceptualize “development” in terms of justice, the potential of metatheoretical research approaches, and indigenous understandings of ICTs (Davison & Díaz Andrade, 2018). Similarly, equality should be viewed as creating a fairer society from a moral and ethical standpoint, where governance structures dominated by neo-liberalism, free markets, and individualism should be restructured to accommodate collective values and cultural conceptualizations of happiness, satisfaction, cooperation, and solidarity (Unwin, 2017).

To create a fairer society, technological innovations need to embrace elements that promote equality, well-being, and justice. A new business model that reconceptualizes traditional ROI dynamics, such as the social business model coined by Nobel laureate Professor Muhammad Yunus, which balances social capital with economic benefit, should be explored/trialed (Yunus et al., 2010). However, this potential shift undoubtedly presents challenges for many businesses that are unwilling to alter their fundamental business models away from pure revenue generation.

Similarly, in the research field, alternative approaches such as intersectionality and participatory action research (mentioned in Section 2), as well as other promising research methods like design science research (DSR) and action design research (ADR), should be explored further to address DI (Gregor, 2022). However, DI researchers should be open-minded, adopting theories and methodologies from other disciplines where such issues are being investigated. For example, while the information system (IS) discipline largely focuses on systems, intervention design, and context, the Media and Communication discipline focuses on the audiences (users) of the same phenomena through a sub-field called “audience studies” (behaviors, perceptions, attitudes, etc.). This field encompasses theoretical and methodological approaches for understanding how and why audiences engage with technology, its political, cultural, and economic implications, and its relationship with audiences. From this perspective, the role of audiences as an agency is critical, and this is becoming increasingly important in the digital environment, where audiences actively participate not only in consuming media but also in creating and reproducing it.

A focused awareness campaign involving multi-level stakeholders is necessary to initiate tangible change. The First International Symposium on Digital Inequality and Social Change (ISDISC) on 28–29 March 2022, hosted by the University of Canberra, is an example. This event was attended by approximately 75 participants from 13 countries, including government ministers, public sector officials, industry leaders, NGOs, and academics. The symposium confirmed the necessity of building common understanding and consensus, offering an opportunity to initiate dialogue, share valuable ideas and best practices on this specific issue, and open a platform for further work.

Rather than investing in and relying on AI alone, the opportunity to realize the broadest potential impact of these possibilities lies in utilizing the untapped “natural intelligence” of the two-thirds of the global population living in developing countries.

Nevertheless, we must also move away from the notion that anything digital is good. Treating digital technology as the hammer to fix every nail (i.e., a social problem) can be unsuitable for certain societies, particularly in developing countries. Instead, we need to establish alternative solutions, including non-IT solutions, which are more appropriate for the local context and more likely to yield positive outcomes. Equally, an individual's personal preference not to use digital products or services (this also falls within fundamental human rights) needs to be considered (Diaz Andrade & Techatassanasoontorn, 2021).

While digitization is an irreversible trend, we need to be cautious regarding over-digitization and the potential harm this may cause to individuals and societies. It is time to establish a balanced choice between digital and alternative non-technical approaches, moving beyond the narrow, one-sided mindset that views technology as the solution to all our problems.

4.2 | Policy reform and intervention

Policy interventions are a powerful starting tool for addressing global issues. However, international bodies and government leaders have not taken a firm stand backed up by policies on the issue of DI. Strong policies could make practitioners and businesses accountable for balancing societal inequalities. The current situation warrants a priority agenda where developed nations should be seriously concerned with integrating low-income and underdeveloped countries into the information super-highway, working together toward capacity-building at a grassroots level to bridge inequality and enable equal participation in the digital economy.

Global policies that prioritize equitable access need to be formulated by international bodies, including the UN, ITU, and other development agencies, through a multidimensional approach covering education, health, social, and well-being factors. Policies should shift the focus from physical access to the people's ability to make use of digital resources, enabling increased opportunities while regulating negative uses when problems persist. Avenues such as open education, open information, free internet, and various other policies must be explored to make information processing accessible to the public. Even relevant policies to enhance transparency, press freedom, and openness can contribute to education, participation, and capital growth through technology (Pick & Azari, 2011).

Several worthy initiatives are being undertaken. Policies like the EU's General Data Protection Regulation (GDPR) represent strong initiatives toward protecting people's rights and privacy, but their contextualization and applicability to developing countries remain problematic because the very concept of privacy at various levels is highly contextual and variable across different cultures and regions (Alhazmi et al., 2022). For example, asking personal questions like marital status is a local norm in some countries, while in others it would constitute a privacy issue. Similarly, the concept and evaluation of "self" through universal criteria (such as a Eurocentric value system) is very different from a non-Western understanding of self and identity, depriving groups of the ability to use their own cultural traditions (Yin, 2018). Such global diversity reiterates the necessity of cultural adaptation, where DI policies with a typical western perspective will not be appropriate.

The role that national and international telecommunications and Internet regulatory agencies can play in this process cannot be overstated. Currently, most regulatory decisions focus on private sector growth, rather than the marginalized population. As a result, ICT is increasingly being used to control and empower global corporations and governments to monitor and influence people.

Reforms should involve modifying existing processes that cause inequality, removing barriers, and supporting the marginalized. Unfortunately, existing structures largely persist as a result of the vested interests underlying them (Imran & Gregor, 2011). A mindset shift involving a whole-of-government approach, followed by appropriate strategies to empower marginalized groups, is therefore required. Renewed policy interventions that accommodate newer innovations, particularly the impact of solutions and services based on AI, machine learning, and robotics on DI, need to be enacted. These emerging technologies must be analyzed alongside the correlation of various social, ethical, and cultural implications before such adoption occurs.

Where there is no particular agency to deal with digital inequality problems, it is crucial to establish cross-agency collaboration to ensure policy contributions deliver appropriate digital services for broader populations in the future.

More up-to-date and robust data that consider multifaceted aspects of DI also need to be collected. For example, the Australian Digital Inclusion Index (ADII) uses survey data to measure digital inclusion across three dimensions: access, affordability, and digital ability. While this may not be adequate to provide in-depth and multifaceted information, it represents a strong starting point to capture more meaningful data for the development of policies and programs that can improve digital inclusion.

4.3 | Inclusive technology solutions and services

The design, development, and rapid deployment of ICTs have been blamed for increasing global inequality (Unwin, 2017). A significant push toward developing inclusive technologies is required, with innovations and ICT services targeting a more comprehensive population needing to pass the inclusion test.

Some hope and examples of inclusiveness do exist. As the latest generation of computers becomes cheaper, their increased computing power ushers in the hope of offering more affordability and inclusivity to marginalized sections of the population, assuming that markets remain under control.

There are several good examples highlighting positive proliferation, including at the bottom of the pyramid of Sub-Saharan Africa (Billari et al., 2020).

The proliferation of mobile technology as the most accessible technology, with considerable benefits for most low-income countries and households, is undeniable. Additionally, access to information, long-distance communication, and mobile financial applications (like m-Pesa in Tanzania and BKash in Bangladesh) were game-changers (Imran et al., 2016). Even some cutting-edge technologies, despite the apprehension about their role in accelerating DI (e.g., Heeks, 2021), provide some optimism for more potent and innovative technology applications across many developing countries to benefit the country and its citizens. For example, Thomason et al. (2018) demonstrated how blockchain technology promises to address many of the critical needs of developing countries by providing solutions to tracking climate finance, climate adaptation, financial management and distribution if it is designed and applied in the right context appropriately.

However, problems arise when the word "inclusive" is missing in broader terms that extend beyond basic accessibility and inclusion of the minority. Groups with disabilities and other marginalized sections of society should be considered when designing information systems. Research emphasizes the need for a trust-building campaign between vendors and target societies, aiming for a unified approach (Fox & Connolly, 2018).

Finally, a call for action in this sphere could involve both the development of the Digital Inequality Index (DII) and the adoption of a DI scanning tool to pass the inclusion test. Every new IT innovation/ service needs to pass these DI metrics, which would operate something like an

environmental scan to gauge the DII threshold of the proposed innovation and its likely impact on society. Such considerations must be undertaken at national and international levels, with a clear mandate.

4.4 | Holistic human capacity building

Traditionally, human capacity-building efforts concerning DI were mainly focused on improving end users' digital skills or literacy. However, to address DI, capacity-building efforts need to expand and be considered among designers, policymakers, and practitioners to have a common understanding of digital inequality issues. With growing complexities, synthezation, and analysis of information in light of fundamental education on human development, ethics, rights, and consequences are critical for deriving the maximal benefits of digital inclusion and services. As such, ethical and social responsibility should be integral to design, development, and training. Mass deployment of cybersecurity and cybersecurity education and training should also include inequality issues.

One of the primary ways to address digital inequality is by deploying massive skill and capacity-building interventions for people of all races and regions. However, these require a renewed focus and development of curriculums and coverage in light of new realities surrounding DI issues. Lack of digital literacy impacts the people's ability to derive equal or optimum benefits from digital services. People with poor digital literacy and skills are also likely to be more prone to fake news, scams, and cyberattacks, which compounds issues surrounding digital inequality. According to a report by the International Telecommunication Union (ITU, 2021), only 15% of countries have populations where at least 10% of individuals possess developed advanced digital skills (e.g., computer program language).

However, mere skill development or leapfrogging skill gaps may not work. Hargattai (2021, p. 5) noted that “even if people catch up with some abilities over time, new developments emerge that are likely to result in new skill differences.” Current initiatives at school and national levels are not sufficient compared to what is needed. Socio-cultural initiatives encompassing family and friends can play an important role in capacity-building and supporting the disadvantaged and elderly in terms of technology (Xiong & Zuo, 2019). More capacity-building initiatives must be commissioned, starting from schools and continuing to the aged population, with a particular focus on bridging digital inequality in various contexts, countries, and demographics.

4.5 | Universities need to play a leading role

In the face of decaying political leadership and a lack of visionary leadership in many countries, the present world needs universities and think tanks to be more proactive in providing knowledge, wisdom, and leadership in dealing with global and social problems that directly or indirectly impact every citizen.

Despite growing demand, DI research is relatively scarce globally. It is insufficient for some universities to be empathetic to these issues and to mention them in strategic intents and plans, or even to apply some strategies and policies within those particular universities. More should be done to prioritize the issue in research, curriculums, and university value systems. Universities should also embrace this philosophy to preserve a just society and play a key role in its commitment to society as a “place of reasoning,” as defined centuries ago by Emmanuel Kant.

Academics are better positioned to understand and reform society by utilizing their acquired knowledge and experience. However, current trends regarding the commercialization and marketization of our education system, with increased workloads and misplaced priorities, hinder noble approaches toward social contribution by academia. Funding mechanisms and measures of research ROI through research income are highly counter-productive, discouraging such social impact research that challenges and often goes against the typical income generation trend. On the other hand, research in this area warrants deep, prolonged immersion into the context of lived experience to grasp the complexities of its many dimensions. Such a nuanced evolution and understanding of DI is challenging for typical academics who are already struggling with their existing workloads.

Universities should undertake a more realistic approach to support and fund such research with additional encouragement and risk, if not for its obligation, at least as part of their corporate responsibilities. Universities should also lead policy dialogues involving relevant stakeholders, policymakers, and industry practitioners to create the awareness and information campaigns outlined in Section 4.1.

4.6 | Multi-disciplinary approach to address DI

In research, crossroads occur where typical silo-based research (driven by a single discipline) does not work, particularly when dealing with complex socio-cultural problems like DI. These emerging problems are largely contextual, with deep-rooted socio-cultural implications that warrant holistic, diverse, and multi-disciplinary lenses/theories. The creative arts, media, psychology, and social sciences play an important role in ensuring social acceptance and the uptake of research outcomes, the adoption of new technologies and ensuring ethical and responsible developments, and the application of emerging technologies. All relevant segments and likely factors affecting DI, including resources, skills, support, autonomy, and scope of

use among people, need to be studied and addressed both separately and in combination with each other. As such, a critical mass of interdisciplinary experts' viewpoints is needed, where solutions and outcomes include combining social and technical artifacts.

Traditionally, academics were discouraged from doing multi-disciplinary research as greater value was placed on publishing in traditional disciplinary journals than in multi-disciplinary outlets. While this trend is shifting, more must be done to break the silos and make these avenues more rewarding for academics.

The ICT domain has been transformed due to its strong relationship with many other fields. Its broad spectrum encompasses many critical issues for our society, such as ethics, inequality, leadership, governance, and management. There is clearly a vacuum of robust theories to tackle this growing problem, which is closely embedded with complex socio-cultural, political, and economic factors. Existing theoretical lenses from multiple disciplines—primarily devised in developed countries—fail to capture either the growing complexities of technologies or the deep-rooted socio-cultural issues of diverse societies in developing countries. We need to take a holistic, neutral view of the problem, allowing for more multi-disciplinary research to understand its long-term societal consequences.

There is a considerable gap in understanding the complexities around DI, which varies across different contexts. It is impossible to grasp the interwoven layers fully without having engaged practically either as an insider or over a prolonged period. While there are sporadic attempts to address DI issues in different regions through case studies and intervention designs, a cumulative body of knowledge in this relatively nascent domain remains lacking. Research of this nature warrants a complementary skill set and expertise to understand and examine a different set of contextual challenges compared to the typical well-defined organizational research setting and context. A more collaborative approach with diverse perspectives, creating an ecosystem of expertise, is required to tackle these problems. One objective would be to create sufficient human capital to achieve research outcomes.

5 | CONCLUSION

DI is real and has added to the existing challenges in this new era of the digital revolution. The world is yet to fully comprehend and assess its impact on society, particularly in bridging the social divide. However, the problem continues to suffer from a lack of focus and attention among stakeholders and researchers. Compared to the focus and speed of innovation in AI and machine learning, research on issues like DI is progressing at “tortoise speed.” Funding agencies openly compete for AI, robotics, and cyber studies. However, they are not interested in addressing growing inequality, as its ROI may not be readily attractive to corporate interests.

Uniting stakeholders interested in the digital divide and inequality issues is critical. Research should focus on emerging real-life problems arising from digital and social transformations with short- and long-term impacts on human development, rather than the typical focus on productivity and efficiency gains. Along with the environment, climate change, and other compelling cases, issues surrounding DI should be prioritized as integral design considerations regarding IT interventions, particularly government service deliveries, where a diverse population in terms of age, ethnicity, socio-economic, and power status are considered. Human capital development should be a priority in those interventions. A balance in the trade-off between DI, productivity gain, and ROI needs to be achieved. It is important to note that DI cannot be addressed through one narrow focus. Instead, it requires a united front to consider the multiple forms of inequality that prevail in society.

These discussions lead to proposing and visualizing what inclusive technology and digital society we would like to see in the future. While the answer is not straightforward, the changed and renewed thought processes will surely guide us toward an overall goal, helping relevant stakeholders to shape and direct actions as they are needed.

This commentary does not aim to reject or blame technology, but rather to emphasize the importance of its design and application, each of which requires close attention. Even cutting-edge technology can contribute positively toward attaining digital equality, but only if it is applied appropriately. Technology has a key role to play in providing hope as a unifying force when the world is so divided on many critical issues. Even the UN Secretary-General, António Guterres, singled out digital technology as a potential avenue for reaching a common consensus to help make our world fairer and more peaceful (United Nations, 2020).

Some of the recommendations made in this paper may appear imprecise, multi-directional, and superficial. However, the intention was to open up readers' imaginations and inspire possibilities. Readers are expected to interpret the suggestions in their own way to explore new avenues and possibilities for future research and application.

The challenge of tackling DI lies in moving away from the influence of the vested interested groups who traditionally planned, designed, and governed ICT services toward leveling the power imbalance and creating fairer access to digital services and the benefits they offer. Echoing Mandela (1995), I would like to conclude with his plea: The development of a global information society based on justice, freedom, and democracy must be one of our highest priorities' as responsible advocates for DI.

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Data sharing not applicable to this article as no datasets were generated or analysed during the current study

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