New Dimensions of the Digital Divide: The Cycle of Literacy, Outcomes, and the Reproduction of Social Inequality

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ABSTRACT

This systematic literature review examines the evolution of the digital divide concept beyond physical access, focusing on its new dimensions of digital literacy and outcome inequality. Through a qualitative thematic synthesis of scholarly works, the study addresses two core research questions: the interconnection between literacy and outcome dimensions, and their role in reproducing structural socio-economic injustices. The analysis reveals a mutually reinforcing cycle where disparities in digital literacy encompassing operational, informational, and strategic skills directly determine the capacity to convert access into tangible benefits. This cycle is mediated by psychological, social, and institutional factors. Furthermore, the study demonstrates that these digital inequalities function as a potent mechanism for social reproduction. By gatekeeping opportunities in increasingly digitalized domains of labor, education, public services, and citizenship, inequalities in digital literacy and outcomes consolidate existing privileges and deepen the marginalization of vulnerable groups. The study concludes that the digital divide in its contemporary form is not merely a reflection of traditional inequalities but an active force that re-encodes and amplifies them into the technical logic of the information society. Consequently, effective policy interventions must adopt a multidimensional approach that simultaneously targets access infrastructure, comprehensive literacy development, and the structural conditions that enable the conversion of digital capacity into life-enhancing outcomes.

INTRODUCTION

The digital revolution that swept across various aspects of human life in the early 21st century promised a huge leap in efficiency, connectivity and access to knowledge. This promise of transformation is based on the assumption of equal access and ability to utilize information and communication technology. However, in reality, the distribution of the benefits of this revolution is uneven, contributing to the reproduction and even deepening of existing patterns of social inequality (Gani et al., 2021; Mardikaningsih, 2021). There is a systematic difference in the opportunities available to individuals and groups to participate in an increasingly digital society. This difference is known as the digital divide, a term that initially focused on the dichotomy between those who have physical access to devices and internet connections and those who do not. This initial understanding described a simple gap that could be bridged by providing adequate infrastructure and hardware. However, closer observation shows that solving the problem of physical access does not necessarily eliminate inequality in the digital space. This indicates that there are other layers of complexity that require a sharper and more multidimensional analytical approach to be fully understood.

Conceptual developments regarding the digital divide then moved beyond the paradigm of access. Scholars began to notice that device ownership and connectivity were only the initial entry points. What was more decisive was what happened after the door was opened. The ability to use technology effectively, critically, and creatively became the main differentiator. This dimension is often referred to as digital literacy, which encompasses a range of technical, cognitive, and socio-emotional competencies. These competencies serve as a bridge connecting technological access to real opportunities

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in education and employment (Arifin & Darmawan, 2021). Without adequate literacy, physical access becomes meaningless or even potentially harmful, as individuals may be exposed to misinformation, data exploitation, or social isolation. Thus, inequality is no longer simply about "having" versus "not having", but about "being able" versus "not being able" to utilize what one has.

Furthermore, there is a layer of inequality that is most substantive but often overlooked, namely the gap in outcomes or benefits obtained. Two individuals with relatively equal access and literacy levels can obtain very different results from using the same technology. These results can take the form of increased economic, social, or cultural capital. An entrepreneur in an urban area may use an e-commerce platform to significantly expand their market, while another entrepreneur with a similar product may only be able to use it for limited transactions without significant growth. These differences in outcomes are influenced by factors beyond the technical realm, such as initial social networks, institutional support, and position within the broader economic and political structure. These dynamics are particularly evident in the gig economy, where access to the same technology can result in vastly different levels of welfare and job stability for each worker (Ishaq & Darmawan, 2021). Therefore, digital inequality in this outcome dimension is closely related to pre-existing structural injustices. Rather than being a tool that levels the playing field, digital technology often functions as an amplifier that exacerbates deep-rooted socio-economic inequalities.

Digital inequality, with its three dimensions of access, literacy, and outcome, cannot be separated from broader social constructs such as class, geography, gender, age, and education. These social factors intersect and create complex and persistent patterns of inequality. For example, an elderly person with a higher education background living in an urban area may experience different barriers than a young person from a rural area with a basic education, even though both have smartphones. The first barrier may lie in psychological adaptation to change, while the second may lie in infrastructure limitations and content relevance. The challenge of inclusivity in technology-based services is becoming increasingly apparent, as it must respond to the diverse needs and capabilities of users from various backgrounds (Ramle & Mardikaningsih, 2022). A scientific approach to understanding this issue requires a lens that can integrate technological analysis with critical social theory, looking at how technology is embedded in power relations and everyday social practices. Thus, the digital divide is not an isolated technical problem, but a symptom of deeper social dynamics.

This literature review stems from the need to understand the conceptual evolution of digital inequality from an issue of access to a multidimensional and structural issue. The focus of the study is on new dimensions that include the gap in usage capabilities and the gap in benefits, as well as their close relationship with established forms of injustice. A comprehensive understanding of these layers of inequality is essential for designing appropriate interventions that go beyond simply distributing devices to building capabilities and addressing the structural barriers that prevent the equitable use of technology. This study will investigate how these three dimensions interact and reinforce each other, as well as their implications for the life chances of individuals and groups in contemporary digital societies.

The main problem in addressing digital inequality is that policies and intervention programmed often remain fixated on an approach that equates connectivity with equality. The assumption that providing broadband infrastructure and inexpensive devices will solve the problem of inequality is mistaken. An excessive focus on physical access ignores the fact that the greatest barriers are often social, cultural, and cognitive. Individuals who have newly gained access may encounter cultural clashes, unfamiliar technical language, or a lack of role models to guide them. In addition, the digital content and services available are often irrelevant to their needs, priorities, or local context, reducing their motivation to adopt and use technology intensively. This creates a situation where large investments in infrastructure are not matched by commensurate increases in capabilities and outcomes, resulting in a waste of resources and a failure to address the root causes of inequality.

Another complex issue is the mutually reinforcing nature of the digital divide and traditional social inequalities. Digital technology has become the primary medium for accessing public services, market information, education, and employment opportunities. When certain groups lag behind in terms of digital access, literacy, and outcomes, they are simultaneously excluded from the paths of social and economic mobility that increasingly depend on these mediums. This process creates a vicious cycle: social backwardness limits the ability to adopt technology, and lagging behind in the use of technology further deepens social backwardness. This cycle is very difficult to break because it involves factors that are deeply embedded in the structure of society, such as

disparities in the quality of education, geographical segregation, and discrimination based on identity. Thus, the digital divide is not merely a consequence, but also a cause of the reproduction of injustice in new forms, which requires systemic and integrated analysis and solutions.

The global Covid-19 pandemic has served as both a catalyst and a massive experiment that has highlighted the real consequences of digital inequality. When physical restrictions were imposed, vital activities such as work, learning and healthcare moved end masse to the online realm. This event starkly revealed who had the capacity to transition smoothly and who was left behind or even disconnected altogether. The effectiveness of programmed such as Work from Home (WFH) was highly dependent on prerequisites of access and digital literacy, which were not evenly distributed (Mendrika et al., 2021). For those with reliable access, adequate literacy, and socio-economic support, the digital world became a lifeline. Conversely, for those on the wrong side of the digital divide, the pandemic exacerbated vulnerability and eroded opportunities, while creating new psychological dynamics and consumption patterns in society (Issalillah, 2021; Khayru, 2021). Children from low-income families lost months of learning, part-time workers lost access to job vacancy information, and micro-enterprises struggled to survive because they were unable to migrate to digital platforms. This collective experience has made digital inequality a very concrete and urgent issue, directly impacting citizens' basic rights, equality of opportunity, and social cohesion on an unprecedented scale. Employee discipline and performance in the pandemic era also face their own challenges due to this uneven digital transition (Hariani et al., 2021), while the mobilization of legal awareness for compliance with health protocols is also aided or hampered by the digital literacy of the community (Rojak, 2022).

On the other hand, the accelerated adoption of technologies such as artificial intelligence, automation, and cloud computing is reshaping the future of work and the global economy. The ability to participate in this new economy is largely determined by the mastery and utilization of digital technology. If inequalities in literacy and outcomes are not addressed, we risk creating a permanent social divide between a skilled class that benefits from automation and a class whose jobs are replaced and who lack the skills to transition. Therefore, the development of ethical and fair technology is an imperative, not just an option, to prevent technology from becoming a new tool for discrimination (Radjawane & Mardikaningsih, 2022). This imperative includes the principle of accountability in AI-based decision-making, so that technological progress does not sacrifice the values of justice and humanity (Gani & Darmawan, 2022). These risks threaten not only economic stability but also the democratic social contract. Therefore, comprehensively understanding the new dimensions of digital inequality is a critical foundation for formulating education, job training, and social security policies that can prepare all levels of society for this major transition, so that the benefits of technological progress can be distributed more fairly and inclusively.

This literature study aims to analyses and synthesize scientific thinking related to the conceptual evolution of digital inequality towards the dimensions of literacy and outcomes. Specifically, this study seeks to examine the reciprocal relationship between the digital literacy gap and the gap in benefits obtained, as well as to explore how these two dimensions function as mechanisms that reproduce structural injustice in society. The expected theoretical contribution is the presentation of an integrative analytical framework that links the theory of digital inequality with the theories of social justice and political economy. In practical terms, this synthesis is expected to provide a more solid foundation for the formulation of policies and intervention programmed that are not only technical-infrastructural in nature, but also socio-cultural and institutional, in order to achieve substantive and equitable digital inclusion.

RESEARCH METHOD

This research was conducted as a systematic literature review using a qualitative approach. This approach was deemed most appropriate for achieving the research objective, which was to develop a comprehensive and interpretative understanding of the complexity of digital inequality in its new dimensions. This type of literature study is not intended to test hypotheses, but rather to synthesize ideas, theories, and findings from various academic sources in order to identify patterns, relationships, and gaps in existing knowledge. Thematic synthesis is the main method of analysis, which allows researchers to organize and interpret the body of literature based on themes that emerge inductively. This process facilitates an in-depth exploration of the conceptual nuances and social dynamics underlying the digital divide, particularly in terms of literacy and outcomes, as well as its links to broader structures of injustice.

The literature search strategy was designed to

ensure broad and relevant coverage. Searches were conducted in leading academic databases, including Scopus, Web of Science, Google Scholar, and JSTOR. A combination of keywords in English was used, such as "digital divide beyond access", "digital literacy gap", "digital outcome inequality", "second-level digital divide", "digital exclusion and social justice", and variations of related terms. The main inclusion criteria were: (1) scientific journal articles, books, or book chapters published within a specific time frame; (2) publications that explicitly discussed the non-access dimensions of the digital divide, particularly literacy, skills, usage, or benefits; (3) works that link the issue of digital inequality to social, economic, or political theory; and (4) texts written in English or Indonesian. Works that focus solely on the technical aspects of infrastructure or that do not discuss the social implications of inequality were excluded from the study. The selection process was carried out in stages, beginning with an assessment of titles and abstracts, followed by a complete reading of manuscripts that met the initial requirements.

The analysis process was carried out iteratively, following the principles of thematic analysis as developed by experts in qualitative methodology. After the literature was collected, active reading and coding of key ideas, theoretical arguments, and propositions proposed by each author was carried out. These initial codes were then grouped based on their semantic and conceptual similarities to form larger themes. These themes were further refined, examined in relation to each other, and organized to answer the research questions. To maintain the quality and reliability of the analysis, source triangulation was carried out by comparing perspectives from various disciplines and researchers. In addition, reflective notes were made during the analysis process to track the development of ideas and ensure transparency in the interpretation of textual data. The end result of this process is a coherent synthetic narrative that not only summarizes but also critiques and integrates various perspectives in the body of literature to produce a new contribution to understanding.

RESULTS AND DISCUSSION

The Interconnection between Digital Literacy and Outcomes: Transcending the Access Paradigm

The relationship between digital literacy and technology utilization outcomes forms a mutually reinforcing cycle that determines the quality of individual participation in the digital society. Literacy dimensions serve as critical intervening variables that mediate between physical access and the achievement of substantive benefits. Without adequate literacy, access is merely unrealized potential. For example, early empirical research by Hargittai (2002) on differences in online skills among students with relatively equal access showed that variations in socio-demographic backgrounds and prior experiences correlated with their ability to complete information-seeking tasks effectively. These findings indicate that even within a connected population, there are gradations of competence that produce information search outcomes of varying quality. Differences in finding, evaluating, and utilizing online information can directly affect academic outcomes, such as the quality of assignments and research. Thus, digital literacy is not merely a complement, but an operational prerequisite for transforming connectivity into useful capital.

Multidimensional digital literacy, as conceptualized by van Deursen and van Dijk (2010), maps a direct relationship with specific types of outcomes. They distinguish between operational skills (using devices and software), formal skills (navigating digital media structures), information skills (searching for, selecting, and evaluating content), and strategic skills (utilizing information to achieve personal goals). It is these strategic skills that are most closely related to life-changing outcomes, such as improved economic status or social empowerment. An individual may be operationally skilled and able to find information, but if they lack strategic skills, they cannot convert that information into beneficial decisions or actions. For example, the ability to search for job vacancies online (information skills) must be accompanied by the ability to assess the suitability of vacancies, prepare competitive digital applications, and utilize online professional networks (strategic skills) to actually obtain a better job. This disparity in the mastery of strategic skills creates a clear division between users who are instrumentally skilled and those who are strategically empowered.

The outcome dimension of the digital divide often manifests itself in the form of differences in the accumulation of various forms of capital. Individuals with high literacy tend to use technology for beneficial activities and to sharpen their competencies, a pattern referred to as "capital-enhancing activities". These activities include self-directed learning through online courses, developing professional portfolios on platforms such as LinkedIn, or using digital financial services for investment. Conversely, individuals with limited literacy, despite having access, often concentrate on consumptive and recreational

activities, such as entertainment social media or games. These different patterns of use, as observed in the literature, are not consequentially neutral. Capital-enhancing activities serve as investments that generate future economic and social returns, while recreational use, though legitimate and important for well-being, has less transformative impact on individuals' socioeconomic position. Thus, the literacy gap leads to divergent usage patterns, which in turn generate divergent capital accumulation, widening outcome inequalities over time.

In addition, the social environment in which literacy is applied significantly influences the outcomes that can be achieved. Digital literacy is not an atomistic competency that operates in a vacuum. Its effectiveness is highly dependent on what is referred to as "socio-technical support". An individual with moderate literacy who has access to a rich and supportive social network, such as family, friends, or skilled colleagues, can achieve better outcomes than individuals with similar literacy who are socially isolated. The importance of social capital and community-based adaptation strategies is not only relevant in climate change, but also in adaptation to rapid socio-technological change (Oluwatoyin & Mardikaningsih, 2022). These networks serve as sources of technical assistance, recommendations, information validation, and opportunities for collaboration. Therefore, the outcomes of digital literacy are moderated by the strength of an individual's offline social capital. Inequalities in social capital, which often overlap with existing lines of social inequality, mean that the benefits of increased literacy will be unevenly distributed. The interaction between digital literacy and social capital creates a complex matrix of inequality, where digital advantages tend to be concentrated among those who already have social advantages.

Psychological factors, such as digital self-efficacy and risk tolerance, also bridge literacy with outcomes. Digital self-efficacy, or a person's belief in their ability to complete tasks using technology, influences the extent to which they will explore new features, overcome technical barriers, and utilize technology for ambitious purposes. A person with adequate objective literacy but low self-efficacy may avoid using technology for important transactions, such as online banking or government services, thereby missing out on the benefits of efficiency and access that it offers. Conversely, high self-efficacy can encourage experimentation and learning, which in turn increases actual literacy and expands the range of positive outcomes. This psychological belief is itself shaped by past experiences, social feedback, and stereotypes attached to gender, age, or class identity. Thus, inequalities in outcomes are also mediated by inequalities in self-confidence and psychological attitudes towards technology.

The level of autonomy and agency in technology use is a critical aspect of literacy that determines outcomes (Pallerin, 2018). Critical literacy, which enables users to understand the political-economic architecture of digital platforms, algorithms, and the data economy, is the foundation for autonomous use. Users with critical literacy are able to make more informed choices, protect their privacy, and even utilize platform structures to their advantage. Without critical literacy, users are vulnerable to exploitation, manipulation, and unconscious influence, which can result in detrimental outcomes, such as debt from online loans, political polarization, or algorithmic discrimination. In this case, the resulting outcomes can be negative, not just neutral. Therefore, the relationship between literacy and outcomes is not always linear and positive; inadequate literacy can actively produce losses, while comprehensive literacy serves as a mechanism for defense and empowerment.

Institutions and policies shape the terrain in which the literacy-outcome relationship takes place. When public and private institutions design digital services that are intuitive, inclusive, and supported by human assistance, they reduce the literacy burden required to achieve certain outcomes. Conversely, services that are complex, full of technical jargon, and unsupported assume a high level of literacy, thereby unfairly excluding certain segments of the population. Government policies that focus only on basic technical skills training without including information and strategic literacy education, or without ensuring that public services are accessible to those with basic skills, essentially sever the link between increased literacy and improved outcomes. Therefore, efforts to change people's behavior so that they can adapt and utilize technology sustainably require systematic education and public awareness strategies, as is needed in other sustainable development issues (Gautama & Mardikaningsih, 2022). Thus, the relationship between literacy and outcomes is also structural, shaped by design and policy choices that can either narrow or widen the gap.

Disparities in literacy and digital outcomes also have a temporal dimension that reinforces itself. Those who have better literacy from the outset tend to be early adopters of new technologies. This early experience gives them a learning advantage, allowing them to accumulate tacit knowledge and skills that are not easily transferable. By the time the technology becomes

mainstream, they are already far ahead on the learning curve, able to leverage it for greater advantage. Conversely, late adopters with low literacy not only start from a lower point, but also have to catch up with ever-evolving technology, an increasingly difficult task. This dynamic creates an "ever-widening gap", where efforts to improve the basic literacy of the lagging population always lag behind the pace of technological innovation, making outcome inequality permanent and possibly even deeper.

Digital literacy also functions as a filter that determines access to advanced opportunities in the digital ecosystem. Many digital economy platforms, such as advanced marketplaces or global freelancing platforms, require a complex set of literacy skills: the ability to create an attractive profile, negotiate digital contracts, manage online reputation, and use analytical tools. These skills are often above basic literacy levels. Those who cannot effectively pass this literacy filter are barred from the most lucrative parts of the digital economy, limited to the roles of consumers or low-income service providers. Thus, literacy acts as a gateway that allocates economic opportunities, transforming differences in competence into differences in market access and, ultimately, differences in income and welfare.

This relationship is further reinforced by the datafication of modern society. Desirable outcomes such as credit acceptance, job matching, or access to affordable health insurance are increasingly determined by algorithms that process digital data. Individuals with high data literacy understand how their data is collected, analyzed, and used to make decisions about them. They can take steps to strategically manage their digital footprint, ensuring that the data generated reflects positive attributes. Those who are data illiterate passively generate data that may not accurately represent their potential or, worse, reproduce existing biases. In a data-driven economy, life outcomes are literally determined by the quality and interpretation of an individual's digital data, and data literacy becomes a critical determinant of control over that process.

Finally, it is important to note that the relationship between literacy and outcomes is contextual and varies across domains of life. The expected outcomes of digital literacy in the field of health, such as the ability to assess online health information and communicate effectively with doctors via telemedicine, differ from outcomes in the field of citizenship, such as the ability to identify political misinformation and participate in online public debates. Literacy gaps in one domain do not necessarily transfer to other domains, but gaps in key domains such as economics or education can have a crippling domino effect. Therefore, an approach that understands literacy as a homogeneous whole will fail to capture the nuances of how specific deficiencies in certain sub-skills hinder the achievement of specific outcomes in vital domains of life.

In summary, this analysis reveals that the dimensions of digital literacy and outcomes are connected through a circular and multidimensional process. Literacy functions as a conversion capacity that transforms access into meaningful benefits. However, this conversion process is mediated by psychological, social, and structural factors, such as self-efficacy, social capital, institutional design, and the temporal dynamics of technology adoption. This relationship is mutually reinforcing: low literacy limits outcomes, and limited outcomes reduce the resources and motivation to invest time in improving literacy. This cycle creates a stable and difficult-to-break digital inequality trap, which explains why simply providing physical access has proven insufficient to achieve substantive digital inclusion. Understanding the mechanisms of this relationship is an important step in designing targeted interventions.

Digital Inequality as a Mechanism for Reproducing Socio-Economic Inequality

Digital inequality in the dimensions of literacy and outcomes serves as a powerful contemporary mechanism for reproducing and consolidating existing socio-economic injustices. This process occurs because digital technology has become a critical infrastructure for social mobility and access to opportunities. In a society transforming towards Society 5.0, where the integration of physical and digital spaces is increasingly comprehensive, the psychological ability to adapt and optimize technology becomes a key determinant of socio-economic participation (Darmawan et al., 2021). When this infrastructure is not equally accessible, or when the capacity to utilize it is unevenly distributed, old social divides are rediscovered and reinforced in the digital space. For example, research by DiMaggio and Bonikowski (2008) shows that internet use for activities that increase productivity and capital, such as job search or online education, is strongly correlated with already high socioeconomic status. These findings indicate that the digital divide is not merely a reflection of old inequalities, but rather an amplifier that magnifies the advantages of already privileged groups. Those with greater initial resources are able to invest time and money in developing strategic literacy, which in turn produces better economic outcomes, perpetuating the cycle of advantage. Thus,

digital technology crystallizes existing social hierarchies rather than disrupting them.

This mechanism of reproduction works through a multiplication of advantages known as the digital Matthew effect, whereby those with greater initial capital gain even more from the digital environment. In the knowledge economy, information and connections are the new currency. Groups with high literacy and access to quality networks are able to accumulate valuable information, build personal online brands, and access global markets. Every success in the digital domain leaves a data trail that can attract further opportunities, creating a positive feedback loop. Conversely, those who are less literate or only able to use technology for basic consumption do not generate productive or attractive digital traces. As a result, platform recommendation algorithms tend to confine them within "filter bubbles" or "echo chambers" that do not open up new opportunities, thereby hindering mobility. This dynamic effectively locks individuals into their socio-economic positions, with technology acting as a sophisticated and automated gatekeeper. The digital divide, thus, creates an additional layer of inequality that is adaptive and hidden within the technical operations of the system itself.

The structure of the contemporary labor market provides a concrete example of how the digital divide reproduces economic injustice. High-paying jobs increasingly require a combination of technical and critical digital literacy. The recruitment process relies heavily on online platforms, algorithmic assessments of digital resumes, and virtual interviews. Individuals from disadvantaged backgrounds, who may have adequate hard skills, are often filtered out due to their unfamiliarity with professional platform norms, inability to optimize their LinkedIn profiles, or lack of access to networks that can provide digital references. Furthermore, trends towards automation and gig-based work tend to depoliticize the workforce and erode workers' rights. Those with weak bargaining positions, often due to inequalities in literacy and access to information about their rights, are more vulnerable to exploitation in this platform economy. Thus, the digital transformation of the labor market does not create a level playing field, but rather shifts the arena of competition to a terrain where already advantaged groups have significant inherent advantages.

In the field of education, the digital divide has the potential to widen the achievement gap and perpetuate intergenerational inequality. Personalized learning through educational technology, such as adaptive systems and virtual tutors, offers great benefits to students who already have digital literacy and support at home. These students can easily navigate platforms, search for additional learning resources, and collaborate online. Students without a strong literacy foundation or access to tech-savvy parental assistance may fall further behind as curricula and assignments become increasingly dependent on certain digital skills. This inequality affects not only content learning, but also the formation of "digital learning dispositions" such as perseverance, independent exploration, and online collaboration, which are increasingly important for long-term academic and professional success. Thus, the education system risks becoming a more efficient machine for social reproduction, where digital advantages and disadvantages are passed from one generation to the next, deepening divisions based on social class.

Access to public services and civic participation is also increasingly digitized, turning the digital divide into a barrier to the fulfilment of basic rights. Processes such as applying for social benefits, enrolling children in school, or participating in government public consultations now often require interaction through online portals. Marginalized groups, such as the elderly, low-income communities, or rural communities, who disproportionately experience digital literacy inequalities, face greater barriers to accessing services to which they are entitled. This situation not only perpetuates but exacerbates their vulnerability. Furthermore, participation in democratic discourse and government accountability now largely takes place in the digital sphere. The inability to engage critically in online discussions, identify misinformation, or advocate for interests through digital channels effectively marginalizes the voices of certain groups from the political process. This erodes the principle of equal citizenship and allows the interests of more connected and literate groups to dominate the public agenda. Therefore, sustainable and equitable public policies must be able to accommodate these rapid social changes, including digital transformation, to ensure relevance and fairness for the entire community (Halizah & Mardikaningsih, 2022).

The digital divide also interacts with and reinforces injustices based on identity, such as gender, race, and geographical location. Biases embedded in algorithms, non-inclusive product design, and hostile online environments can exacerbate the discrimination already experienced by certain groups. For example, job search algorithms trained with historically biased data can replicate gender or racial discrimination. Women in many regions may face additional barriers to developing digital literacy due

to social norms, limited access, or concerns about online safety. Rural or remote communities may have poor internet access and a lack of relevant local content, rendering technology unfamiliar and less useful to their lives. In each of these cases, the digital divide not only reflects but actively reinforces deep-rooted patterns of marginalization, adding a new layer of technical exclusion that is therefore difficult to challenge or change.

The commercialization of digital space and the attention economy increasingly link outcome inequality to economic exploitation. Digital platforms funded by advertising and data extraction have incentives to design interfaces that maximize user engagement, often by exploiting psychological vulnerabilities. Users with low critical literacy are more vulnerable to these manipulative designs, spending more time on unproductive content and providing their personal data without realizing its value or risks. This data is then converted into profit by platform companies, creating a form of unequal value extraction. Meanwhile, users with high literacy are better able to use ad-blocking tools, manage privacy settings, and selectively choose platforms that offer them direct value. Thus, the literacy gap also influences the degree to which an individual becomes an exploited subject or an empowered consumer in the digital economy, which further contributes to the wealth gap.

Spatial mobility and access to smart urban environments are another domain where the digital divide deepens social divisions. The concept of the "smart city" often prioritizes data-driven services and applications to manage transport, energy, and security. However, the benefits of this smart city infrastructure are most accessible to residents who are already well-connected and literate. The opportunity to use efficient ride-hailing transport applications, take advantage of electric vehicle sharing schemes, or participate in circular economy platforms often requires a smartphone, data connection, and a set of specific literacy skills. Low-income groups who may live in areas with poor digital or physical infrastructure can be further marginalized, creating a new form of "digital redlining". This divide is not only economic but also spatial, reinforcing segregation between those who can afford to live in technology-enabled environments and those who cannot. Sustainable development in the social and environmental spheres requires an inclusive balance, where technological progress should not create or deepen new inequalities (Mardikaningsih & Hariani, 2021).

Resilience to economic shocks and crises, as demonstrated during the pandemic, is also increasingly dependent on digital assets. The ability to switch to remote work, run businesses online, or access digital social safety nets provides an important buffer. Groups experiencing digital inequality in terms of literacy and outcomes find themselves more vulnerable during crises, with fewer options and resources to survive. This vulnerability can then force them to take on unfavorable debt through fintech platforms, sell assets, or accept poor working conditions, further worsening their long-term economic position. Thus, digital inequality also acts as a multiplier of vulnerability, turning a temporary crisis into a permanent setback for those who are least digitally prepared.

Theoretically, this process can be understood through the lens of social reproduction theory. The digital divide acts as one of the "arenas" in which social class is reproduced. Upper-middle-class families not only pass on traditional economic and cultural capital to their children, but also digital capital: better devices, faster connections, a home environment that supports technological exploration, and most importantly, a high level of digital literacy embedded in daily parenting. This digital capital is then converted into advantages at school and in the labor market, thereby preserving class status. Schools, as institutions, often unconsciously reinforce this process by assuming a certain basic level of digital literacy from students, thereby giving an advantage to those who already possess it. Thus, the cycle of social reproduction runs smoothly, with digital technology as a highly effective new mechanism of transmission and legitimization.

Finally, the normalization of digital society makes this inequality seem natural and technical, rather than political. Because barriers are often framed as a lack of skills or devices, outcome inequalities can be easily attributed to personal shortcomings rather than structural failures. The narrative of digital meritocracy, which asserts that anyone who works hard can succeed online, obscures the ways in which systemic injustices shape digital opportunities. This legitimization makes inequality more difficult to challenge politically, as it appears to arise from a neutral market and individual choice. As a result, public policy may remain focused on technical solutions and individual training, which are insufficient to address the structural roots of literacy and outcome gaps. Sustainable environmental and human resource management strategies demonstrate that an integrative and systemic approach is necessary to create resilient organizations and societies, a principle that also applies to addressing structural digital inequality (Hariani et al., 2022). Digital inequality, therefore, not only reproduces economic

injustice but also helps protect the systems that generate such injustice from meaningful criticism and change.

Overall, this analysis shows that digital inequality in the dimensions of literacy and outcomes functions as a resilient and multifaceted mechanism of socioeconomic reproduction. It works by reinforcing existing advantages, creating new barriers to mobility, increasing vulnerability, and perpetuating cycles of intergenerational deprivation. This process is embedded in the digital transformation of key institutions such as the labor market, education, public services, and government. By making access to opportunities and resources a function of digital competencies and assets, digital inequality encodes old structural injustices into the technical logic of the information age. Overcoming this reproduction, therefore, requires more than simply expanding access; it demands interventions that directly target the distribution of strategic literacy, regulate the design of technology and markets to ensure inclusivity, and critically challenge narratives that equate connectivity with equality. Only by acknowledging and addressing the nature of digital inequality that reinforces injustice can we unlock technology's potential to be a tool for breaking cycles, not a more sophisticated lock.

CONCLUSION

This literature review has successfully mapped the conceptual evolution of digital inequality from a problem of physical access to a complex issue encompassing dimensions of literacy and outcomes. The analysis shows that digital inequality can no longer be understood as merely a gap between the connected and the unconnected. The dimension of digital literacy, which includes operational, informational, and strategic skills, serves as a critical variable that determines whether access can be converted into substantive benefits. The relationship between literacy and outcomes is circular and mutually reinforcing, mediated by psychological factors, social capital, and institutional design. Furthermore, this study reveals that inequality in these new dimensions has the potential to become a mechanism for reproducing structural socio-economic injustice. By becoming a prerequisite for participation in the increasingly digitized labor market, education, public services, and citizenship, the literacy and outcome gap consolidates the advantages of already privileged groups and deepens the vulnerability of marginalized groups. Digital inequality, thus, perpetuates and even reinforces existing class, geographical, and identity-based inequalities, transforming them into new formats hidden within the technical logic of the information society.

The findings of this study have important implications for theory and practice. Theoretically, this study affirms the need for an interdisciplinary approach that integrates perspectives from media studies, sociology, political economy, and education science to understand digital inequality in its entirety. The analytical model must shift from a dichotomous approach to one that views inequality as a dynamic, multidimensional continuum. Practically, the most direct implication is for the formulation of public policy. Digital inclusion policies should no longer be limited to infrastructure and device provision programmed. Effective policies must simultaneously target three layers: expanding and improving access quality, building comprehensive digital literacy with a particular emphasis on strategic and critical skills, and creating institutional and socio-economic conditions that enable individuals to translate their digital capacities into better life outcomes. This includes regulating platforms to prevent exploitation, designing universal and user-friendly public services, and integrating digital literacy education into formal curricula and lifelong learning programmed.

Based on the analysis conducted, several recommendations are proposed for further research and action. First, longitudinal empirical research is needed to track how specific interactions between digital literacy levels, usage patterns, and socio-economic outcomes evolve over time in different population groups. Such research would provide strong evidence about causal pathways and reproduction mechanisms. Second, the development of more sensitive and contextual measures of digital literacy is urgently needed. Measures should capture not only technical skills, but also critical, strategic, and socio-emotional competencies, and be applicable across different cultural and socio-economic settings. Third, it is advisable to promote and evaluate community-based intervention programmed models. Such programmed should combine skills training with social support, access to affordable devices, and mentoring to utilize these skills in overcoming real-life problems, such as finding employment or starting a business. The success of such models could serve as a blueprint for more transformative digital inclusion policies.

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