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Digital Inequality and Digital Oppression: Mapping the Divide, Its Mechanisms, and Pathways to Equity

Nurul Islam[1],*, and Catalina Georgeta Dinu[2]

1. Research and Integrated Thoughts (RIT), Dhaka, Bangladesh
2. Department of Law, Transilvania University of Brasov, 500019 Brasov, Romania; catalina.matei@unitbv.ro
* Correspondence: nislam121512@gmail.com

Abstract: The gap in access, skills, use, and benefits from digital technologies that were initially identified as "digital inequality" has grown into a "digital oppression" the systematic exclusion, exploitation, and control of existing marginalized groups by digital systems design, deployment, and governance. This paper draws on the most recent scholarship to synthesize the various components of the digital divide and how they intersect with race, gender, class, disability, and geography. It explores how digital technologies replicate and, in some instances, reinforce existing power hierarchies such as algorithmic bias, data extraction through surveillance, exclusionary design, and the offshoring of dangerous forms of digital work to the Global South. The paper offers an overview of the effects of digital inequality in education, employment, health and civic life, based on data from the International Telecommunication Union (ITU), peer-reviewed audits of commercial AI systems, investigative reporting and human rights reports regarding the platform economy, and foundational theoretical work in critical data studies. It argues that the digital divide is not a natural or temporary phenomenon of uneven technological diffusion, but a result of political and economic decisions and choices, and that closing the divide will require conscious investments in infrastructure, skills, inclusive design, and regulatory accountability.

Keywords: digital divide; equity; digital oppression; inequality; sustainable development goals (SDGs)

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1. Introduction

The first messaging of the digital revolution was a promise of a democratization of information, opportunity and voice. Flattening hierarchies through inexpensive devices and growing networks was the expectation that everyone, regardless of geographic or income level, would have equal access to the knowledge commons and economic platforms. This promise has largely yet to come to fruition, 30 years after the dawn of the commercial internet. In many ways, digital technologies have created new hierarchies without dissolving the old ones, and often reinforcing, the old hierarchies of race, class, gender, disability, and geography. The term "digital inequality" is used to describe these differences. It encompasses the question of whether people can access the internet as well as their ability to access and use digital tools effectively, the quality and purpose of that use, and the real-world outcomes (economic, educational, civic, and social) that use brings to people. Digital oppression, a more narrow and specific term, refers to the ways in which digital technology actively oppresses people who are already vulnerable, whether via a biased algorithm, extractive data practices, precarious digital labor, or design that makes the technology inaccessible to disabled, elderly, or less literate users. This paper suggests that if left to their own devices, digital technologies will further deepen pre-existing social divisions. The analysis is given in three movements. First it conceptualizes digital inequality and digital oppression and places them in the context of the wider literature on the digital divide. Second, it examines how this divide has emerged, by looking at structural causes, and at the specific mechanisms, algorithmic, economic, and infrastructural, by which digital oppression works, with examples. Third, it examines the areas in which digital inequality has measurable effects and offers avenues for a more equitable digital order. It is intersectional, global and uses evidence from high- and low-income countries, and is aware throughout that digital disadvantage doesn't fall evenly on a population, but is compounded by a range of factors, including gender, race, class and disability.

2. Digital Inequality and Digital Oppression

Researchers of the digital divide have been well aware that being able to access a device or a connection is but the first and easiest requirement for digital inclusion. There are several sequential layers in Jan van Dijk's influential framework, each of which has to be tackled before the next one comes into play. First-level divide: motivational and material access, that is, whether a person has or can get a device and an internet connection. The second level is digital skills and literacy, which are the technical, informational and strategic skills required to use digital tools effectively. Third-level divide: outcomes whether or not digital use is translated into real social, economic or educational capital. This layered model is important because it shows that simply closing the first level divide (obtaining a device and a connection) is no guarantee of closing the second/third level divide. A 1:1 student from a rural region who receives a mobile device without access to a reliable electricity grid, digital literacy training, or digital content in a language and format that works for her is "functionally excluded" despite having a "smartphone" by the most literal of definitions.

Digital oppression is an extension of this, which foregrounds power. Digital-oppression scholarship asks who benefits from the gaps and benefits from systems on top of the connectivity once it has been achieved, rather than recognizing disparities as gaps to be closed. It encompasses algorithmic discrimination, the business model of surveillance capitalism (Zuboff 2019), the outsourcing of psychologically dangerous digital work (including content moderation and data annotation) to low-income employees in the Global South, gendered and racialized online harassment which expels women and minority users from digitally public space, and the persistent rural-urban and income-based disparities in the quality of connectivity, not its quantity.

The data presented below provide some recent examples of the extent of the first-level divide that still undergirds these dynamics. By 2025 the International Telecommunication Union estimated that around 6 billion people (around three-quarters of the world's population) were on the internet, while around 2.2 billion were off the internet (International Telecommunication Union 2025). However, significant inequalities remain in the figures: while 94 per cent of people in high-income countries are using the internet, just 23 per cent of those in low-income countries do so, and 96 per cent of the world's offline population resides in low- and middle-income countries (International Telecommunication Union 2025). But there's a gender divide as well 77 percent of men in the world online, compared with 71 percent of women which is about 280 million more men on the web than women according to the (International Telecommunication Union 2025). These numbers only reaffirm that the first level divide is not being solved, but that second and third level divides, and the oppressive inequalities stacked on top of them, are still forming across the boundary conditions set by the first level divide.

3. Historical and Structural Causes

Digital access disparities are not coincidental. It is anchored in a legacy of inequitable infrastructure development, economic policy decision-making, and in many areas colonial and postcolonial histories of who got access to telecommunications infrastructure first and who was on the margins. The drive to provide broadband and mobile network coverage to high-quality markets and high-value consumers has been evident in the past and very similar to other forms of discriminatory infrastructure investment, like redlining in housing and utility services. This developed further during the neoliberal globalization of the '90s and beyond. Economic liberalization frequently took the form of privatizing telecoms markets, which were encouraged to focus on already established economic activity centers, such as commercial capitals, export processing zones, and university towns, rather than on the rural and other peripheral areas that would benefit the most from connectivity to help them follow suit. The impact was exacerbated by education systems: those that lacked digital literacy in the curriculum meant that lower-income, first-generation internet users remained to learn second-level skills informally and disparately, if at all. Intersectionality is key to understanding who will have to pay the resulting costs. The effects of race, class, gender and disability are multiplicative, not additive. A low-income woman in a rural community of a low-income country is not only subject to access barriers, but to skills barriers, safety barriers, and, once online, being exposed to design choices built without her. This is clearly illustrated in the combination of gender and income: females from low-income countries are only about 18% connected to the Internet, whereas males from these countries are around 29% connected (International Telecommunication Union 2025). Similar trends are seen in Africa, with women making up a small proportion of users compared to men (International Telecommunication Union 2025).

4. Mechanisms of Digital Oppression

4.1 Algorithmic Bias and Discrimination

Automated decision systems are often portrayed as "neutral," but a significant amount of empirical audit research demonstrates that they perpetuate and can exacerbate biases found in the data on which they are trained and their design. That is most often done by the IBM, Microsoft, and Face++ facial-analysis systems, which were audited by Buolamwini and Timnit for accuracy at identifying gender by skin tone and gender subgroups (Buolamwini and Timnit 2018). The study revealed that all three systems had the lowest accuracy with darker-skinned female faces, and that error rates for darker-skinned women in follow-up audits were more than 30 percent compared to near-perfect accuracy for lighter-skinned men (Buolamwini and Timnit 2018). This discrepancy has been found to be largely due to a lack of representation of darker skin color women in the datasets used to develop and test these systems and a lack of representation in engineering teams that design these systems. The impact of this bias does not just extend to lab benchmarks. In contexts such as the policing, hiring, and credit scoring, where false positives for a specific demographic group reflect directly on the risk of misidentification, or false negatives in welfare administration, the higher the error rate, the greater the risk of misidentification, false denial of services, or discrimination. The findings from the Gender Shades led to several vendors, including IBM, to reconsider or abandon their facial recognition products, and demonstrate the depth of the problem as well as the ability of independent algorithmic auditing to create accountability.

4.2 Surveillance Capitalism and Data Extraction

The other way in which people can be oppressed digitally is through the business models that a lot of free or low-cost digital services are based upon. Zuboff's conception of surveillance capitalism is an economic logic whereby platforms harvest behavioural data from their users in ways that are rarely meaningful, i.e., without consent and without understanding the terms, and use that data to predict products, which are sold to advertisers and others. This extraction is particularly heavy on free platforms that are often

the sole or primary way for many lower-income users to connect to the internet, thus exposing the costs of surveillance capitalism profiling, manipulation, loss of privacy to those with the least privacy-protective alternatives.

4.3 Outsourced and Hazardous Digital Labor

The third mechanism relates to the human work that supports what is often perceived as "automated" digital systems. These tasks content moderation, data annotation, and data labeling are essential for training and maintaining machine-learning systems and for taking social platforms off of the most disturbing content, and have been widely outsourced to lower-wage laborers in the Global South, such as Kenya, the Philippines and Colombia (Du and Chinasa 2025). Investigative reporting reveals that content-moderation workers in the city of Nairobi, who are hired under the contract with Sama, review ads for graphic violence, child exploitation material and other graphic trauma at wages much lower than those paid to moderators in the U.S. or Europe, and that their efforts to unionize are being suppressed (Perrigo 2022; Suleiman and Khadija 2026). In December 2024, a psychiatric assessment of the Facebook content moderators presented to the Kenya's Employment and Labor Relations Court revealed that the majority of the content moderators had severe psychological disorders such as post-traumatic stress disorder (PTSD), anxiety and depression due to their work (Makola 2025). This setup has been described as 'digital colonialism', where those in the Global South bear the burden of platform economies' psychological and financial burden, while the economic benefits of their work go to companies based in rich countries (Makola 2025; Baru 2025).

4.4 Gendered and Racialized Online Violence

A fourth mechanism is one of designing and moderating online spaces. Harassment, doxxing, and coordinated harassment are disproportionately high for the women and for racial and ethnic minorities on the major platforms. When these moderation systems are not designed or implemented well, because they lack adequate resources, they have algorithmic blind spots or because they suffer from the same demographic issues found in facial recognition research, the practical result is that targeted groups are being pushed out of digital public life, and being made less likely to have access to civic or economic opportunities in a digital space.

4.5 Exclusionary Design

Last, but not least, digital oppression is built into the design of products, where the narrow, typically able-bodied, literate, broadband user is the default. Any non-accessibility-built interfaces will not include persons with visual, auditory, motor, or cognitive disabilities. This same disconnect between high bandwidth, always-on applications and lower-speed, limited-bandwidth connections, which the ITU has documented as an affordability gap, is a real handicap for users who are ostensibly "online" but who have a limited bandwidth connection or slower network. By the best evidence, exclusionary design has been increasing in scale--and, by most measures, in severity--over the last two decades of formal accessibility standards. According to the World Health Organization, approximately 1.3 billion people, which is approximately 16 percent of the global population, suffer from a severe disability (Jensen 2026). In 2025, the top one million homepages had an average of 1.0 failure of the WebAIM Million project, an improvement of just approximately 3 percentage points from the previous six years (Gevorkian 2026). The single most prevalent defect (Gevorkian 2026) was low-contrast text, which was found on approximately 79 percent of homepages, especially for people with low vision and color vision defects. The data also show that individuals with disabilities are approximately three times more likely to be offline than individuals without disabilities, and that disabled internet users are significantly less confident of their ability to use digital devices than non-disabled users of the internet (WeAreTenet 2026). These statistics, alongside the connectivity and skills gaps elsewhere in this paper, highlight that the first level divide in access is often nominal but design decisions routinely reopen a comparable first level divide for disabled users.

5. Impacts on Key Domains

5.1 Education

The COVID-19 pandemic brought into focus the second and third tier digital divides when students were forced to leave school or school buildings to learn remotely or in a hybrid model. Students who did not have a quiet place to learn, connectivity, or reliable devices to learn with were less likely to keep up with their peers who had all three, and the gaps were strongly correlated with income and geographic disparities. Connectivity data from the ITU indicate that this challenge has not been solved by the use of the internet in schools, as it is estimated that approximately half of the world's schools does not have internet connectivity, with the lack of connectivity more prevalent in low-income and rural areas of the world (Giga 2025).

5.2 Employment

Digital inequality is observed in the labor market both in terms of the mismatch between the skills gap of the workers with the need for more advanced digital skills by employers, and as a form of digital economy exploitation itself. The gig and platform economy also tends to pay workers low wages and provide them with little benefits, algorithmically-managed working conditions, and little opportunity for protection against being misclassified as an independent contractor rather than an employee (Du and Chinasa 2025). Algorithmic management is also a type of labor precarity. This practice of giving workers assignments, determining acceptable rates of pay, and measuring staff performance using opaque, un-inspectable, and unappealable scoring systems gives a lot of managerial discretion to the software over accountable human supervisors. As with the outsourced content moderators (IHWB 2025; Du and Chinasa 2025), the population most vulnerable to algorithmic management is the population most vulnerable to first- and second-level digital divides, and the platforms are often the most accessible way in which they engage with the digital economy.

5.3 Health

In the last decade, telehealth and digital health information systems grew significantly, with differential effects on the progress. Without reliable connectivity or digital literacy, populations are effectively barred access to telehealth, while health misinformation is more likely to proliferate in digital spaces where quality information is not as available and trusted among different populations.

5.4 Civic and Social Life

From government services to political organizing and public debate, civic engagement is moving online. But populations lacking access to meaningful digital engagement, either because of access or because of a hostile online environment, are, of course, excluded from these avenues of civic voice, leading to further political marginalization.

6. Global and Comparative Perspectives

6.1 The Global South

Internet penetration and cost burden per income level remain at their lowest level in low-income countries. Low-income countries still have the lowest level of internet penetration, and the highest cost burden per income level. Data-only mobile broadband is still not affordable in about 60 percent of the world's low and middle-income countries, while a typical user in a high-income country consumes about eight times as much mobile data as a user in a low-income country, indicating that the quality of connectivity is still inadequate, in addition to the access gap (International Telecommunication Union 2025).

6.2 High-Income Countries

The city-rural and racial disparities in Internet use exist, even in countries with high overall Internet adoption rates and high penetration rates, and are especially pronounced in access to high-speed broadband and quality of broadband connectivity among low-income and minority populations. The gaps shown here are illustrative of how national penetration figures can be deceptive, even though they are aggregates.

6.3 Gender

Gender disparities in digital skills have proved particularly tenacious across the world. While the global number of internet users has increased significantly since 2019, the ITU's gender parity score has dipped slightly to 0.92, showing that the gender gap in internet use is not being closed with internet alone (International Telecommunication Union 2025). In addition to the access gap, women and girls also speak of specific challenges with respect to online safety and harassment that influence their access to the internet even when they are able to be online.

6.4 Disability

Disabled individuals frequently encounter interfaces, documents, and platforms that were not designed with accessibility standards in mind, layering a design-based exclusion on top of whatever access and skills barriers they may also face.

6.5 South Asia and Pakistan

Pakistan is a case in point of the persistence and malleability of the digital divide in a single lower-middle income country. According to (DataReportal 2026), Pakistan's internet penetration was around 45.6 percent, with a total of 117 million internet users and 194 million active cellular connections, representing 76 percent of the population, as of late 2025, with the difference between penetration of mobile connections and actual use of the internet reflecting second-level and affordability barriers outlined throughout this paper. The ITU's composite measure of network access, use, and skills, which is commonly known as the ICT Development Index, shows a significant increase from 56.4 to 67.7 in 2026 compared to 2025, but still lags behind the lower-middle-income-country average and the Asia-Pacific regional average, with analysts noting that the index does not include data on fixed-broadband penetration, connection speed, digital skills, or online safety, and that national averages could mask disparities across provinces and among demographic groups (Business Recorder 2026). The gender gap in Pakistan has shrunk at an accelerated pace. The GSMA Mobile Gender Gap Report 2026 showed that access to mobile internet has narrowed from 38 percent in 2024 to 25 percent in 2025 and further to 8 percent in 2026, which is considered the fastest rate of progress in the report for the 14 LMIC countries tracked, with part of this progress attributed to the rollout of affordable SIM cards to women and increased access to mobile financial services (Dunya News 2026; Arab News 2026). A more conservative picture emerges from the question of mobile phone ownership, as even when it becomes parity, Pakistan still has the broadest mobile-ownership gender gap of all the countries surveyed, with 93 percent of men owning mobile phones compared with 68 percent of women, with 28 percent of all women using the internet via a borrowed device – compared with 4 percent of men using the internet on a borrowed mobile phone. A shared or borrowed phone also limits women's access to the Internet and their ability to be private, while also restricting their ability to engage in a variety of activities on a phone that is not theirs. (financial transactions, professional networking, political expression and more) The difference between usage parity and ownership parity provides a good example of van Dijk's layered divide, which is also reflected in the wider literature on Pakistan's gendered use and ownership barriers, which suggests that culture and safety are also clear barriers to women's mobility and ownership of mobile devices (Ali 2025).

7. Theoretical Frameworks

There are three theoretical traditions that will be useful to help make sense of digital inequality and oppression. The digital-divide literature, as in the work of van Dijk, offers descriptive scaffolding to identify the population at which a lack of connectivity or access-skills or at which the outcomes are lacking. The economy of digital capitalism including the theory of surveillance capitalism offered by critical theory makes it clear that some kinds of exclusion and extraction are not only worth of their while, but are profitable. Intersectional feminist theory further helps to understand why costs of digital exclusion and exploitation are not evenly distributed but manifest at the intersections of race, gender, class and disability, as demonstrated in the ITUs disaggregated data on women in low-income countries. It is helpful to draw parallels with other areas of structural inequality in America's past, such as redlining in housing and the provision of utilities, since the fact that structural inequality in these sectors is seldom rectifying in and of itself. They are likely to continue and can sometimes grow larger if not counteracted by policy.

8. Case Studies

8.1 Gender Shades and Algorithmic Accountability

The Gender Shades audit is a good example of the potential of independent, disaggregated evaluation to identify and bring to the surface the embedded bias and to create tangible corporate accountability. After the study was published, IBM was audited by the research team and was reported to have had a significant performance boost in the least accurate group, while other vendors were subjected to public criticism that led to a general reassessment of commercial facial recognition by the industry (Buolamwini and Timnit 2018).

8.2 Content Moderation in Nairobi

The Sama-Meta content moderation case in Nairobi is a real-life example of digital oppression and the labor it entails. The workers who remove graphic violence, child exploitation material and other severe content from Facebook were paid wages significantly lower than workers in wealthier countries who perform similar duties and a formal psychiatric evaluation revealed that a large majority of the workers had severe psychological disorders that the Facebook job caused (Perrigo 2022; Makola 2025). As of late 2025, the case remains pending in Kenya's Employment and Labor Relations Court and has sparked advocacy efforts on the issue of fair pay and mental health protections for data and content workers globally, including through the establishment of new organizations like the African Content Moderators Union (Du and Chinasa 2025).

8.3 The 2025 Global Connectivity Snapshot

The ITU's Facts and Figures 2025 report is, in itself, an empirical study that demonstrates that, despite a continued growth in the absolute number of Internet users, qualitative aspects of the gap in terms of Internet speed, reliability, cost, and Internet skills are becoming more important. The ITU has even identified the qualitative aspects of the gap as one of the axes for inequality in its own leadership (International Telecommunication Union 2025).

8.4 Pakistan's Mobile Gender Gap Closure

The ITU's reported mobile internet gender parity numbers are in contrast with the narrowing of the gender divide in Pakistan, which has taken place at a rapid pace. The improvement is attributed to a concerted effort by the Pakistani government to provide almost ten million subsidized mobile connections to women, increase women's access to digital wallets and targeted rural outreach campaign by the Ministry of Information Technology and Telecommunication, the Pakistan Telecommunication Authority, mobile operators and development partners (Xinhua 2025; Business Recorder 2026). This case reinforces the main argument of this paper: digital-divide outcomes result from policy decisions and do not stem from inherent characteristics of technology and culture; and that a multi-point decrease in a usage divide can be realized in two years with coordinated investment. However, the strength of the Pakistan device ownership gap, and the narrowing gap in usage, should temper complacency in reading any single statistic as evidence that the gap has closed, as shared-device access can both boost usage metrics and leave the issues of autonomy, privacy, and digital sphere of use largely unchanged.

9. Pathways to Equity and Resistance

Infrastructure investment: perpetuation of public and public-private investment in wireless and wireline network deployment in underserved, low-income, and rural areas based on ITU's conclusion that affordability and availability are the limiting factors in most LMICs.

Digital literacy and skills programmes: curricula, community-based training on digital literacy that go beyond distribution of devices to cover advanced skills such as ‘online safety' and ‘content making', increasingly critical skills identified by ITU.

Inclusive and accessible design: interface and product standards, which consider disability, low bandwidth and linguistic diversity from the start and not as an add-on. Algorithmic accountability and regulation: independent, disaggregated audit of high-stakes automated systems, as done in the Gender Shades study with regulations that mandate bias testing and disclosure.

Labor protections for digital and data workers: The minimum wage, mental health support and collective bargaining protections for content moderators and data annotators must be made binding on digital companies, and must be specific to the harms documented in Kenya and comparable outsourcing hotspot cities.

Data rights and privacy regulation: laws that limit collection, extraction, and use of data, and allow users especially those with limited other options to have meaningful control over their own data.

Community-led and open-source alternatives: locally governed networks, open-source software, public digital infrastructure, that decrease reliance on extractive commercial platforms.

Global cooperation and technology transfer: coordinated international financing and knowledge sharing mechanisms to narrow the gaps in affordability and infrastructure identified between high income and low-income countries.

Targeted device-access programs: subsidized-connection and device-distribution programs that are designed specifically for underrepresented populations (as in Pakistan, subsidized SIM distribution to women), with emphasis on device access rather than device usage only to avoid shared-device workarounds as a way to mask an unaddressed access gap.

Accessibility-by-default engineering standards: Building accessibility into procurement and development processes from the beginning, based on the fact that automated accessibility tests are only able to identify a portion of real-world accessibility issues and manual testing by disabled users is still required.

10. Discussion and Future Directions

With the speed of generative AI and immersive technologies like virtual and augmented reality, it is now possible to view how digital oppression could be expanded, not reduced, as new tools are introduced first, and most effectively, to people who are already well connected and well resourced. The new, fourth level of distinction, emerging more clearly in outline, is access to a device and connection to a network, plus the necessary bandwidth and computing power to seamlessly access and interact with capable AI systems; the literacy to skillfully prompt and evaluate their outputs critically; and, often, a subscription pricing tier that creates a new form of income-based exclusion in the AI layer of the internet for those who are otherwise well connected. Generative AI systems are primarily developed using data from high-resource languages and domains, which also puts them at risk of failing users

from other lower-resource languages, such as Pakistan, where digital content and tools for Urdu and regional languages are less advanced than those in English.

Meanwhile, though, there is a case for guarded optimism. The costs of devices and connectivity have also been steadily dropping as a share of the total, grassroots labor organizations representing content moderators and data workers are getting institutionalized, with the African Content Moderators Union being one example, and independent algorithmic auditing has proved capable of making real, positive change in corporate practice, as the Gender Shades case illustrates. The Pakistan coordinated and government-driven decrease in the mobile gender gap also points to the fact that even when mobile gender gaps are deeply entrenched, they can close rapidly when investment and political commitment are aligned, although the fact that Pakistan still has a device-ownership gender gap should not be taken as an indicator of closed gender gaps. Future research should track at least four developments: emerging divides specific to generative AI access, literacy, and language coverage; the long-term labor-market effects of AI-driven automation on already-marginalized workers, including those currently employed in the data-annotation and content-moderation roles this paper documents; the durability of rapid gender-gap reductions such as Pakistan's once initial subsidy programs mature or lapse; and the practical effectiveness of the regulatory and design interventions outlined in Section 9 as they move from pilot programs to implementation at national and platform scale.

11. Conclusion

Digital inequality is not a natural or inescapable consequence of technological development but rather the result of decisions made in investment in infrastructure, business models, design and regulatory choices that in principle could be different. The evidence collected in this survey — ranging from the enduring connectivity divides in the world, to documented bias of widely used algorithmic systems, to the documented psychological effects of outsourced content moderation reveals that digital technologies that are not intentionally crafted to erase and/or create new social hierarchies, tend to perpetuate and sometimes exacerbate them. There is a need to see technology from a digital justice perspective: digital inequality and digital oppression cannot be ignored, as technology requires connectivity, digital skills, algorithmic fairness, and fair digital labour conditions that go beyond being secondary issues to be taken up after deployment these are part and parcel of a digital order that can provide a true sense of inclusion for progress.

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