Technological infrastructures for education as a political project toward digital sovereignty

Alexandre Costa Barbosa

University of Arts Berlin (UDK), Berlin, Brandenburg, Germany

ale.costabarbosa@protonmail.com

Priscila Gonsales

University of Campinas (UNICAMP), São Paulo, São Paulo, Brazil

prigon@educadigital.org.br

Abstract: This essay addresses the need for public technological infrastructures in education as part of a country's digital sovereignty, given the development of artificial intelligence (AI)-based services offered by US technology companies. Using a bibliographic method, it examines documents on current infrastructure systems for digital education in the Brazilian context, demands from researchers and activists, and the growing dependence on private companies for educational networks. It concludes that there is an urgent need to create a political project for digital sovereignty in education that considers social participation and federated models of cooperation between institutions.

Keywords: Digital public infrastructure, Artificial intelligence, Education, Digital sovereignty.

Infraestruturas tecnológicas para a educação como projeto político rumo à soberania digital

Resumo: Este ensaio aborda a necessidade de infraestruturas tecnológicas públicas na educação como parte da soberania digital de um país, dado o avanço de serviços baseados em inteligência artificial (IA) ofertados por corporações de tecnologia estadunidenses. Utilizando método bibliográfico, examina documentos sobre sistemas atuais de infraestrutura para a educação digital no contexto brasileiro, reivindicações de pesquisadores e ativistas, e a crescente dependência de empresas privadas por redes de ensino. Conclui-se que é urgente criar um projeto político de soberania digital para a

educação que considere a participação social e os modelos federados para a colaboração entre instituições.

Infraestructuras tecnológicas para la educación como proyecto político hacia la soberanía digital

Resumen: Este ensayo aborda la necesidad de infraestructuras tecnológicas públicas en educación como parte de la soberanía digital de un país ante el avance de los servicios basados en inteligencia artificial (IA) ofrecidos por empresas tecnológicas estadounidenses. Mediante un método bibliográfico, se examinan documentos sobre los actuales sistemas de infraestructura para la educación digital en el contexto brasileño, las demandas de investigadores y activistas, y la creciente dependencia de empresas privadas en las redes educativas. Se concluye que es urgente crear un proyecto político de soberanía digital para la educación que considere la participación social y modelos federados de colaboración entre instituciones.

1 INTRODUCTION

The Brazilian Plan for Artificial Intelligence (PBIA) (Brasil, 2024), presented by the Federal Government in August 2024 during the 5th National Conference on Technology and Innovation, is the first official document that recognizes technological and data sovereignty as a central axis. It is a proposal that aims to invest [1] in Brazilian technological infrastructure with high processing capacity and reduced environmental impact, which represents a clear advance in the discussion of public digital infrastructures (IPD)[2] in the contemporary era of data-based Artificial Intelligence (AI) systems.

Such systems require robust physical support with supercomputers located in large territorial areas, currently under the control of a specific group of American private companies known by the acronym GAFAM (Google, Apple, Facebook, Amazon, and Microsoft)[3]. This international physical network not only requires huge investments but also consumes excessive amounts of energy and water to cool the equipment and emits CO_2[4] into the atmosphere. Despite the assertiveness of the PBIA in highlighting the issue of sovereignty, the scope of the document ignores the digital infrastructure capabilities that can be provided to the education sector beyond the provision of Internet connectivity and the distribution and use of software. The PBIA only lists actions by the Ministry of Education (MEC) that are supposedly underway in basic education - many of them in partnership with corporate foundations and big techs[5] – and in higher education related to preparing individuals for the job market increasingly permeated by AI technologies.

In order to clarify the discussion proposed in this essay, it is important to elucidate the intrinsic relationship between digital sovereignty or data sovereignty and the topic of artificial intelligence (AI). Traditionally, the field of education understands digital technologies - and now AI technologies

---

[1] The document proposes R$23 billion in investment distributed in improving public services, product/service innovation and supporting the regulatory process. The plan has 10 premises: 1) focus on social well-being (how AI can improve people's lives) ; 2) focus on generating national capabilities and training; 3) focus on technological and data sovereignty; 4) strategic alignment with government policies; 5) environmental sustainability, ecological transition that considers renewable energy sources; 6) valuing diversity; 7) international cooperation; 8) ethics and responsibility in the use of AI; 9) participatory governance; 10) flexibility and adaptability.

[2] Digital Public Infrastructure, DPI, in the English acronym.

[3] In 2015, Google became a brand of the company Alphabet and Facebook became a brand of the company Meta, in 2021.

[4] The data centers, data transmission networks and connected devices that underpin digitalization will emit 2.5 billion tonnes of CO_2 by 2030. See more at: https://www.reuters.com/markets/carbon/global-data-center-industry-emit-25-billion-tons-co2-through-2030-morgan-stanley-2024-09-03/. Accessed on: Nov. 20, 2024.

[5] We will use the term big techs to refer to large technology corporations such as Google (Alphabet), Microsoft, Amazon, Meta and also OpenAI, which is funded by Microsoft and appears as a partner in PBIA.

- as mere tools for teaching school subjects, attributing to them the achievement of innovation and progress (Mariotti; Zauhy, 2019; Gonsales, 2022). There is little epistemological discussion of technology and its functional and operational requirements, and even less of its mechanisms of geopolitical, economic, and ideological power (Morozov, 2018; Cassino; Souza; Amadeu, 2021; Buzato, 2023). As a field of knowledge formally established in 1956[6], AI has experienced ups and downs in its research over the years, but since the second decade of the 2000s, a combination of two factors - gigantic availability of data and computational development - has allowed a significant evolution of machine learning[7]. It is enough to observe the offer of applications and services that are increasingly present in everyday life, such as social networks, platforms (for mobility, shopping, relationships), and, from 2022, products capable of generating content in natural language (texts, images, audios, videos). To fully function, AI systems require, in addition to digitized data, physical infrastructures of various elements (cables, supercomputers) in specific territorial spaces. In this sense, the debate on digital sovereignty, data sovereignty, or technological sovereignty in the contemporary context necessarily includes the ecosystem for the functioning and operation of AI.

In any case, the notion of sovereignty, associated with the emergence of the modern nation-state as described by Wilson (1934), has evolved over the last century to encompass other social representations relevant to dimensions in the digital domain (Chander; Sun, 2023). Although challenged by the recent wave of globalization, sovereignty remains a fundamental principle of international order and essential to diplomacy (Werner; De Wilde, 2001). As a discourse, governments often use the term to exercise power over other actors (Adler-Nissen; Gammeltoft-Hansen, 2008).

Even if the convergence of opinions on the concept of digital sovereignty is not evident, there is an apparent consensus that the roots of its claims today are rooted in the advancement and consolidation of an oligopoly of large technology corporations and the influences these entities exert in terms of territorial domination (Busch, 2021). At a time when data and human experience itself have become direct commodities for training artificial intelligence systems, several authors refer to this process as "digital colonialism" or "data colonialism" (Kwet, 2021; Cassino et al., 2021; Avelino, 2023; Faustino; Lippold, 2023). This phenomenon goes hand in hand with the so-called "surveillance

---

[6] The term was coined in 1956 during the Dartmouth Conference. See more at: https://jala.university/pt/2024/07/11/john-mccarthy-pioneiro-na-intelligencia-artificial/. Accessed on: Nov. 19, 2024.

[7] In English, machine *learning* is a branch of AI and Computer Science that uses data and algorithmic models to train AI systems to make correlations and predictions (Russell; Norvig, 2010).

capitalism" (Zuboff, 2019) or "platform capitalism" (Srnicek, 2017), which thrives on the widespread extraction of personal behavioral and institutional strategic data.

The vast majority of research on digital sovereignty considers three main dimensions: the state, the market, and the individual (Couture; Toupin, 2019; Herlo et al., 2021; Pohle; Thiel 2020; Belli et al., 2023). Many approaches highlight the educational issue as central, but a specific analysis of these relationships is lacking, as in the case of educational platforms (Herlo et al., 2023). In this regard, it is important to highlight the contributions of the study commissioned by the Brazilian Internet Steering Committee (CGI.br), "Education in a Scenario of Platformization and Data Economy", which highlighted the need for a debate on sectoral demands for digital sovereignty (CGI.br, 2024, translated by us).

For this essay, the definition included in the book "The Smart City" by Evgeny Morozov and Francesca Bria (2019, p. 22, translated by us) was adopted, according to which digital technological sovereignty "denotes the ability of citizens to have a voice and participate in the operation and destiny of the technological infrastructures that surround them". This definition points to the infrastructural element as a determinant of digital sovereignty, in addition to the dialogue with critical and decolonial perspectives of education, as highlighted by Mendonça:

> The search for digital decoloniality, for resources and platforms that challenge the structure of the Internet, for well-being and balance in the use of screens, in addition to the search for collective movements focused on a decolonial logic of the digital, would include relevant actions to interrupt colonialism. This movement, in education, can be constituted through the instrumentalization focused on the use of resources and the understanding of the mechanisms involved in their conception. Above all, interactions that promote critique, constructed knowledge and ancestry, the context of data generation and production, data literacy, and other actions that value equity, local and plural knowledge, dialogue, and diversity should be prioritized (Mendonça, 2024, p. 48, translated by us).

The debate has advanced on the international agenda since 66% of the global infrastructure market (cloud computing) is under the control of American big techs (Kersley, 2024), which has social, economic, and environmental impacts, especially in the countries of the Global South. It has also been included in the agenda of the G20, the forum for economic cooperation of the 19 largest economies in the world, including the European Union and the African Union, whose presidency has been taken over by Brazil for the first time since 2023. Among the public policy reports produced by the G20 Brazil 2024 Task Force for Inclusive Digital Transformation, one was specifically dedicated to educational technologies. Entitled Building Digital Public Infrastructure (DPI) for Inclusive, Equitable, and Quality Education: Educational technology must be based on public values, the

briefing aimed to emphasize the need for public education policies to focus on the tangible physical aspect of DPI in education, which, as mentioned, must go beyond software and ensuring connectivity (Gonsales et al., 2024).

Considered the main asset of today's economy, data is often extracted through the various applications offered to educational networks as if they were "free", something that has intensified since the COVID-19 pandemic and the need to maintain remote education in emergency situations. As noted above, this is a business model that embodies a strategy of loyalty and "digital colonization" for uninterrupted exploitation (Gonsales et al., 2024). By providing free email service to a basic education network or university, the company that owns the cloud service also comes into possession of data that can predict the needs of a nation's population through mere statistical correlation. In a mapping conducted by the "Observatório Educação Vigiada", it was pointed out that 76% of the digital infrastructure of public education in Latin America is linked to technology from Google (Alphabet) and Microsoft. However, this infrastructure goes beyond the provision of email servers and also includes storage services in data centers and educational package applications such as Google Classroom (Amiel et al., 2023).

Our approach in this essay aims to highlight how a public service related to the guarantee of a fundamental right, such as the right to education, must pay attention to digital infrastructure in the emerging context of AI technologies as essential for the functioning of public educational institutions (Gonsales et al., 2024). A doctoral thesis on the right to education, defended in 2023, found that there is no in-depth research that identifies the potential and dangers of the use of AI technologies for the right to education and the quality of schooling. Technologies and their developments are not just neutral devices or tools but constitute socio-technical systems loaded with economic and ideological power (Lima, 2023).

As an essential element for reflection, we will first present the context of the public digital infrastructure for education and the emerging national and international discussions. Next, we point out some emblematic cases of how public education networks in Brazil are increasingly linked to and dependent on private digital infrastructure. In the third and final topic, we highlight the need for a public policy project on data sovereignty to improve public education services and digital sovereignty, also understood as part of a counter-narrative that aims to challenge the neoliberal ideologies embedded in different discourses of technology providers (Laval, 2019).

2 EXPLORING DIGITAL PUBLIC INFRASTRUCTURE FOR EDUCATION

In many ways, infrastructure refers to elementary services, public goods, and enduring systems that function effectively, including but not limited to railways, roads, telecommunications, public transport, and resource provision (Bowker et al., 2010). This idea is often mentioned in political and economic discourses as essential for comprehensive and large-scale solutions that are crucial for the quality of life of the population (Edwards et al., 2009). Public infrastructure would then be this "set of enabling technologies" financed and managed, albeit partially, by the public sector.

Although software is considered an infrastructure, studies on information infrastructure emphasize the tangible aspect as essential to the definition (Star, 1999). In addition, other dimensions such as transparency, embedding, and modularity are central to infrastructure; infrastructure is the basis for multidimensional effects (Frischmann, 2012). Thus, digital infrastructure includes submarine and terrestrial cables, fiber optics, towers, satellites, and the Internet, as well as technical standards and the respective organizations that maintain them, as in the case of the Domain Name System (DNS). To a large extent, these are infrastructures that enable the flow of data nationally and internationally (Bowker et al., 2010).

In this sense, Digital Public Infrastructures (DPIs) are another controversial concept, especially concerning the notion of "public" (Mazzucato et al., 2024); especially after India's diplomatic negotiations in 2023, the year in which the country participated in the G20. DPIs refer to the tools and systems, including software and protocols, necessary to "make digital life work". Ethan Zuckerman (2020), a professor at the University of Massachusetts-Amherst, even considers digital content platforms, including social networks, to be DPIs in his article The Case for Digital Public Infrastructures. Also, within the scope of the G20, a standard definition of DPI was sought that goes beyond a merely technological approach but governance, innovation, capabilities, and stakeholder participation.

In education, an important example is Learning Management Systems (LMS), which allow school administrators and teachers to manage, monitor, document, automate, analyze, and deliver educational content, such as courses and training activities. For a Learning Management System or any other digital educational platform to work, several elements must be considered, including connectivity infrastructure, devices, applications, and data hosting servers. Therefore, the DPI approach to education includes tangible infrastructure, from digital connectivity in public schools, to

data hosting servers, to applications such as videoconferencing software, learning management systems, and so-called modular platforms.

Because of their adaptability to teaching and learning objectives and the possibility of remote use (such as during the COVID-19 pandemic), modular platforms have been increasingly requested by public educational institutions in Brazil (CGI.br, 2024). There are two main types of modular digital platforms for education: proprietary and closed, such as Google Workspace and Microsoft 365, and open source, such as Moodle. On the one hand, proprietary platforms simultaneously provide convenient and immediate access but concentrate data in their physical infrastructures (data centers) to fulfill their data-driven business models (Srnicek, 2019). On the other hand, open source platforms require servers to host data and technical support that can be managed internally or by external providers such as Amazon Web Services, Microsoft Azure, or Google Cloud Platform. In any case, both approaches require a variety of physical and software devices, from hardware to data security tools, to maintain a digital learning environment suitable for teaching.

Moreover, DPI also includes cables, server networks, routers, backups, and support, so even in the case of open source platforms, or those based on free software, such as Moodle, a study by CGI.br (2023) showed that 80% of Moodle developers in Brazil host on Amazon servers, generating dependence on large transnational companies and their systems, whose algorithmic management is based on proprietary and closed source solutions. In this sense, "the state's ability to guarantee the interests of a national policy is compromised: the logic of investment in national innovation is replaced by the mere consumption of outsourced technologies" (CGI.br, 2023, p. 10, translated by us).

The fact that a few technology companies dominate the digital infrastructure and, consequently, the educational sector, has implications for educational practices, such as: influence on the curriculum, pedagogy, and the way of assessment, since constant changes and updates are made by the companies; in their quest for profit, companies have an easy time extracting data, analyzing and monitoring the functioning of schools through data analysis (learning analytics). By leaving the entire infrastructure under the control of private companies, the loss of sovereignty and bargaining power is expected, so the state can no longer act effectively as a regulator of national education (Cone et al., 2021).

The same study by CGI.br (2023) lists the most common models for the composition of the educational digital infrastructure, in addition to connectivity and equipment/devices (Chart 1), and mentions that the diversity of systems, the possible overlap of decentralized cloud infrastructures and

the risks of considering a single public cloud for education must be considered when choosing or adopting. Therefore, the federated model deserves attention.

Chart 1 – Recurrent models for the composition of educational digital infrastructure

Model	Descriptive	Example
Software as a Service (SaaS)	It requires the institutional client (school, education network, university) to exercise very few levels of operation and control. Resources behind the application (backend) are not subject to user intervention, as only application management tasks are made available.	Email service, calendars, communication solutions, and other interactive and collaborative applications accessed via login, and others.
Platform as a Service (PaaS)	Provides the institutional client (school, education network or university) with an environment for implementing an application without having to worry about maintaining computing resources.	Website hosting or application testing services
Infrastructure as a Service (IaaS)	Allows greater control by the institutional client (school, education network or university)	Cloud services (datacenter) for various purposes
Community	It enables organizations to integrate resources to ensure more robust and scalable infrastructures, while maintaining control and operation under a set of organizations that mutually ensure the institutional requirements for proper functioning .	Federated model that provides resources and tools so that all organizations can benefit from collaboration and exchange; allows technical collaboration between teams

Source: Adapted from CGI.br (2023).

The digital infrastructure for education, in addition to its fundamental role in building and maintaining quality, accessible, and comprehensive education, is a principle that must be considered in its implementation and maintenance. From this perspective, the infrastructure should be made available and maintained in services that promote the technological and educational development of the country. Therefore, the inclusion of the educational "technological ecosystem" in the production chain is a strategic choice. An example of DPI for education is the Schul-Cloud, funded by the German Federal Ministry of Education and Research and developed to enable interoperability and data protection from the design of the digital public infrastructure and during digital learning (Meinel et al., 2023).

As public digital learning platforms do not have a specific definition, nor do they include the concept of digital commons[8], UNESCO has been working with UNICEF since 2022 to support countries in strengthening and improving public digital learning platforms through the Gateways to Public Digital Learning initiative[9]. The two multilateral agencies aim to map and describe the main public digital learning platforms in different countries and develop quality standards for public digital learning platforms, in addition to producing research and case studies. This is a joint effort with the UN to establish and strengthen/revitalize digital commons, as mentioned in the United Nations (UN) Secretary General's Roadmap for Digital Cooperation[10], which also takes into account the UNESCO Connectivity Report[11], the UN Secretary General's Common Agenda[12], and the disastrous teaching experiences during the COVID-19 pandemic, as reported in the An EdTech Tragedy? Report (West, 2023). This is an emerging agenda that demands new research around issues such as: a) the definition of public learning platforms, what they are or what they should be; b) the definition of digital commons and how this concept relates to education and also to digital learning platforms.

3 BRAZILIAN SITUATION: DIAGNOSIS OF DIGITAL DEPENDENCE

Even before the COVID-19 pandemic, some studies had pointed to the growing problem of dependence on technological infrastructure in education, justified by a narrative that it is "more efficient" in the private sector, widespread individual use of "free" proprietary platforms, or even debilitating tensions related to institutional bureaucracy and lack of technical staff (Parra et al., 2018). With the pandemic, a new narrative of "saving public funds" emerged as another justification for adopting proprietary commercial platforms, given the urgency of maintaining distance education, whether in universities or basic education networks.

In 2019, the TIC Education Survey 2019 (Pesquisa TIC Educação) (CETIC.br|NIC.br, 2020) showed that 14% of public schools had pedagogical work on digital platforms. In the following

---

[8] The importance of digital commons is referenced in the preliminary version of the Global Digital Compact, a document negotiated and agreed among countries. See more at: https://www.un.org/techenvoy/global-digital-compact. Accessed on: Nov. 20, 2024.

[9] About the initiative: https://www.unesco.org/en/digital-education/learning-platforms-gateway. Accessed on: Aug. 22, 2024.

[10] About the roadmap: Available at: https://www.un.org/en/content/digital-cooperation-roadmap/assets/pdf/Roadmap_for_Digital_Cooperation_EN.pdf. Accessed on: Aug. 20, 2024.

[11] Publication available at: https://unesdoc.unesco.org/ark:/48223/pf0000381482.locale=en. Accessed on: Aug. 20, 2024.

[12] Publication available at: https://www.youtube.com/live/1sKpd_4nZd0https://www.un.org/en/common-agenda. Accessed on: Aug. 20, 2024.

edition, already under the influence of the pandemic scenario, the use of digital platforms - including videoconferencing - was mentioned by 91% of the educational managers interviewed (CETIC.br|NIC.br, 2022), in addition to complaining about the lack of adequate equipment, such as computers, for study in the homes of most students.

Education in Brazil follows the federal pact, in which states, municipalities and the Union have autonomy to develop and implement educational policies. Educational policies on the integration of technology in education in Brazil, from PROINFO in the 1990s to the National Digital Education Policy, emphasize Internet connectivity and instrumental skills (Gomes; Santos; Medeiros, 2021). However, these two critical aspects are not enough for a functioning digital ecosystem that guarantees public education as a right. The adoption of digital platforms is strongly influenced by factors such as national digital inclusion policies and solutions offered by multinational technology companies. Although there is an awareness of the importance of developing proprietary technological solutions, time and resource constraints during the pandemic have led to the adoption of readily available solutions.

To understand how state and municipal public networks (capitals and cities with more than 500,000 inhabitants) opened spaces for platforms and other digital applications as a result of the pandemic, the study on partnerships and asymmetries (CGI.br, 2022) shows that the vast majority of networks made supply agreements with Google (Alphabet), either directly or indirectly through secondary applications that use the company's software engines (Evangelista; Gonsales, 2024). Another company that consolidated itself in the field of agreements was Meta, through its instant messenger WhatsApp, incorporated in several educational applications launched during the pandemic. The study found that educational managers were unaware of the business model based on data extraction and the marketing practices of big techs. As the Minister of the Superior Court of Justice, Nancy Andrighi, points out, "the fact that the service provider argues that its service is 'free' does not distort the relationship with the consumer, since there are many ways for the provider to profit indirectly" (CGI.br, 2024, p. 92, translated by us).

For example, São Paulo, the largest city in Brazil, has implemented and continues to implement digital educational platforms for distance education, using widely available technological solutions such as Google tools. In fact, at the launch of the partnership between the City of São Paulo and Google, the local government stated that:

Google's role will be to collaborate with innovation in the educational network of Brazil's largest municipality through accessible technological solutions that promote greater student engagement and focus on training teachers, who are the protagonists of this transformation" Daniel Cleff, Google Representative (São Paulo, 2020, translated by us).

In addition to email servers, the company offers cloud services, office applications, and an LMS system, Google Classroom, all bundled into a single package. As Lima (2020) found, although the terms of service state that the package does not use user data for targeted advertising, services not included in the package, such as YouTube, collect data for commercial use.

The State of Paraná is another relevant example of how the lack of knowledge, combined with values contrary to the right to education, encourages the expansion of private enterprise in public education through its applications and infrastructure. The representative of App-Sindicato, Vanda Santana, denounced at the 14th Internet Forum[13] the constant precariousness of teaching work due to the compulsory introduction of commercial digital platforms into daily pedagogy. This dependency on external platforms highlights both the lack of robust policies on digital sovereignty in educational networks and threatens the guarantee of the right to quality public education. The research shows that although there is discussion about the need for public digital infrastructures, the effective implementation of these solutions faces significant challenges, such as lack of investment and dependence on foreign expertise.

3.1 Demands from **Researchers and Social Movements**

During the campaign for the 2022 presidential election, a group of about 100 intellectuals, researchers, and activists from social organizations from different regions of the country drafted and delivered to then-candidate Lula the so-called "Letter in Defense of Digital Sovereignty"[14]. The document warned against the growing technological dependence on foreign companies, the model of market concentration based on the extraction of data (knowledge and information) of great economic and social value for the country. As evidence, the group pointed to the case of the vulnerability of national scientific production since public universities began to adopt Google and Microsoft services,

---

[13] Educator's speech available at: https://www.youtube.com/live/1sKpd_4nZd0?si=q1VisLI8Xo3t-nAb. Accessed on: Aug. 20, 2024.

[14] Available at: https://cartasoberaniadigital.lablivre.wiki.br/carta/. Accessed on: Aug. 8, 2024.

as pointed out by the Observatório Educação Vigiada (Observatory of Watched Education)[15], initially offered as free and unlimited, but which soon began to charge or have space limitations. Among the proposed measures is precisely the creation and implementation of a federated infrastructure, considering investments in the implementation and maintenance of data centers so that data remain within national territory.

The concerns of the group of signatories may have been partially addressed by the Brazilian Plan for Artificial Intelligence 2024 (PBIA), which emphasizes digital sovereignty. However, providing for the education sector remains a challenge. The case of the National Research Network (RNP) is emblematic of to better understanding of this scenario. Linked to the Ministry of Science, Technology, and Innovation (MCTI) since its creation in 1989, along with other ministries such as the Ministry of Education (MEC), the RNP's purpose is to build and support a national academic Internet network infrastructure. Due to its network structure and format, the RNP is connected to other education and research networks in Latin America, North America, Africa, Europe, Asia, and Oceania through terrestrial and submarine fiber optic cables. However, in 2017, RNP inaugurated a new operating model and began to act as a broker of cloud services, coordinating different providers and being responsible for the level of selection and contracting of services. As reported in the CGI.br study (2024), RNP is currently establishing partnerships with technology companies such as Amazon, Microsoft, Google, and IBM, as well as with telephone companies such as Embratel, Vivo, and Vert, in order to make the services of these companies available to the managers of public educational institutions. The service, called "Nas Nuvens" (On the Clouds, in free translation) (not dated), offers a marketplace of cloud services from these companies.

The problem of technological dependency on the part of the education system also emerged in a survey on digital sovereignty conducted by Sempre Viva Organização Feminista (Always Alive Feminist Organization, in free translation) (SOF, 2022) with several Brazilian and Latin American social movements, including quilombola education communities. The study found concern regarding false discourses and seductive narratives about the neutrality and ease associated with private and corporate technologies, and because of this, the movements would be fighting for the construction of accessible and democratic technologies (Chart 2).

---

[15] Available at: https://educacaovigiada.org.br. Accessed on: Nov. 20, 2024.

Chart 2 – Principles for technological sovereignty

Politicize technologies.	To encourage debates that expand the idea that technology is not neutral, but social and political. It is produced and controlled by specific models and agents, designed and used to serve certain purposes.
Public and community connectivity models.	Demand that the State invest in communication and connectivity infrastructure, prioritizing public, national and community supply models, in the direction of autonomy and against the business models of large foreign companies.
Encouragement of the use, creation and dissemination of free and open software.	Comply with the right to information and transparency by encouraging the development of free and open software, adaptable to the most diverse contexts.
Technodiversity	Promote the participation of groups that have been historically marginalized in the production of technologies. By including women, black people, people from the periphery, rural inhabitants, indigenous people, and others, technodiversity and territorialized infrastructures that are appropriate for the lives of each group are promoted.
Transparency, privacy and data sovereignty	Regulate so that the right to privacy and transparency and privacy includes participation in the design of algorithms and their objectives, opposing the surveillance and commodification of bodies and ways of life.
Build collective and popular mechanisms for technological regulation.	Build mechanisms for participatory technology assessment in accordance with popular and collective interests. This means strengthening popular power, as well as the role of the State as a regulator and promoter of alternatives, so that it is able to curb the excessive power of digital corporations.
Value what is socially useful and sustainable.	Respect the energetic and physical limits of nature's capabilities.
Networking technology.	Promote technologies created in a participatory and collaborative manner, in a network with other movements, communities, research institutions and organizations.

Source: Adapted from SOF (2022).

It is essential to support specific analyses of how digital policy decisions are made in essential areas such as education. Acquisitions, adoptions and public purchases are the result of choices that have implications for the education and innovation system as a whole. An important contribution is the debate on governance in the context of digital education, proposed by the Latin American Campaign for the Right to Education (CLADE), which considers it "crucial to rethink governance as a participatory and equitable mechanism that includes different actors, especially given the current power imbalances" (Gonsales, 2024, p. 43, translated by us).

3 TOWARD SOVEREIGN DIGITAL FUTURES

As highlighted by UNESCO, the pandemic has revealed a growing process of precarization and privatization of education through promises of improvement and innovation provided by different actors in partnership with schools (UNESCO, 2023). This is a scenario where it has been gradually consolidated without fanfare, reinforcing the privilege of various interests outside schools, which are reinforced in discussions about the incorporation of AI technologies in schools. The vaunted innovation in education hardly takes into account a new issue for the field of human rights, which is "digital colonialism", that is, the same type of extractivism from the time of the exploration of territories through colonization, except that now it is the big techs from the US that colonize the populations of the Global South through the extraction of data and also the monopolization of the physical infrastructure (Amiel et al., 2023; Avelino, 2023; Kwet, 2021).

Gonsales (2024) emphasizes that the ecosystem of digitization in education includes, in addition to the physical infrastructure and digital security, institutional policies on the educational goals to be achieved. Given the constant evolution of technologies, the following steps are fundamental to the implementation of educational policies: understanding how contemporary technologies work, and being able to collectively decide, through broad discussion, which technologies can enter the educational field, minimizing risks such as privacy, data commodification, and the privatization of public education. Leadership, democratic management, and collaboration can be strategies in this sense, so that any hiring and/or adoption of products from technology companies is carefully considered and discussed, in line with what Adrião et al. (2015) had already warned about in relation to educational materials.

Considering the state, economic, and individual dimensions and their respective intersections with the education sector, specific justifications for promoting digital sovereignty through education stand out given its critical importance (Meinel et al., 2023). First, the demand for and improvement of public education, as outlined in the 2019 Abidjan Principles, a United Nations effort to reaffirm the need for governments to guarantee the right to education (Princípios de Abidjan, 2019). This process stems from the lack of evidence on the effectiveness of public-private partnerships in education policy, despite their growing popularity (Verger; Moschetti; Fontdevila, 2020). Secondly, the immeasurable value of educational and scientific data for a country, as they are sources of vital statistics for monitoring public policies, in addition to being assets and inputs for the development of solutions adapted to the Brazilian reality. Furthermore, the necessity to prevent and mitigate risks for children and adolescents, many of which arise from the business model of current educational platforms. Finally, the fact that the development of digital educational platforms is in itself an indicator of scientific and technological knowledge necessary for the implementation, maintenance, and sustainability of digital infrastructures in a given territory (Timotheou et al., 2022; CGI.br, 2023).

Connecting schools is, therefore, not just about providing Internet access or using a digital tool, but about adopting a new model of thinking about the challenge of public schools in the face of technology companies with commercial interests behind this process. Once again, it is worth referring to the UNESCO GEM report (2023):

> There are different views on how digital technologies can improve the quality of education. Some argue that, in principle, digital technology creates engaging learning environments, enlivens students' experiences, simulates situations, facilitates collaboration, and enhances connections. Others, however, argue that digital technology tends to favor an individualized approach to education, reducing students' opportunities to socialize and learn by observing each other in real-life scenarios. Moreover, while technology helps overcome some problems, it also brings its own. Increased screen time has been linked to negative effects on physical and mental health. Inadequate regulation has led to the unauthorized use of personal data for commercial purposes. Digital technology has also contributed to the spread of misinformation and hate speech, including through education (UNESCO, 2023, p. 11, translated by us).

Another important aspect, as noted by Gonsales (2022), is that innovation in education is always seen as an element external to the school and not as a consequence of people's involvement in a given context. However, innovation comes as a product to be acquired, and this reduces the understanding of technology as a "neutral" utilitarian tool for teaching content, which prevents students and teachers from understanding the interests behind this technology. One cannot simply praise "digital   literacy" without taking into account that the data

on the use of applications to acquire these skills is captured as an improvement to a commercial product.

In addition to the need for content, resources, and teacher training, it is necessary to understand the various elements that make up the ecosystem for delivering digital education, such as aspects related to digital infrastructure, cybersecurity, and the management of this ecosystem itself (Gonsales, 2024; Holmes, 2023). Paths to sovereign digital futures may be possible if the educational policies to be developed prioritize the collective participation of the stakeholders involved (educators, administrators, students, legislative representatives, community activists, and others) in design, conceptualization, and decision-making. Some contextual questions are key to better understanding:

- What is the country's general trajectory in developing digital infrastructure for Education?
- What are the regulations on digital education before COVID-19? Do they refer to infrastructure? If so, in what way?
- Are digital infrastructures for education based on proprietary or open source software?

Some European countries have enacted policies banning the use of Google and Microsoft platforms in schools. In Denmark, the national data protection authority declared in July 2022 that Google for Education was not fulfilling its responsibilities under the GDPR. Another German state that decided to ban the service was Hesse (Mujovic, 2022), citing concerns about privacy violations by the Microsoft 365 service package. According to the state's data protection authority, the program's settings collect data about users' programs, which violates GDPR guidelines. The ban came despite the validity of a special contract with Germany, in which the country would host its servers locally to prevent user data from leaving the country. A study by Fiebig et al. (2021) found that three-quarters of all Dutch student data is stored in clouds managed by American technology companies such as Microsoft and Amazon, raising concerns that the increasing reliance on these technology companies could undermine scientific integrity.

4 FINAL CONSIDERATIONS

This essay has attempted to demonstrate that the lack of a specific digital infrastructure policy for education reflects a tension between the immediate need for solutions for educational purposes

and the pursuit of greater digital sovereignty. The dependence on foreign technological solutions points to the need for a more integrated strategy for the development of public digital infrastructures in Brazil, which seems to be addressed in the Brazilian Plan for Artificial Intelligence (PBIA), but without due consideration of education as an essential sector and fundamental right.

Progress toward digital sovereignty in education, in addition to investing in local technological development, requires promoting greater participation of local stakeholders in understanding the ecosystem necessary for decision-making, ensuring that the policies adopted reflect the needs and capacities of the territory. In this sense, there is an urgent need to discuss a sectoral approach to digital sovereignty, based on the concept of essential domains (Guggenberger, 2021), rather than a generalist approach focused on specific groups of stakeholders in society or specific lenses of sovereignty, such as legal, political or economic.

This means prioritizing an interdisciplinary and governance analysis of digital infrastructures in public education so that the notion of sovereignty is not limited to the expression of power but can be legitimized and concretely implemented when entering sectors such as education (CGI.br, 2023). Investing in public infrastructures will not only allow public education systems to have significant control and sovereignty over the information and data created and used by students, teachers, and administrators, but it will also allow the promotion of digital decoloniality and the development of critical pedagogies.

REFERENCES

ABIDJAN PRINCIPLES. **The Abidjan Principles on the right to education**, 2019. Available at: https://www.abidjanprinciples.org/. Accessed on: Nov. 19, 2024.

ADLER-NISSEN, R.; GAMMELTOFT-HANSEN, T. (Eds.). **Sovereignty games**. Instrumentalizing State Sovereignty in Europe and Beyond. Palgrave Macmillan US, 2008. 265p. DOI: 10.1057/9780230616936. Available at: https://link.springer.com/book/10.1057/9780230616936. Accessed on: Nov. 19, 2024.

ADRIÃO, T. *et al*. **Sistemas de ensino privados na educação pública brasileira**: consequências da mercantilização para o direito à educação. São Paulo: Ação Educativa, 2015. 114 p. Available at: https://acaoeducativa.org.br/wp-content/uploads/2016/10/sistemas_privados_pt.pdf. Accessed on: Nov. 19, 2024.

AMIEL, T. *et al*., Mapeo del Capitalismo de Vigilancia en la Educación Superior Sudamericana. **Revista Latinoamericana de Tecnología Educativa,** v.

22, n. 1, p. 221-239, 2023. DOI: 10.17398/1695-288X.22.1.221. Available at: https://relatec.unex.es/index.php/relatec/article/view/4425. Accessed on: Feb. 19, 2024.

AVELINO, R. **Colonialismo Digital**: tecnologias de rastreamento online e a economia informacional. São Paulo: Alameda, 2023.

BELLI, L. *et al*. **Cybersecurity:** A systemic view towards a regulatory proposal for a digitally sovereign Brazil. Centro de Tecnologia e Sociedade, Fundação Getúlio Vargas, 2023. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4966479. Accessed on: Nov. 19, 2023.

BOWKER, G. *et al*. Toward information infrastructure studies: ways of knowing in a networked environment. In: HUNSINGER, J.; KLIEVER, L.; SCHROEDER, R. (Eds.). **International handbook of internet research**. Dordrecht: Springer, 2010. p. 97–117.

BRASIL. Ministério da Ciência, Tecnologia e Inovação (MCTI). **Plano Brasileiro de Inteligência Artificial (PBIA)**. 2024. Available at: https://www.gov.br/lncc/pt-br/assuntos/noticias/ultimas-noticias-1/plano-brasileiro-de-inteligencia-artificial-pbia-2024-2028. Accessed on: Nov. 19, 2024.

BUSCH, C. **Regulation of digital platforms as infrastructures for services of general interest**. Bonn: FES, 2021. Available at: https://library.fes.de/pdf-files/wiso/17836.pdf. Accessed on: Aug. 16, 2024.

BUZATO, M. E. K. Inteligência artificial, pós-humanismo e educação: entre o simulacro e a assemblagem. **Dialogia**, *[S. l.]*, n. 44, p. e23906, 2023. DOI: 10.5585/44.2023.23906. Available at: https://periodicos.uninove.br/dialogia/article/view/23906. Accessed on: Nov. 20, 2024.

CASSINO, J. F.; SOUZA, J.; AMADEU, S. **Colonialismo de dados**: como opera a trincheira algorítmica na gerra neoliberal. 1ª Edição. Editora Autonomia Literária, 2021.

CETIC.BR | NIC.br. **TIC Educação 2019**. Available at: https://www.cetic.br/media/docs/publicacoes/2/20201123090444/tic_edu_2019_livro_eletronico.pdf. Accessed on: May 24, 2024.

CETIC.BR | NIC.br. **TIC Educação 2020**. Available at: https://cetic.br/pt/pesquisa/educacao/analises/. Accessed on: Jul. 6, 2024.

CGI.br. **Educação em um cenário de plataformização e economia de dados:** parcerias e assimetrias. Grupo de trabalho de Plataformas Educacionais do Comitê Gestor da Internet do Brasil (CGI.br), 2022. Available at: https://bibliotecadigital.acervo.nic.br/items/685ea856-60a8-43de-8468-218a1eea287f. Accessed on: Nov. 19, 2024.

CGI.br. **Educação em um cenário de plataformização e economia de dados**: soberania e infraestrutura. Grupo de trabalho de Plataformas Educacionais do Comitê Gestor da Internet do Brasil (CGI.br), 2023. Available at: https://cgi.br/media/docs/publicacoes/1/20231129143817/educacao_em_um_cenario_de_plataformiza%C3%A7ao_e_de_economia_de_dados_soberania_e_infraestrutura.pdf. Accessed on: Nov. 19, 2024.

CGI.br. **Educação em um cenário de plataformização e economia de dados**. Versão compilada dos três estudos. 2024. Available at: https://cgi.br/publicacao/educacao-em-um-cenario-de-plataformizacao-e-de-economia-de-dados/. Accessed on: Nov. 19, 2024.

CHANDER, A.; SUN, H. **Data sovereignty**: From the digital silk road to the return of the state. Oxford University Press, 2023.

CONE, L. *et al*. Pandemic Acceleration: Covid-19 and the emergency digitalization of European education. **European Educational Research Journal**, v. 21, n. 5, p. 845-868, 2021. Available at: http://journals.sagepub.com/doi/10.1177/14749041211041793. Accessed on: Nov. 19, 2024.

COUTURE, S.; TOUPIN, S. What does the notion of "sovereignty" mean when referring to the digital? **New Media & Society**, v. 21, n. 10, p. 2305-2322, 2019. DOI: 10.1177/1461444819865984. Available at: https://journals.sagepub.com/doi/10.1177/1461444819865984. Accessed on: Nov. 19, 2024.

EDWARDS, P. N.; BOWKER, G. C.; JACKSON, S. J.; WILLIAMS, R. Introduction: an agenda for infrastructure studies. **Journal of the Association for Information Systems**, v. 10, n. 5, 2009.

EVANGELISTA, R.; GONSALES, P. A plataformização da educação no sul global e seus laços com os atores do capitalismo de vigilância. In: ALVES, L.; LOPES, D. **Educação e plataformas digitais**. Salvador: UFBA, 2024.

FAUSTINO, D; LIPPOLD, W. **Colonialismo digital**: por uma crítica hacker fanoniana. 1. ed. Boitempo Editorial, 2023.

FIEBIG, T. *et al*. Heads in the Clouds: Measuring the Implications of Universities Migrating to Public Clouds. **ArXiv**, 2021. Available at: http://arxiv.org/abs/2104.09462. Accessed on: Nov. 19, 2024.

FRISCHMANN, B. M. **Infrastructure**: the social value of shared resources. Oxford: Oxford Academic, 2012. DOI: 10.1093/acprof:oso/9780199895656.001.0001. Available at: https://academic.oup.com/book/34694. Accessed on: Nov. 21, 2024.

GOMES, R; SANTOS, J; MEDEIROS, E. Programa Nacional de Tecnologia Educacional – PROINFO: pensar a política educacional para além da implementação na escola pública. **Revista Ibero-Americana de Estudos em Educação**, v. 16, n. esp.3, p. 1647-1661, 2021. DOI: 10.21723/riaee.v16iesp.3.15303. Available at: https://periodicos.fclar.unesp.br/iberoamericana/article/view/15303. Accessed on: Nov. 19, 2023.

GONSALES, P. **Gobernanza de la digitalización de la educación**: reflexiones desde Améria Latina y Caribe. Campaña Latino-americana del Derecho a la Educación (CLADE), 2024. Available at: https://zenodo.org/records/12764115. Accessed on: Nov. 20, 2024.

GONSALES, P. **Inteligência além da Artificial**: educar para o pensar complexo. São Paulo: Z Edições, 2022.

HOLMES, W. **The unintended consequences of Artificial Intelligence and Education**. Education

International, 2023. Available at: https://www.ei-ie.org/en/item/28115:the-unintended-consequences-of-artificial-intelligence-and-education. Accessed on: Nov. 20, 2024.

GUGGENBERGER, N. **Essential Platforms**. Stanford Law School, 28 de maio de 2021. Available at: https://law.stanford.edu/publications/essential-platforms/. Accessed on: Nov. 20, 2024.

HERLO, B.; IRRGANG, D.; JOOST, G.; UNTEIDIG, A. (Eds.). **Practicing Sovereignty**: Digital Involvement in Times of Crises. Bielefeld: Transcript Publishing, 2021.

KERSLEY, A**. Big tech's cloud oligopoly risks AI market concentration.** Available at: https://www.computerweekly.com/feature/Big-techs-cloud-oligopoly-risks-AI-market-concentration. Accessed on: Aug. 20, 2024.

KWET, M. A ameaça nada sutil do Colonialismo Digital. **Outras Palavras**, São Paulo, 15 mar. 2021. Available at: https://outraspalavras.net/tecnologiaemdisputa/a-ameaca-nada-sutil-do-colonialismo-digital/. Accessed on: Nov. 20, 2024.

LAVAL, C. **A escola não é uma empresa**: o neoliberalismo em ataque ao ensino público. São Paulo: Boitempo Editorial, 2019.

LIMA, S. H. B. **Diretrizes jurídicas para a qualidade da digitalização escolar**: um olhar sobre a contratação da plataforma Google pelas Secretarias Estaduais de Educação à luz do Direito à Educação. 2023. Tese (Doutorado em Direito do Estado) - Faculdade de Direito, Universidade de São Paulo. Available at: https://www.teses.usp.br/teses/disponiveis/2/2134/tde-17062024-155927/fr.php. Accessed on: Nov. 19, 2024.

LIMA, S; GONZALES, P; AMIEL, T. Educação, dados e plataformas: análise descritiva dos termos de uso dos serviços educacionais da Google e Microsoft. Iniciativa Educação Aberta, 2020. Available at: https://zenodo.org/records/4012539. Accessed on: Jul. 22, 2024.

MARIOTTI, H.; ZAUHY, C. **O desafio da incerteza:** a cultura atual, a inteligência artificial e a necessidade do pensamento complexo. São Paulo: Mariotti, 2019.

MAZZUCATO, M.; EAVES, D.; VASCONCELLOS, B. **Digital public infrastructure and public value:** what is 'public' about DPI? UCL Institute for Innovation and Public Purpose, Working Paper Series, 2024. Available at: https://www.ucl.ac.uk/bartlett/public-purpose/publications/2024/mar/digital-public-infrastructure-and-public-value-what-public-about-dpi. Accessed on: Apr. 13, 2024.

MEINEL, C.; GALBAS, M.; HAGEBÖLLING, D. Digital Sovereignty: Insights from Germany's education sector [Digitale Souveränität: Erkenntnisse aus dem deutschen Bildungssektor]. **Technische Berichte des Hasso-Plattner-Instituts für Digital Engineering an der Universität Potsdam**, v. 156, 29 p., 2023. DOI: 10.25932/PUBLISHUP-59513. Available at: https://publishup.uni-potsdam.de/frontdoor/index/index/docId/59513. Accessed on: Nov. 19, 2023.

MENDONÇA, H. A. **A (in)visibilidade dos processos de colonialismo e decolonialidade digital na educação online e remota no Ensino Superior**. 2024. Tese (Doutorado em Educação) - Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, São Paulo, 2024.

Available at: https://www.teses.usp.br/teses/disponiveis/8/8147/tde-06112024-171950/. Accessed on: Nov. 20, 2024.

MOROZOV, E. **BigTech**: a ascensão dos dados e a morte da política. Tradução de Claudio Marcondes. São Paulo: Ubu, 2018.

MOROZOV, E.; BRIA, F. **A cidade inteligente**: tecnologias urbanas e democracia. São Paulo: Ubu Editora, 2020.

MUJOVIC, V. **Germany forces a microsoft 365 ban due to privacy concerns**. TechGenix, 2022. Available at: https://techgenix.com/microsoft-365-ban-in-germany/. Accessed on: Nov. 19, 2024.

PARRA, H. *et al*. Infraestruturas, economia e política informacional: O caso do Google Suite for education. **Mediações**, v. 23, n. 1, p. 63-99, jan./ jun. 2018. Available at: https://repositorio.unifesp.br/bitstream/handle/11600/51998/32320-158774-1-PB.pdf?sequence=1&isAllowed=y. Accessed on: Nov. 19, 2024.

POHLE, J.; THIEL, T. Digital sovereignty. **Internet Policy Review**, v. 9, n. 4, 2020. DOI: 10.14763/2020.4.1532. Available at: https://policyreview.info/concepts/digital-sovereignty. Accessed on: Nov. 19, 2024.

RUSSEL, S.; NORVIG, P. **Artificial Intelligence**: a modern approach. New Jersey: Prentice Hall, 2010.

SÃO PAULO. **COVID-19**: Estudantes e educadores poderão contar com tecnologias do Google for Education, 2020. Available at: https://educacao.sme.prefeitura.sp.gov.br/noticias/covid-19-estudantes-e-educadores-poderao-contar-com-tecnologias-do-google-e-foreducation/. Accessed on: Nov. 19, 2024.

SOF. Sempre Viva Organização Feminista. **Documento soberania tecnológica**, 2022. Available at: https://www.sof.org.br/wp-content/uploads/2022/11/documento-soberania-tecnologica-3.pdf. Accessed on: Aug. 20, 2024.

SRNICEK, N. **Platform capitalism**. Cambridge: Polity Press, 2017.

STAR, S. L. The ethnography of infrastructure. **American Behavioral Scientist**, v. 43, n. 3, p. 377–391, 1999. DOI: 10.1177/00027649921955326. Available at: https://journals.sagepub.com/doi/10.1177/00027649921955326. Accessed on: Nov. 21, 2024.

TIMOTHEOU, S. *et al*. Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. **Educ Inf Technol,** v. 28, p. 6695-6726, 2023. DOI: 10.1007/s10639-022-11431-8. Available at: https://link.springer.com/article/10.1007/s10639-022-11431-8. Accessed on: Nov. 19, 2024.

UNESCO. Organização das Nações Unidas para a Educação, Ciência e Cultura. **Global Education Monitoring Report – Technology in education**: a tool in whose terms? 2023. Available at: https://gem-report-2023.unesco.org/. Accessed on: Nov. 19, 2024.

VERGER, A.; MOSCHETTI, M. C.; FONTDEVILA, C. How and why policy design matters: understanding the diverging effects of public-private partnerships in education. **Comparative Education**, v. 56, n. 2, p. 278-303, 2020. DOI: 10.1080/03050068.2020.1744239. Available at: https://www.tandfonline.com/doi/full/10.1080/03050068.2020.1744239. Accessed on: Nov. 19, 2024.

WERNER, W. G.; DE WILDE, J. H. The Endurance of Sovereignty. **European Journal of International Relations**, v. 7, n. 3, 2001.

WEST, M. **An ed-tech tragedy?** 2023. Relatório UNESCO. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000386701. Accessed on: Jul. 20, 2024.

WILSON, F. G. A Relativistic View of Sovereignty. **Political Science Quarterly**, v. 49, n. 3, p. 386-410, 1934. Available at: https://academic.oup.com/psq/article-abstract/49/3/386/7271879?redirectedFrom=fulltext. Accessed on: Nov. 19, 2024.

ZUBOFF, S. **The Age of Surveillance Capitalism**: The Fight for a Human Future at the New Frontier of Power. New York: PublicAffairs, 2019.

ZUCKERMAN, E. **The Case for Digital Public Infrastructure**, 20-01 Knight First Amend. Inst., 2020. Available at: https://knightcolumbia.org/content/the-case-for-digital-public-infrastructure. Accessed on: Apr. 14, 2024.