Artificial Intelligence, Education and Childhood
Education in Contemporary Times: Between Data and Rights

By Priscila Gonsales[1] and Tel Amiel [2]

With the suspension of in-person classes due to the COVID-19 pandemic, schools and educational networks began using platforms that large technology companies made available at no financial cost to replicate the traditional teaching model[3] so that classes could be held remotely through video classes.

A problem and a concern arise in this scenario. The problem is with respect to the limited offer students have to access content and resources, something that goes against the principles of pluralism of ideas and conceptions present in the Brazilian National Education Guideline and Framework Law.[4] The concern is related to the lack of regulation, transparency, and responsibilities involved in implementing private platforms for distance learning and/or communication that collect personal data from the school community.

We are facing a digital culture[5] marked by Artificial Intelligence (AI). AI, which is increasingly present in our daily lives, uses statistical probability models that employ data processing[6] to incrementally improve its efficiency, without human intervention. However, in an educational context, few administrators, parents, and caregivers are aware that students and educators may be exposed to massive data collection[7] by AI-based education platforms.

What can be done with the data that tells the academic trajectory of students? What about the metadata[8] on the visited websites, surveys carried out, preferences, behaviors, and geolocation? How long is this data stored, and which companies have it, or which companies can it be shared with? Amidst so many questions, it is still uncommon for educational institutions to promote a continuous debate about the necessary autonomy and control of their technologi-

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[3]   Find out more: https://onlyo.co/2VCQy9w

[4]   Available at: http://www.planalto.gov.br/ccivil_03/leis/l9394.htm

[5]   Or cyberculture, which, according to André Lemos, professor at the Federal University of Bahia and coordinator of Lab404, is currently marked by the acronym PDPA: platformization, datafication and algorithmic performativity. Learn more: http://www.lab404.ufba.br/os-desafios-atuais-da-cibercultura/

[6]   According to the Brazilian General Personal Data Protection Law, processing is any operation performed with personal data. Learn more: https://www.serpro.gov.br/lgpd/menu/a-lgpd/glossario-lgpd

[7]   Find out more: https://www.uol.com.br/tilt/noticias/redacao/2020/07/18/nova-economia-dos-dados-criancas-sao-exploradas-sem-que-pais-percebam.htm

[8]   See section "Answers to your questions" of the Internet Sectoral Overview, year 11, number 2, about privacy and personal data. Available at: https://cetic.br/pt/publicacao/year-xi-n-2-privacy/

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cal structures. Culturally, the idea has spread that large platforms deliver services for free and without risk. However, the high costs of this seemingly unpretentious offer are becoming increasingly clear.

The *Educação Vigiada*[9] project, launched in March 2020, aims to shed light on privacy, surveillance, and security issues related to the data of students, teachers, and researchers in Brazilian public educational institutions. A mapping[10] carried out via script revealed that 74% of public universities and state education departments have their e-mail servers allocated to external Google and Microsoft computers, which are companies whose monetization logic has been called "surveillance capitalism."[11] The term, which is the title of the book written by American researcher Shoshana Zuboff, is used to designate business models that are based on the extensive extraction of personal data using algorithms and AI techniques that allow to identify patterns of behavior of a set of users, whether on the web or mobile applications, to generate market value, offer personalized advertising, influence opinions, and market products and services.

In the case of Brazilian public education, the *Educação Vigiada*[12] project, which checked the information obtained through requests via the Brazilian Access to Information Law, draws attention not only to the issue of personal data but also to a context in which higher education public institutions and education networks represent a strategic field in a country that is delegating essential services, such as e-mail management and data storage (registration, research, private information in documents and countless strategic content) that may be circulating in an opaque manner, establishing a continuous and nontransparent relationship between institutions, networks, and companies.

Background

Debates regarding Internet privacy, security, and surveillance have been gaining ground in the press, mainly due to some representative cases. In 2013, Edward Snowden, a former agent of the U.S. National Security Agency (NSA), exposed an espionage scheme based on data collection on individuals and organizations.[13] What used to be an issue limited to researchers and activists has become an international scandal. Today, it is part of the public agenda, emphasizing the lack of zeal of companies and governments regarding collecting and processing confidential, protected, or private personal data.

However, for a large part of the population, Snowden's revelations have not generated attitude changes. Not even the mention of companies like Microsoft and Google, which would have cooperated with the US government through the NSA's PRISM[14] spy program, led most users of these services to react strongly.

In 2018, there was another alert with the Cambridge Analytica[15] case. This

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[9] Carried out by the *Laboratório Amazônico de Estudos Sociotécnicos*, the *Centro de Competência em Software Livre*, both from the Federal University of Pará, and the Open Education Initiative (a partnership between the UNESCO Chair in Distance Education, from UnB, and the Instituto Educadigital). Find out more: http://www.educacaovigiada.org.br

[10] The mapping was done via script developed and run in a GNU/Linux environment, with the purpose of accessing the database of the e-mail server of the researched institutions.

[11] Find out more: https://www.theguardian.com/technology/2019/jan/20/shoshana-zuboff-age-of-surveillance-capitalism-google-facebook

[12] More detailed analyses are available in Parra et al. (2018) and Cruz et al. (2019).

[13] Find out more: https://www.theguardian.com/us-news/the-nsa-files

[14] Find out more: https://pplware.sapo.pt/informacao/prism-o-sistema-americano-que-regista-tudo-o-que-fazemos

time, a British company used data collected through Facebook, without the knowledge or authorization of users, to influence voters in political campaigns in different countries. The impact on billions of users of the world's largest social network led its owner, Mark Zuckerberg, to be questioned in the U.S. Senate and motivated the production of the documentary Hacked Privacy (2019). The incident also sparked off an international debate about using social network data in political campaigns, including in Brazil. In that year's presidential election, there was an exponential increase in the spread of fake news in the country due to data collection and the creation of detailed profiles in hundreds of specific categories for each individual.[16]

Although data collection by platforms and their non-neutrality had already been confirmed in previous surveys and audiovisual productions, such as the documentary Freenet (2016), it was only after the reverberation of these incidents that society awakened. As a positive consequence, several countries have approved regulatory frameworks for personal data and privacy. Based on the European Union General Data Protection Regulation (GDPR), in 2018, the Brazilian General Personal Data Protection Law (LGPD in Portuguese), long defended by lawyers, activists, and companies in the Internet industry, was approved in Brazil and enters into force in 2020. It should be noted, however, that although the LGPD represents a milestone in regulating[17] an increasingly central issue, the Brazilian legal framework already considered the defense of the right to privacy in documents such as the Federal Constitution, the Civil Code, the Brazilian Consumer Defense Code, the Statute of the Child and Adolescent and, more recently, in 2014, the Brazilian Civil Rights Framework for the Internet.

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Digital ecosystem and citizenship

With the approval of the Brazilian Civil Rights Framework for the Internet, which represented a great achievement for civil society, there was hope that education could take on concepts and principles that are increasingly essential to exercise citizenship in a digital environment, such as network neutrality, freedom of expression and privacy. However, the debates and issues that effectively penetrate the educational agenda, whether in the public or private sphere, are still distant from these concerns. It is as if our interactions – and those of our students, children, and adolescents – mediated by various platforms, to which we explicitly contribute with content (images, videos, texts and the like) and with data and metadata, were mere procedures for the much-desired integration of technology with teaching and learning processes. During the COVID-19 pandemic, Antonio Nóvoa, the Portuguese educator and UNESCO ambassador, has been one of the voices highlighting the importance of reflecting on this topic within the educational field.[18]

Such reflections gain even more relevance in a context in which the interface between individuals in educational environments, whether in person or at a distance, has been increasingly mediated by large digital corporations, which act as

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[15]   Find out more: https://www.theguardian.com/news/2018/mar/17/cambridge-analytica-facebook-influence-us-election

[16]   Find out more: https://www.theguardian.com/news/2018/may/06/cambridge-analytica-how-turn-clicks-into-votes-christopher-wylie

[17]   For LGPD to be effective, it is necessary to establish the National Data Protection Authority, an authority responsible for enforcing the law.

[18]   Find out more: https://jornal.usp.br/artigos/e-agora-escola/ and https://vimeo.com/418234051

> In the field of education, the dismay with issues related to privacy and personal data protection is still emerging.

mediators of our online experiences. According to data from the ICT in Education 2019 survey conducted by Cetic.br|NIC.br,[19] 85% of students in urban schools who are Internet users indicate that they have a WhatsApp profile; of these, 61% indicate that they use the application to perform school activities, a number that increased 18 percentage points from 2015 to 2018. An increasing share of this same group (65%) reports having an Instagram profile, which, like WhatsApp, is owned by Facebook.

Although there is a relevant movement in several countries aiming at promoting a critical understanding of technology and media, it is certain that most of the innovative proposals formulated in pedagogical environments, as well as the objectives of methodological practices and teacher trainings disregard Paulo Freire's reflections on the topic – "To me, the question is: at whose service are the machines and advanced technology? I want to know in whose favor, or against whom the machines are being put into use…" (Freire, 1984).

In the field of education, the dismay with issues related to privacy and personal data protection[20] is still emerging. Little is discussed about these concerns with teachers, students, and administrators, and when this topic is brought up, the focus is invariably on the accountability of the end-user. It would be up to each person to "decide" on a "conscious use" of networks and applications. We thus ignore the power and co-responsible role of governments, institutions, and large companies in building and defining this digital ecosystem – delegating responsibility to the end-user to make limited choices is unreasonable.

The decisions regarding the technologies that will be adopted are usually made by the education system's administrative authorities. When, for example, the director of a school or the Secretary of Education defines that the participation of the school community will be via a specific application, what choice do parents or guardians have if they want to keep up with what happens at school, other than using the application? The same goes for the classroom environment. If a teacher creates a class group on a social network, what autonomy does a student have to refuse to be a part of it?

Several topics can be explored based on these questions. The first one is about the existence of power asymmetry between the different school players, capable of becoming, intentionally or not, a form of coercion. Another question is regarding the meaning of "free" services, considering the companies' business model. Adopting such "free" services also reveals the possibility of institutional-based platforms being discontinued, weakening national technological innovation by discouraging solutions created from internal research and development, generating dependence, and undermining the leading role of institutions. Lastly, according to the 5th General Competency of the National Common Curriculum Base,[21] the opportunity to withstand the inertia of the current reasoning is missed, which leads us to "accept the terms" merely to have access to a service. The role of education is vital here, to show that one can (and should) question how technological structures operate, create opportunities to debate, and design new possibilities.

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[19]   Available at: https://cetic.br/en/pesquisa/educacao/

[20]   It is worth noting the difference between the two concepts, which are interconnected but not synonymous. Privacy concerns intimacy and private life, and is taken into account in several Brazilian legislations, such as the Brazilian Federal Constitution and the Brazilian Civil Code. The protection of personal data, as the name says, refers to the act of protecting data, whether public or private.

[21]   Find out more: http://basenacionalcomum.mec.gov.br/implementacao/praticas/caderno-de-praticas/aprofundamentos/193-tecnologias-digitais-da-informacao-e-comunicacao-no-contexto-escolar-possibilidades

In this context, regulations and laws are an important part of the process, since they establish norms or a sharing ethic. The Brazilian General Personal Data Protection Law, for example, determines that companies, governments, and other institutions adapt to improve transparency mechanisms to show how they collect and process personal data. Thus, institutional definitions are created. If the online classes are recorded, where will the recording be available, to whom, and for how long?[22] It can also be determined that those responsible for the students should decide what permissions they will give to share different material produced by the students, on what platforms, and with what type of access.

However, norms are not enough to raise awareness about how the contemporary economic system works. Data sharing occurs implicitly since our behaviors, interactions, breaks, and connections act as value – which is why there are so many "free" offers. Understanding the scale and scope of this information is not a simple task, but it is increasingly crucial. By selecting and promoting content, the algorithms contribute to strengthening worldviews as well as preconceived notions. Researchers such as the Israeli Yuval Harari and the Belarusian Evgeny Morozov have been drawing attention to the threat of "digital dictatorships," that is, the monitoring of populations through statistical probability applications that characterize AI. In this context, open education plays a key role in incorporating technologies into educational environments, promoting a sharing culture, and defending digital rights.

The role of open education

The open education movement has highlighted the importance of fostering a culture of collaboration and sharing as a framework for thinking about contemporary education. Under the terms of the Pocket Guide to Open Education,[23] it:

> *Promotes equity, inclusion, and quality through open pedagogical practices supported by the freedom to collaboratively create, use, combine, alter, and redistribute education resources. It incorporates open technologies and formats, prioritizing free software. In this context, it prioritizes digital rights, including access to information, freedom of expression, and the right to privacy.*

As a global movement that precedes the advent of digital technologies and values knowledge as a common good, open education is directly related to the right to access information. This is achieved by promoting open copyright licenses, especially regarding educational resources that are financed with public money, so that they become available to society. Thus, even those who are not associated with the formal education system are benefited. In 2019, the UNESCO General Conference approved an official recommendation[24] for open education resources, calling Member-States to implement open education policies as part of the demands of the Sustainable Development Goal 4: Ensure inclusive and equitable quality education.

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22 Find out more: https://zenodo.org/record/3964713

23 Available at: https://educapes.capes.gov.br/handle/capes/564609

24 Available at: https://aberta.org.br/recomendacaorea/

(…) open education plays a key role in incorporating technologies into educational environments, promoting a sharing culture, and defending digital rights.

> Open education also connects with the right to freedom of expression, because there is a fundamental value in diversity.

Open education also connects with the right to freedom of expression, because there is a fundamental value in diversity. As it seeks to decentralize knowledge production, it values and highlights the plurality of ideas and authorships, which can be widely shared through formal educational material, intellectual, artistic and scientific manifestations, and communications. In the field of digital rights, the privacy and protection of personal data are essential but not always emphasized by those who defend an open education.

One of the main characteristics of open education is to promote the adoption of open and free technological solutions that offer more freedom, autonomy, transparency, and data control by users. Figure 1 lists the benefits of open source as an example.

Figure 1 - WHY CHOOSE OPEN SOURCE?

ASPECT	BENEFIT
Transparency	Having access to the code allows one to know what the program does, verify what type of data is collected, communicated and how the program guarantees privacy (or not)
Information	The technologies used and the codes are not exclusive to the program creator, because the knowledge is shared with everyone
Security	When the code is publicly available, anyone with the necessary knowledge can contribute to improve it or correct any security flaws. In proprietary code this can only be done by the original programmers
Maintenance	When the code is open, it is easier and faster to keep the software up-to-date and provide enhancements. In closed code, this depends on the program vendor
Cost	Although not all open programs are completely free, there are many more providers, which eliminates dependency on a single service provider

Source: Prepared by the authors.

Although development and supply of open technologies are growing, they are not very explored in the field of education, which is the area that should benefit the most, because of its potential to experiment and suggest improvements to the developer community. We talk about "maker education," but little about "hacker ethics."[25] Both are part of a concept of education that promotes the understanding of how things work so that, based on this knowledge, people can recreate with freedom and collaboration. We talk about forming autonomous citizens, but we still prefer to condition them to ready-made and closed solutions.

Educators and administrators point out challenges that arise when there is an increase of open solutions, like the lack of knowledge about suppliers and the lack of best practices dissemination in schools. Aimed at assisting schools to learn about potentialities and explore them, with UNESCO's support, the Open Education Initiative[26]

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[25] Find out more: http://www.ihu.unisinos.br/172-noticias/noticias-2012/515929-as-criancas-sao-todas-originalmente-hackers-constata-pekka-himanen

[26] The Open Education Initiative aims at serving and connecting the Brazilian education ecosystem, bringing together projects of the UNESCO Chair in Distance Education and the Instituto Educadigital. The projects, carried out since 2007, involve academic research, publications, resource and repository production, as well as in-person and distance education. Find out more: https://aberta.org.br/sobre

launched the Open Services Map[27] where users can search for service providers. Other initiatives are the Free Choice[28] project, which focuses on finding open source alternatives for educational purposes, and the Comunica[29] project, which allows some of these services to be tested.

We urgently need to understand the importance of digital rights and how they can directly ensure an open education where technologies are integrated with inclusive and equitable perspectives. Considering that advances in AI are inevitable and may offer both benefits and threats, as the Brazilian researcher and professor Dora Kaufman puts it, it is up to society to become aware of AI's functioning and logic to attempt to mitigate or eliminate its risks. "The more aware institutions and individuals are of the interference of AI algorithms, the greater our capacity to minimize and/or eliminate negative impacts."[30]

We believe it is vital to introduce assertive public and institutional policies that promote the principles of open education, considering and aligning the universal right to education with digital rights, taking on a more active, critical, and co-responsible stance towards partnerships with companies that maintain services based on proprietary technologies, with a shift towards the adoption of free and open technologies in education.

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We urgently need to understand the importance of digital rights and how they can directly ensure an open education where technologies are integrated with inclusive and equitable perspectives.

[27] Find out more: https://msa.aberta.org.br

[28] Find out more: https://escolhalivre.org.br

[29] Find out more: https://comunica.aberta.org.br

[30] Find out more: http://www.ihu.unisinos.br/159-noticias/entrevistas/599769-a-relacao-entre-o-homem-e-a-tecnica-e-o-alicerce-para-projetar-o-futuro-civilizatorio-entrevista-especial-com-dora-kaufman

Interview I

Internet Sectoral Overview (I.S.O.)._ Considering the increasing presence of Artificial Intelligence (AI) in children's daily lives – for example, in toys, educational tools and social networks –, what are the main opportunities and risks in the adoption of this technology by children?

Sandra Cortesi (S.C) and Alexa Hasse (H.S)._ It's important to note that we are still in the initial stages of understanding the impact of AI on society, and the technology itself is still evolving, too. The same may be said in the context of youth. We recently launched a report[31] that explores the ways in which different AI applications have started to shape young people's lives across different domains, such as education, health and well-being, and the future of work.

In terms of education, AI can be used in the form of personalized tutors, or interactive learning resources that are adapted to the interests and the needs of a young person. With respect to health and well-being, AI systems have been used to assess and treat medical issues (particularly around mental and behavioral health) through public health interventions, therapeutic chatbots, and diagnostic tools. Such resources help facilitate diagnosis and treatment and promote societal awareness around complex health issues, creating opportunities for earlier intervention and pathways of care for vulnerable youth.

Overall, we're optimistic that advances in AI systems will bring many opportunities to new generations and empower them so they can shape our society's future. At the same time, we have observed a number of open questions that are cause for concern. There is a risk of undermining young people's privacy if companies that develop AI-based systems, such as ed tech applications, are not clear about how they store and collect users' data, and what may be done with the data. Additionally, the complicated interplay between data sets and algorithms that drive the AI "black box" raise concerns around transparency and accountability, as well as around bias and discrimination. There are also questions around the ways in which AI may exacerbate existing inequalities among youth of different regions (e.g., Global North and Global South), races, and socio-economic statues. Finally, very little is done to empower youth[32] to become key contributors to the design and development of AI. Looking ahead, as we've seen from prior cycles of technological advancement, it's essential that we — including parents, caregivers, educators, academics, international organizations, and companies — work together to ensure the positive uses of these technologies while mitigating the risks they may come with.

I.S.O._ Although AI is increasingly present in our society, the digital gap still persists worldwide. How may inequalities related to digital skills hinder the benefits of AI by children from different socioeconomic contexts? What role may gender, race and class play in this debate?

S.C. and A.H._ Inequities in access to the Internet and digital technologies present key challenges to youth's adoption of AI and learning the requisite skills to interact with these systems. Approximately 29% of youth across the globe[33] (or

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[31] Available at: https://cyber.harvard.edu/publication/2019/youth-and-artificial-intelligence/where-we-stand

[32] Find out more: https://www.wired.com/story/ai-innovators-should-be-listening-to-kids

[33] Find out more: https://www.unicef.org/publications/index_101992.html

346 million individuals ages 15-24) do not have access to the Internet, mirroring economic inequalities around the world.[34] In the context of AI, lack of connectivity and access to devices may entail,[35] for instance, limited functionality (restricted only to using voice-based interaction systems, such as Siri, on a mobile phone) and content availability (only the use of AI-based applications that draw information and data from a few sources).

With limited functionality and restricted content, youth may not develop the full range of skills — including practical, physical, cognitive, metacognitive, and social and emotional[36] — to leverage AI. For example, with respect to physical skills, users may not understand how to fully operate different AI devices. In terms of cognitive skills, it may be more difficult for young people to critically consider how the algorithms shape the content they see on AI-powered systems if such content is drawn from limited sources. In turn, the skills needed to use AI intersect with variables such as gender, race, and class.

I.S.O._ Unprecedented amounts of datasets, including children's data, are being used to train AI algorithms. How can children's personal data be protected? How can issues such as privacy and consent be addressed? What are the responsibilities of different stakeholders?

S.C. and A.H._ It's key to apply a holistic frame that not only prioritizes the protection of young people and their privacy (and by extension, the protection of their personal data), but also their participation and access to digital technologies, relevant skills, and agency. However, there are many complexities involved and tensions to be navigated carefully. One challenge is that online participation (e.g., on social media), often involves the sharing of personal information (e.g., pictures, preferences, friends). What is needed is not only robust privacy safeguards, but also safeguards that are in sync with youth's needs, attitudes, and expectations. Second, in order for AI systems to be relevant for youth — particularly young people from underrepresented communities — the inclusion of their data may be necessary.

While many efforts have been launched to address privacy and create training data for AI systems, youth-specific guidelines are still under development. In this sense, traditional privacy safeguards — such as consent — may no longer be sufficient. If a user refuses to give consent — and, in turn, permission for platforms and services to collect data — they will be refused the benefits of the platform or tool in question, which creates a one-way relationship with minimal room for negotiation.[37] Even though parents and caregivers may consent to young people's use of certain platforms and services, the question remains as to what extent adults understand[38] how their children's data is being used and processed for different purposes, such as targeted advertising or predictive analytics.

To address all these complexities, different stakeholders — such as government, private sector, and academia — need to work together to develop innovative ways to in-

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34 Find out more: https://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2017.pdf

35 Find out more: https://onlinelibrary.wiley.com/doi/10.1002/hbe2.140

36 More information on these skills, drawn from the document "Skills for 2030," by the Organization for Economic Co-operation and Development (OECD), is available in Section 4, item 1 of the following report created by our team: https://cyber.harvard.edu/publication/2020/youth-and-digital-citizenship-plus

37 Find out more: https://www.lse.ac.uk/media-and-communications/assets/documents/research/projects/childrens-privacy-online/Evidence-review.pdf

38 Find out more: https://www.unicef.org/innovation/media/10726/file/Executive Summary: Memorandum on Artificial Intelligence and Child Rights.pdfIntelligence and Child Rights.pdf

corporate youth[39] in the design, development, implementation, and evaluation of AI systems, as well as the enactment of next-generation privacy and consumer protection laws. Formats such as youth labs, youth boards, and co-design approaches can inform designers and policymakers in the private and public sectors so as to build and deploy AI-based applications that both empower youth and provide adequate levels of protection and safety nets.

Article II

Artificial Intelligence: Including the Perspective of Children and Adolescents in the Debate

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The rapid transformations that we have experienced since the spread of digital technologies have placed Artificial Intelligence[42] (AI) at the core of public debates. AI-based systems are now making recommendations, forecasts, or even decisions which are based on an objective defined by those who develop them (OECD, 2019).

In face of the growing presence of digital technologies in our daily lives, it can be difficult to differentiate what is and what is not mediated by them. Whereas adults find themselves inserted in digital environments with tools that facilitate their personal and professional lives, such as devices and online applications, children and adolescents participate in this world through interactions with technologies that are, in general, mediated by virtual assistants (or even "friends"). Based on AI, such assistants know their tastes and doubts and can anticipate searches and desires like few others.

Adults understand the social roles, uses, appropriations, and means of interacting with technological resources in a different way than children and adolescents. However, generational factors are not the only threshold for different perceptions

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[39]   Find out more: https://www.youtube.com/watch?v=fpz9x199pgE

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[42]   Agreeing with Fjeld et al. (2020), the present text takes the concept adopted by the Independent Group of High Level Experts on Artificial Intelligence as a reference, created by the European Commission: "AI systems are software systems (and possibly also hardware) designed by human beings, who, having received a complex objective, act in the physical or digital dimension, perceiving their environment with the acquisition of data, interpreting the structured or unstructured data, reasoning about knowledge or processing information resulting from that data, and deciding the best initiatives to be taken to achieve the established goal. AI systems can use symbolic rules or learn a numerical model, as well as adapt their behavior by analyzing how the environment has been affected by their previous actions."
Available at: https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai

about digital technologies. Socioeconomic and cultural aspects must also be considered to understand the forms of interaction between humans, devices and digital environments, as well as the new challenges posed to the promotion, the protection, and the provision of rights.

Given that the use of technologies and platforms based on integrated AI systems can impact the experience of girls and boys (UNICEF, 2020), hearing the perceptions of young populations on how they benefit from these platforms, their concerns, and their fears about the online environment is of utmost importance. As technological systems advance in establishing relationships that are increasingly closer to users, it is important to be mindful of the data that feed them.

In this sense, the growing use of AI-based systems, including by children and adolescents, raises questions related to the design and development of these systems; the pertinence and representativeness of the data that feed them; the protection and privacy of children's personal data; and the rights that must be guaranteed.

Representatives of international organizations, the government, the technology industry, non-governmental institutions and civil society from different parts of the world have been dedicated to developing guiding principles for policies and actions regarding AI. In order to join efforts to ensure the ethical and equitable development of AI, these actors have considered questions such as: Are systems appropriate for the use of children? Are the different identities of young populations represented in the applications? Are the systems suitable for different social, cultural, and economic contexts? What lies behind the systems that are based on the personal data of children and adolescents? Despite the expressive number of documents on this matter and also the fact that they are in considerable alignment, few are directed specifically towards the empowerment and safeguarding of children and adolescents in their relations with such systems, which is essential to guarantee their rights.

Although the Convention on the Rights of the Child (CRC) is considered the most comprehensive legal framework in terms of protecting their rights, it does not directly address the challenges posed by technologies and AI-based platforms due to the constant and rapid technological changes (UNICEF, 2019). However, the CRC serves as a guide, since it identifies rights that may be impacted, such as the right to privacy, to education, to non-discrimination, and to participation (UNICEF, 2019). Based on the latter, it is possible to explore the importance of including topics related to children and adolescents in the development of public AI policies, as well as in the design of technologies aimed at young populations.

In the context of promoting and protecting the rights of children and adolescents in the digital age, with the support of the Government of Finland, UNICEF held, between 2019 and 2020, global consultations[43] with experts in AI, childhood, and digital rights to elaborate the Policy Guide for Artificial Intelligence and Childhood.[44] Bearing in mind the importance of giving a voice to young populations in the processes that involve them, the project included workshops offered to this audience,[45] whose perceptions were considered in development of the Guide.[46]

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[43] More than 200 experts from 39 countries participated in the workshops, which took place in five cities, covering five regions: North America (in New York, United States); Europe (in Helsinki, Finland); Africa (in Cape Town, South Africa); Latin America and the Caribbean (in São Paulo, Brazil); and East Asia and the Pacific (in Bangkok, Thailand).

[44] Find out more: https://www.unicef.org/globalinsight/featured-projects/ai-children

[45] Conducted in five countries – Brazil, Chile, South Africa, Sweden, and the United States – the workshops involved roughly 250 children and followed the guidelines designed by UNICEF, based on a participatory methodology.

[46] After the first version was released in September 2020, the document received contributions from a public consultation. The final version is scheduled for release in December 2020.

With the growing integration of AI into our daily lives, it is necessary to discuss the opportunities and challenges brought upon by such technology, especially when referring to young populations and respect for their rights.

UNICEF Brasil was part of this initiative, as well as the Regional Center for Studies on the Development of the Information Society (Cetic.br|NIC.br) and SaferNet Brasil, all who acted as partners in consultations with government representatives, the private sector, non-governmental institutions, and civil society in Latin America and the Caribbean.[47] Two workshops were also held with children, in Manaus (AM) and São Paulo (SP). This article brings together perceptions elaborated from the perspective of the 42 participating adolescents, aged between 12 and 19 years old, on the following topics: risks and opportunities related to AI; impacts of these technologies on their rights and well-being; measures to maximize the benefits and mitigate the harm of AI systems for young populations.[48]

Artificial Intelligence and youth: the Brazilian context

With the growing integration of AI into our daily lives, it is necessary to discuss the opportunities and challenges brought upon by such technology, especially when referring to young populations and respect for their rights. Data from the ICT Kids Online Brazil 2019 survey, conducted by Cetic.br|NIC.br, point out that 89% of children and adolescents aged 9 to 17 were Internet users;[49] of these, 95% reported using their cell phones to access the Internet. In addition, 68% said they used social media, and 79% sent instant messages.

Such data show that children and adolescents' access, use, and interact with AI-based technologies. As noted by UNICEF (2019), platforms such as YouTube use algorithms to recommend content and, especially in the case of YouTube Kids, mediate appropriate videos for this audience. Besides the concern with opacity and lack of transparency in relation to algorithms (UNICEF, 2019), there is also the challenge of possible exposure to market content. According to results from the 2018 edition of the ICT Kids Online Brazil survey[50], over half of children and adolescents using the Internet had contact with advertising on social networks and video websites.

Although we already have AI-based algorithms incorporated into platforms and other online applications that are used by children, the perception of the presence of these systems is not intuitive and may be hampered as interactions with such technologies become more integrated. Therefore, to capture children's understanding of the topic we first need to identify how this population understands AI-based systems and interacts with them.

When encouraged to comment on what they think when they hear the term "Artificial Intelligence" – a concept for which the definition is not consensual even among experts –, participants in Brazilian workshops mixed examples that range from technologies present in everyday life, such as virtual assistants (Siri, Alexa, Google Assistant), store and bank assistants (Bradesco's BIA, Vivo's Aura and Magazine Luiza's Lu[51]), to cases of science fiction (Terminator, Matrix, Iron Man, Mark

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47 The report of this consultation with experts is available at: https://www.unicef.org/globalinsight/media/1011/file

48 The workshop data was recorded in written activities, audio recording, and reports, the latter shared with global UNICEF.

49 To be considered Internet users, they had to use the Internet at least once in the three months preceding the interview. Learn more: https://cetic.br/pt/pesquisa/kids-online/indicadores

50 Available at: http://cetic.br/en/arquivos/kidsonline/2018/criancas#tabelas

51 Translation note: the examples cited by adolescents relate to names of virtual assistants of well-known brands in Brazil: Bradesco, a Brazilian Bank; Vivo, a telecommunications company in Brazil; and Magazine Luiza, a Brazilian retail company.

50, Ultron). That is, while they perceive the presence of AI in technologies that are used on a daily basis, they also refer to fictions and distant futures that border dystopian scenarios.

Opportunities and challenges

In relation to the systems that are used in daily life, children and adolescents mention the following as benefits related to the use of AI: quick and practical access to information; the agility to carry out specific activities; the suggestion of films and music suited to personal tastes; improvement in the diagnosis and in the treatment of diseases; the development of cars that drive themselves; and the possibility of learning new languages. In addition to aspects related to daily activities made easier, the young population also considers the potential of developing personalized systems to accompany the elderly, improve accessibility, and help those with difficulty in learning, for example.

Although the opportunities observed by participants arouse their interest and encourage them to think about future scenarios, reservations are shown in their questions and concerns about: the use of their data; lack of clarity about the stages in the development of systems; possible social impacts; the future of work; and uncertainties in relation to both the control and accountability of the actors involved in the entire technology development chain.

The concerns participants showed during the workshops demonstrate that core aspects to the discussions on AI – such as privacy and protection of personal data – are part of their worries, reinforcing the need for AI principles to be adapted to the demands of young populations. Among the questions raised are: "Who exactly creates AI systems?", "How does it [AI] work and do the things it should?", "How are my data used, where are they stored and who has access to them?" and "Who is responsible for such data?". Other topics cited were: "Data leakage and the invasion of people's privacy" and "The intention, the real purpose of some technologies."

Along with the call for transparency – "full transparency, please" –, the concerns raised by children and adolescents can be understood as ways of claiming systems that consider the protection of personal data, ensure that the data are not subject to external attacks, are reliable and operate as proposed. It is worth assessing which measures aimed at transparency, privacy, and safety should be taken, not only considering the usage of systems, but also throughout their entire useful life – "There is no way we can know how such information is used or what happens next with it. I think it's stored, isn't it?" [on the use of chatbots in the health field by children and adolescents] (girl, 17 years old, São Paulo).

The complexity involved in the development of AI-based systems creates significant challenges for the governance of these initiatives, since, in addition to the technical implications, their implementation and usefulness are not always clear. AI governance is essential to establish shared guidelines and policies for the various sectors and actors that are related to AI, either directly or indirectly. Specifically for young populations, such normative instruments must guarantee rights.

"Who exactly creates AI systems?", "How does it [AI] work and do the things it should?", "How are my data used, where are they stored and who has access to them?"

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We must always give our opinion. This can be done by voting, with everyone knowing about it, for example. Because I didn't even know about this [facial recognition on São Paulo subway], then you get to the subway and there are cameras? People who use public transportation need to be consulted and [to have] this clarified as well: What are the proposals for this? Why is this going to happen? Not simply put cameras there. And several tests must be done also […] will it be efficient, or will it just cost more money? (Girl, 17 years old, São Paulo)

Fair and equitable Artificial Intelligence

Among the requirements listed by UNICEF (2020) to develop AI systems focused on children and adolescents are: ensuring the inclusion of this population, prioritizing equity and non-discrimination. To fulfill them, it is essential that the process of developing such systems are considered from the beginning, which means looking at data and algorithms (since they influence the results) and at an inclusive design approach. Regarding the data, UNICEF recommends that they represent important characteristics for the groups that will make use of or be affected by these systems, such as gender and culture, in order to minimize possible discrimination. An inclusive approach can guarantee that, regardless of aspects such as age, geographic and cultural diversity, all children can use AI-based technologies, even those that would potentially be excluded due to platform algorithm bias (UNICEF, 2020).

These concerns are raised by the children and adolescents participating in the workshops. Questions regarding "prejudice and the exclusion of people" and "how studies for the improvement of AI work" were raised by young people. Considering that the systems are used for decision making, they question "the coldness and the superficiality with which it [AI] deals with situations" and if "we can be sure there will be no consequences." Just like in previous inquiries, these questions can be associated to claims – in this case, for fair and equitable systems.

Another important aspect is the adaptation of systems to the national and local realities. To this end, policies and guidelines aimed at AI must prioritize the most vulnerable children and adolescents, consider the development of databases that include data from different children, as well as eliminate biases that result in discrimination and exclusion. Such concern is also evidenced in the statements of young people. Although they recognize that AI-based systems can reproduce or intensify discriminatory patterns, they are aware that such problems precede the creation of technologies: "More than half of the Brazilian population is black or has black features [...] The technology is being used, but it is not developed enough to help everyone [...] We live in a racist society, right?" [on the use of AI for facial recognition] (girl, 17 years old, São Paulo).

For being aware of the historical roots of the social problems ad-

dressed, adolescents identify that the under-representation of population groups in the development of AI is associated with the role of those who develop such technologies: "We realize how difficult it is for sexism to end and how it is reproduced by AI. The company will hire more men because it [the database that feeds the AI algorithm] has more CVs of men, and the programmer considered this. Sexism is passed on from men to the machine" (girl, 14 years old, Manaus).

In addition to the reproduction of prejudices by systems fed by non-representative data, decision makers can underestimate the needs of vulnerable or marginalized populations in the creation and development of AI-based systems, which appears in examples cited by young indigenous people. Thus, the importance of AI being inclusive from the beginning is highlighted: "There are indigenous people who do not speak Portuguese properly. Technology needs to be improved because it considers diversity only in Portuguese. Here in Amazonas alone, there are more than 350 ethnic groups with different languages. Technology is not interested in these ethnicities" (boy, 14 years old, Manaus).

If the multiplicity of actors and interests is disregarded in the development of AI technologies, reaching inclusive and effective solutions will be compromised. In this sense, listening to young people from different backgrounds can inspire valuable and innovative solutions: "Pharmacy drugs can have other effects. We have natural remedies. And I believe that it could be safer if AI advised on this type of medicine. It would be important to value and enjoy the culture of natural remedies" [on the use of chatbots in the Health field by children and adolescents] (girl, 14 years old, Manaus).

Participation and guarantee of the rights of children and adolescents

Young participants in the workshops identify that the creation, development, and application of AI systems presuppose human control, and they also recognize the possible impacts arising from specific interests. However, there is a lack of clarity as to who are the actors responsible for ensuring that the opportunities brought by these systems are actually benefitted from and that the risks are mitigated.

The development of systems is strongly associated to scientists and developers working with AI, but there is little mention of the companies (as institutions) responsible for making such systems available. This can represent a misunderstanding by the participants about the AI ecosystem, leading to a lack of understanding about who is responsible for the technologies and what their interests are. In addition, although possible flaws and biases are recurrent in the speeches of young people, references to the development of normative instruments in relation to the role of the State are rare. Although there is criticality on the part

"There are indigenous people who do not speak Portuguese properly. Technology needs to be improved because it considers diversity only in Portuguese. Here in Amazonas alone, there are more than 350 ethnic groups with different languages. Technology is not interested in theseethnicities" (boy, 14 years old, Manaus).

The effectiveness of the promotion, provision, and protection of the rights of children and adolescents in the digital age is established based on the right to participation.

of young populations and power for their engagement in the debate about AI, the gaps in instances of participation cause doubts about how to enter these spaces and from whom they can demand their rights.

Without the specific perspectives and needs of children and adolescents being in fact considered, the development of safe, fair, equitable technologies, geared to the demands of this public, will not be effective. Consulting this population and inserting it in the participation arenas is determinant, having contact with the multiplicity of actors and interests involved in the technology production chain.

The effectiveness of the promotion, provision, and protection of the rights of children and adolescents in the digital age is established based on the right to participation. All the actors that participate in the AI ecosystem need to guarantee the creation of opportunities for the training and critical development of those who will take on the challenges to build fairer societies, in which vulnerabilities are overcome and identities are respected. Creativity, innovation, engagement, and protagonism cannot and should not be denied or underestimated by these actors.

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Interview II

Internet Sectoral Overview (I.S.O.)._ Why is it important to include children's perspectives in the development of Artificial Intelligence(AI)-based platforms and technologies? How can children be empowered and engaged in this discussion?

Steven Vosloo (S.V.)._ Children interact with AI technologies in many different ways, such as through voice assistants, chatbots and adaptive learning systems. Algorithms provide them with recommendations on who to be friends with, what videos to watch and what news to read. Even when not using AI-based platforms directly, children can be impacted such as when automated decision-making systems determine their education access or their families' housing applications. If children's perspectives and contexts are not included in the design of AI platforms the result can be discrimination against certain children based on characteristics like age, gender identities, or geographic and cultural diversity, amongst other characteristics.

Inclusion of children's points of view – such as through youth councils, community consultations and user testing with a *diverse* mix of children –, for example, needs to happen throughout the AI system life cycle, from policy development to design, testing, implementation and ongoing monitoring. We know that for the most part this is not the reality. For AI systems to become child-centered, it must change.

There needs to be a commitment to meaningful and safe participation of children, to ensure children are given agency and opportunity to shape AI systems, make educated decisions on their use of AI and the impact that AI has on their lives. This is new ground and companies, governments and researchers should openly share how they achieved the participation of different groups of children. In addition, it is important to have diversity in AI policy and system development teams, and that they consult a broad range of stakeholders in children's lives, such as parents, teachers, child psychologists and child rights experts.

I.S.O._ What is the role of AI-based social media platforms, products and applications with regard to children's protection of personal data, privacy and consent?

*Jasmina Byrne (J.B.)_* Children are accessing the Internet at younger and younger ages and the COVID-19 pandemic has led to them spending more time with their digital devices. Much of that time is spent on social media platforms that use AI-based services, offer new experiences, advertise products or track and trace children's behavior or their movements. Often, their data is captured by companies or governments alike, without children's prior knowledge or informed consent. This is largely due to the fact that, prior to the deployment of these technologies, transparent and accountable data management frameworks are often not put in place.

We need an integrated and comprehensive approach to children's data governance that puts their needs and rights at the forefront of the AI policy de-

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bate, especially the right to privacy and protection of their data. We need to be able to articulate what outcomes are desirable for children and to assess whether the technologies produce these outcomes. Furthermore, data protection and safeguards need be built into the design of all digital operations and platforms. Companies that design these platforms need to ensure that all information about their products and services is accessible to children in a language they understand, and they also need to demonstrate transparency and accountability for how they achieve these objectives.

I.S.O._ How can international legal frameworks protect the rights of children impacted by the development and use of AI, such as the right to privacy, to education, to play, and to non-discrimination?

J.B._ International legal frameworks need to offer clear guidelines and standards for national governments to develop an appropriate legislation on the use of AI and children's rights. Currently there are no clear international standards that offer such protections to children. The good news is that UNICEF, together with its partners, is currently developing a global policy guidance on children and AI. In addition, we are working on a good governance of children's data manifesto that includes suggestions for the world we want for the new generations, where their data and privacy are safeguarded.

International human rights instruments such as the Convention on the Rights of the Child, offer broad safeguards for children, including respect of their rights to education, play and non-discrimination. These safeguards should be enshrined in all digital and AI policies, and their application should consider the new context. When we talk about the right to education, for example, digital platforms offer huge benefits to those children who are unable to attend the school in person due to the COVID-19 pandemic. AI based platforms also offer personalised learning, quicker assessment of children's learning and better school and district level administration of education results.

However, AI systems can also create biases and unintended negative consequences, as it was recently the case with the British high school leavers' grading that utilised a specifically designed algorithm.[52] International standards help us understand the benefits and be aware of the risks and highlight the norms and principles that need to guide the development of such technologies. The limitation of these norms is that they are not enforceable and often remain as guidelines, and it is up to the states to translate these into their laws. That is why we need a concerted action of all actors (governments and the private sector alike) to ensure that children benefit from these technologies but that they are also protected in the process.

I.S.O._ Can Big Data and AI-based technologies reinforce societal inequalities? How might children be impacted?

S.V._ This is one of the greatest concerns around AI. Since AI systems can process huge amounts of data to make analyses and inferences at an unprecedented speed and scale, the potential for reinforcing societal inequalities is real, especially when the data is biased or unrepresentative. For example, because facial

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[52]   As a result of the COVID-19 outbreak, schools in the United Kingdom were closed, which prevented last-year students to take their final exams. An algorithmic system was created to predict the grades of each student, but the experiment was considered a failure. The algorithm penalised high-performing students in historically disadvantaged schools, while raising the scores of low-performing students in schools that usually do well. The system was set aside and replaced with a manual teacher-led scoring process.

recognition systems are mostly trained on images of white adult' male faces, they work less accurately for faces of children and adults of other genders and ethnicities, such as women of colour. This can lead to discrimination or marginalization of minority communities when used in biometric identification systems and surveillance.

Data is not the only problem: algorithms can reflect or cement social biases. This is the result of a lack of diversity amongst the teams that program the algorithms or a lack of testing and impact assessments. As shown by the case of the British high school students, children can be negatively impacted directly or indirectly through AI systems. Since children often lack the understanding to know when they are being discriminated against, or the power to do something about it, it is possible that the impacts can be even more harmful.

I.S.O._ Are there recommended policies and best practices for children specifically in the development of AI?

J.B. and S.V._ It is hard to suggest policies and best practices because currently there is little currently being done around AI for children specifically. One notable exception is the document "Age Appropriate Design Code".[53] It provides practical guidelines for putting the child at the centre of many of the requirements mentioned here and in our Policy Guidance report,[54] such as data protection, transparency and profiling of children. The report was developed with multiple stakeholders, including Cetic.br|NIC.br, and it calls for application of human-rights-based principles through a child's lens. This serves to promote wellbeing, fairness, non-discrimination and inclusion. It also serves to empower governments and businesses to expand their knowledge of child rights and to promote digital collaboration and investment in digital infrastructure for children. Lastly, it is important to emphasise the need for knowledge sharing of different practises to help these different actors create more child-centered AI policies and systems.

"For example, because facial recognition systems are mostly trained on images of white adult' male faces, they work less accurately for faces of children and adults of other genders and ethnicities, such as women of colour. This can lead to discrimination or marginalization of minority communities when used in biometric identification systems and surveillance."

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[53]   Available at: https://ico.org.uk/media/for-organisations/guide-to-data-protection/key-data-protection-themes/age-appropriate-design-a-code-of-practice-for-online-services-2-1.pdf

[54]   Available at: https://www.unicef.org/globalinsight/reports/policy-guidance-ai-children

Domain Report

The dynamics of registration of domains in Brazil and around the world

The Regional Center for Studies on the Development of the Information Society (Cetic.br|NIC.br) carries out monthly monitoring of the number of domain names in country code top-level domains (ccTLD) registered among G20 countries.[55] Combined, they exceed 79 million registrations. In September 2020, domains registered under .de (Germany) reached 16.55 million, followed by China (.cn), the United Kingdom (.uk) and Russia (.ru), with 15.66 million, 9.49 million and 4.95 million registrations, respectively. Brazil had 4.45 million registrations under .br, occupying 5th place on the list, as shown in Table 1.[56]

Table 1 – REGISTRATION OF DOMAIN NAMES AMONG G20 COUNTRIES – SEPTEMBER 2020

Position	G20 countries	Number of domains	Reference period	Source
1	Germany (.de)	16.559.458	30/09/2020	denic.de
2	China (.cn)	15.666.667	30/09/2020	research.domaintools.com/statistics/tld-counts/
3	United Kingdom (.uk)	9.499.208	01/08/2020	nominet.uk/news/reports-statistics/uk-register-statistics-2020/
4	Russia (.ru)	4.957.768	30/09/2020	cctld.ru
5	**Brazil (.br)**	**4.453.676**	**30/09/2020**	**registro.br/dominio/estatisticas/**
6	France (.fr)	3.590.035	29/09/2020	afnic.fr/en/resources/statistics/detailed-data-on-domain-names/
7	European Union (.eu)	3.517.760	30/09/2020	research.domaintools.com/statistics/tld-counts/
8	Italy (.it)	3.325.148	30/09/2020	nic.it
9	Australia (.au)	3.211.969	30/09/2020	auda.org.au/
10	Canada (.ca)	2.956.350	30/09/2020	cira.ca
11	India (.in)	2.300.000	-	registry.in/
12	United States (.us)	1.668.994	30/09/2020	research.domaintools.com/statistics/tld-counts/
13	Japan (.jp)	1.605.645	30/09/2020	jprs.co.jp/en/stat/
14	South Africa (.za)	1.264.123	30/09/2020	zadna.org.za
15	South Korea (.kr)	1.097.766	01/08/2020	krnic.or.kr/jsp/eng/domain/kr/statistics.jsp
16	Mexico (.mx)	923.224	30/09/2020	research.domaintools.com/statistics/tld-counts/
17	Argentina (.ar)	650.243	30/09/2020	nic.ar/es/dominios/estadisticas
18	Indonesia (.id)	451.488	30/09/2020	pandi.id/?lang=en
19	Turkey (.tr)	424.395	30/09/2020	nic.tr/index.php?USRACTN=STATISTICS
20	Saudi Arabia (.sa)	70.110	30/09/2020	nic.sa/en/view/statistics

[55] Group of the 19 largest economies in the world and the European Union. More information available at: https://g20.org/en/Pages/home.aspx.

[55] The table presents the number of ccTLD domains, according to the sources indicated. The figures correspond to the record published by each G20 country. For countries that do not present or publish official statistics provided by the authority for registration of domain names, the figures were obtained from: https://research.domaintools.com/statistics/tld-counts. It is important to note that there are variations among the reference periods, although it is always the most up-to-date one for each country. The comparative analysis for domain name performance should also consider the different management models for ccTLD registration. In addition, when observing rankings, it is necessary to bear in mind the diversity of existing business models.

Graph 1 shows the performance of .br since 2012.

Graph 1 – TOTAL NUMBER OF DOMAIN REGISTRATIONS PER YEAR FOR .BR – 2012 to 2020*
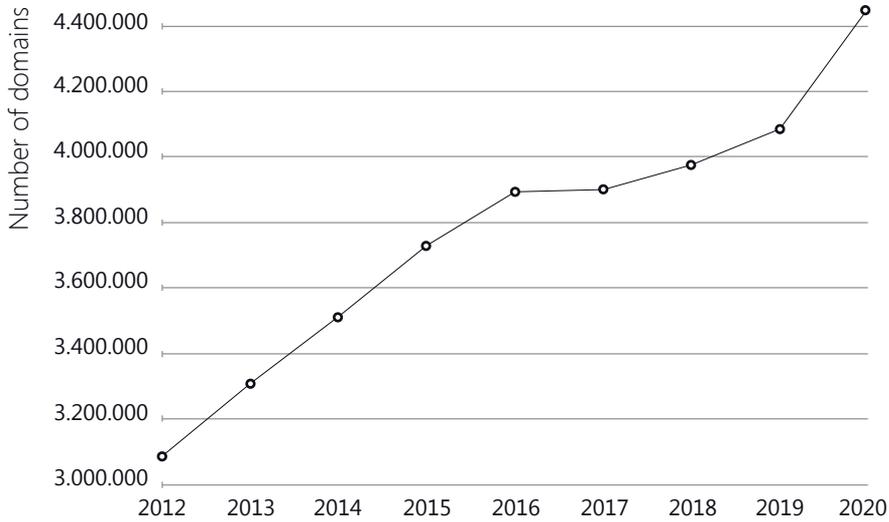
*Data in reference to September 2020.
 Source: Registro.br

In September 2020, the five generic Top-Level Domains (gTLD) totaled more than 182 million registrations. With 149.79 million registrations, .com ranked first, as shown in Table 2.

Table 2 – MAIN GTLDS – SEPTEMBER/2020

Position	gTLD	Domains
1	.com	149.793.611
2	.net	13.266.971
3	.org	10.259.383
4	.icu	5.374.618
5	.info	4.247.731

Source: DomainTools.com
Retrieved from: research.domaintools.com/statistics/tld-counts

CHILDREN, ADOLESCENTS AND ALGORITHMS

Artificial Intelligence (AI) algorithms are present in digital platforms used to carry out several activities – for example, when we choose a movie to watch, search for information or publish content on social networks. How exposed to these algorithms are children and adolescents?

In Brazil, 89% of children and adolescents aged 9 to 17 are Internet users.[57] Of these:[58]

84% LISTENED TO MUSIC ONLINE.

83% WATCHED VIDEO CLIPS, TV PROGRAMS, MOVIES OR SERIES ONLINE.

76% LOOKED UP INFORMATION ON THE INTERNET FOR SCHOOLWORK.

68% USED SOCIAL NETWORKS.

64% LOOKED UP INFORMATION ON THE INTERNET OUT OF CURIOSITY OR OWN WILL.

48% POSTED A PHOTO OR VIDEO ON THE INTERNET IN WHICH THEY APPEARED.

31% LOOKED UP HEALTH INFORMATION ON THE INTERNET.
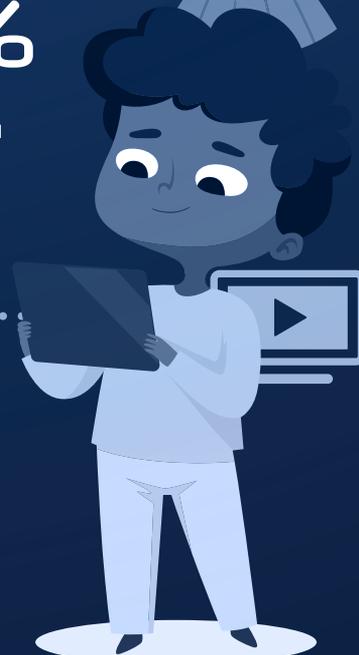
[57] Based on data from the ICT Kids Online Brazil 2019 survey, by Cetic.br|NIC.br. A "user" is someone who used the Internet at least once in the three months preceding the interview. Find out more: https://cetic.br/en/pesquisa/kids-online/indicadores

[58] The data refers to the three months preceding the survey.

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