

# 2022

## Annual Report Cetic.br



**cetic.br**

Regional Center for  
Studies on the  
Development of the  
Information Society

**nic.br**

Brazilian Network  
Information Center

**egi.br**

Brazilian Internet  
Steering Committee

## About CGI.br

The Brazilian Internet Steering Committee (CGI.br) was created with the purpose of coordinating and integrating all Internet service initiatives in Brazil, as well as promoting technical quality, innovation, and dissemination of Internet services.

## About NIC.br

The Brazilian Network Information Center (NIC.br) was created to implement the decisions and projects of the Brazilian Internet Steering Committee.

## About Cetic.br

The Regional Center for Studies on the Development of the Information Society (Cetic.br) is the NIC.br department responsible for the production of indicators and statistics on the availability and use of the Internet in Brazil. In 2012, Cetic.br|NIC.br was approved as a UNESCO Category 2 Center with the mission of monitoring the development of knowledge and information societies in Latin America and the Portuguese-speaking countries of Africa.

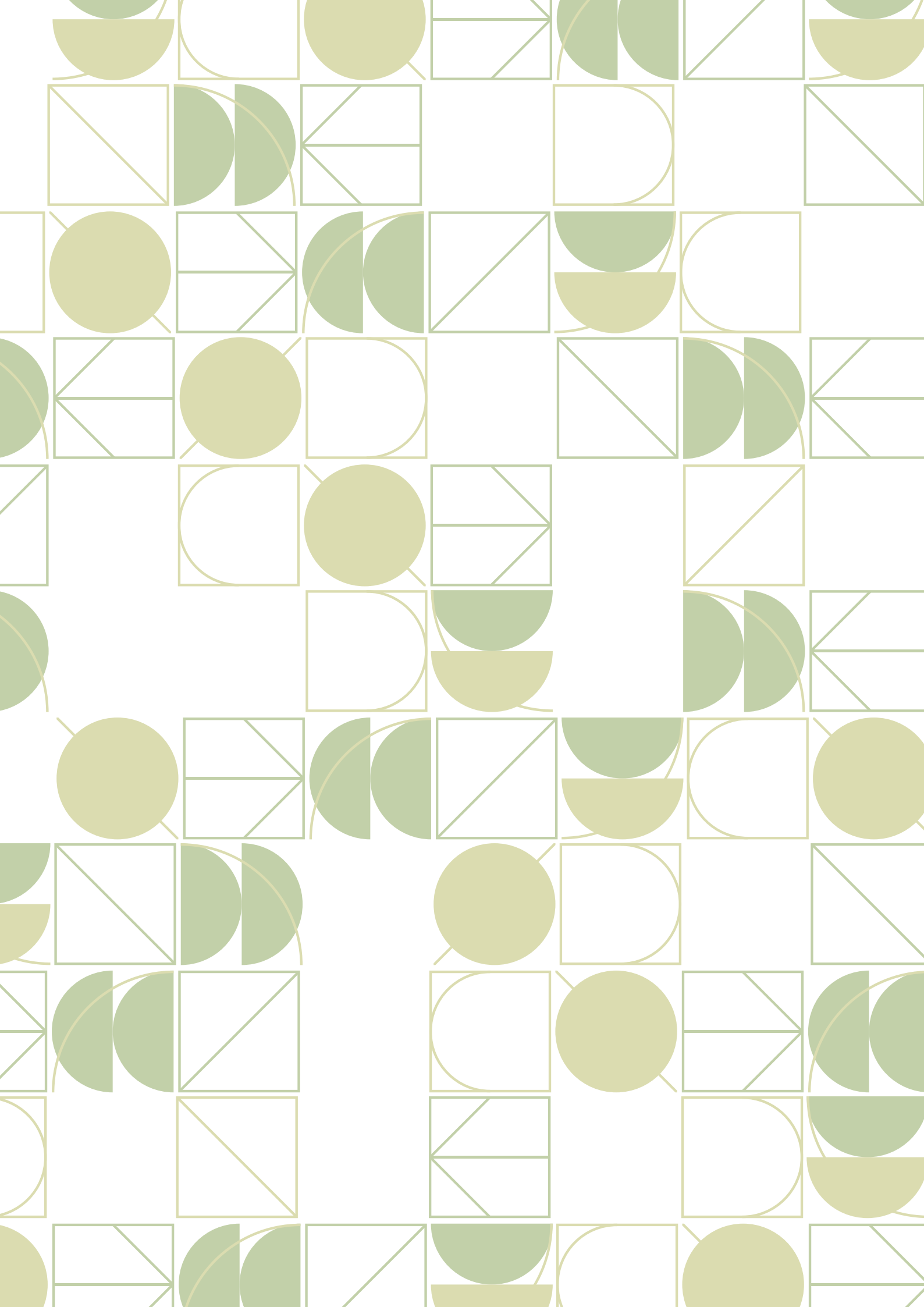


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# Message from the CEO

As we present the 2022 annual report for the Cetic.br|NIC.br, I want to take a moment to reflect on the challenges and opportunities posed by the increasing adoption of disruptive digital technologies such as Artificial Intelligence (AI).

On the one hand, digital technologies have the potential to transform nearly every aspect of our lives, from health care and education to safety and transportation. AI-based applications can perform a wide range of tasks, making use of natural language processing, image and video recognition, recommendation systems, predictive analytics, robotics, and automation.

On the other hand, the adoption of these technologies also generates significant challenges, such as ethical concerns around the use of AI, the potential for job displacement, and the risk of exacerbating social inequalities. There are also concerns around the potential misuse of AI-based applications, such as the potential use of facial recognition technology for surveillance, the spread of misinformation and disinformation at scale, and the use of algorithms that could perpetuate discrimination.

To better understand the implications of this adoption and to take effective action to foster a trusted, safe, and secure digital environment, we need to measure and produce reliable and meaningful statistical data. Operating under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO) since 2012, Cetic.br|NIC.br has become a reference center in the production of statistical data to monitor the implications of the adoption of digital technologies in societies. Following its mission to monitor the development of knowledge and information societies, the indicators, data analysis and policy briefs produced by Cetic.br|NIC.br provide relevant

information capable of driving the actions of a wide range of stakeholders. In this regard, the Center has been continuously striving to explore new frontiers in data production and survey methodologies, including measuring the impacts of new disruptive digital technologies such as robotics, AI, and the Internet of Things (IoT).

During 2022, Cetic.br|NIC.br, along with key partners, started to work towards building an observatory of AI in Brazil. The observatory will serve as a hub for collaboration and knowledge exchange among stakeholders in the AI ecosystem. It is also worth noting the capacity-building initiatives carried out by the Center in measuring access to, use, and adoption of information and communication technologies (ICT) in the context of the UN Sustainable Development Goals (SDGs), and the Internet Universality Indicators (IUIs). In this last area, Cetic.br|NIC.br has been providing technical support to countries in the region that are applying the IUIs. All these initiatives, as well as the data production processes through nationwide surveys on access to and use of ICT, are fully funded by resources derived from Brazil's Internet domain name registry, i.e., the country code top-level domain (ccTLD) .br operated by NIC.br. The .br domain has become one of the largest in the world, reaching more than 5 million domain registrations.

I would like to thank our dedicated staff, partners, and the network of experts for their support and collaboration in the work developed by Cetic.br|NIC.br. Together, we can harness the potential of data to drive policymaking, research and beyond.

**Demi Getschko** – CEO  
Brazilian Network Information  
Center (NIC.br)

# 2022 Highlights

Throughout 2022, Cetic.br|NIC.br carried out a range of initiatives and projects, reinforcing our commitment to advancing the field of measuring access to and use of information and communication technologies (ICT) and their contributions to building knowledge societies. In the current landscape, digital technologies can be leveraged to build better, more inclusive knowledge societies. Because of that, it is critical to have statistical data to measure the impacts of the digital transformation on socioeconomic and sustainable development.

In view of its mission as a UNESCO Category 2 Center, Cetic.br|NIC.br has carried out a wide range of activities that have included comprehensive data collection and analysis through both stand-alone ICT surveys and qualitative research, webinars, public debates, and capacity-building programs. Furthermore, the Center has made significant progress towards its goals of international cooperation by pursuing regional collaboration with countries in Latin America and the Caribbean, as well as with Portuguese-speaking countries in Africa. As a result of these efforts, we have successfully implemented a number of joint projects and initiatives with key stakeholders in the region. Through these collaborations, we have deepened our understanding of the challenges and opportunities posed by the digital transformation. None of these accomplishments would have been possible without the vital support of our strategic partners, who have helped us develop innovative methodological strategies to produce quality and reliable data. In addition, we have facilitated relevant dialogues with key stakeholders regarding digital transformation and the impacts of new emerging

technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI). These partners have played a critical role in helping the Center maintain active engagement in important dialogues with key stakeholders, providing insights and analysis on the digital transformation and the socioeconomic impact of digital technologies. These efforts have helped to raise awareness of the importance of digital technologies in ensuring the region's continued development of its digital ecosystem.

Measuring the development of knowledge and information societies at a disaggregated level is fundamental to identifying digital inequalities and to better understanding the profile of digitally excluded citizens. This requires the production of accurate data to support effective policymaking.

In 2022, Cetic.br|NIC.br continued to promote capacity-building programs, workshops, and public debates focused on policymaking with data user communities in Brazil, Latin America, and Portuguese-speaking countries in Africa. These programs covered theoretical and practical survey methodology concepts, including data collection and data analysis techniques, and reached more than 168 participants. Two relevant programs were: the 12th edition of the NIC.br Annual Workshop on Survey Methodology; and the 8th edition of the School of Digital Transformation. In addition, the "Tech for Good" MOOC had 1,051 participants and the "AI and the Rule of Law" MOOC had 4,432 participants. Our public debates, available online, recorded 6,956 views.

The Center also organized 10 workshops to promote exchange of experiences between national statistical institutes and

international organizations, which included topics on methodological innovations in the production of relevant ICT statistics for the Agenda for Sustainable Development.

The Center also launched 14 new publications and published around 350 indicators collected through national ICT surveys. Big Data sources and web scraping algorithms were also among the innovative strategies implemented in partnership with international organizations.

#### The publications were:

- Seven national surveys on access to and use of ICT;
- Two sectorial studies: “Community networks and the Internet in Brazil: Experiences and challenges for digital inclusion” and “Artificial Intelligence and culture: Perspectives for cultural diversity in the digital age”;
- Four editions of the Internet Sectoral Overview Report: “Digital transformation in health systems”; “Digital technologies, current trends, and the future of education”; “New technologies and innovation in enterprises”; and “Emergent technologies and digital services in the public sector”;
- “Frontiers of digital inclusion: Social dynamics and public policies of Internet access in small Brazilian municipalities.”

“ In 2022, digital transformation continued to reshape society by creating digitally enabled society. The internet and digital technologies have become integral parts of our daily lives, and the increasing availability of digitally-enabled services has accelerated online interactions between individuals and organizations. At Cetic.br|NIC.br, we are monitoring the socioeconomic impacts of digital transformation through our measurement initiatives. Through partnerships with UNESCO and other key stakeholders, we have been able to build capacity, disseminate methodologies for measuring Internet development, and promote debates on digital inclusion, digital skills, and media information literacy. ”

**Alexandre Barbosa** - Head of the Regional Center for Studies on the Development of the Information Society (Cetic.br|NIC.br)

# 2022 Facts & Figures

**622**

Field interviewers involved in data collection

**32**

Field coordination supervisors

**14**

Publications of ICT surveys, NIC.br Sectoral Studies & Internet Sectoral Overview Reports

**34,002**

Interviews carried out in all of Cetic.br|NIC.br's surveys

**472**

Indicators published

**232**

External experts involved in ICT survey projects

**8**

Expert Group meetings (multistakeholder groups)

**2,716**

Media appearances

**4**

New cooperation agreements signed in 2022

**24**

Number of cooperation agreements in force

**6,956 views**

Webinars and public debates organized by Cetic.br|NIC.br

**5,483 participants**

MOOCs: "Tech for Good: The Role of ICT in Achieving the SDGs" and "AI and the Rule of Law"

**168 participants**

Capacity-building and workshops on research methodologies<sup>1</sup>

<sup>1</sup> The participants were enrolled in the following capacity-building workshops: "NIC.br Annual Workshop on Survey Methodology" and "School of Digital Transformation".



# Publications

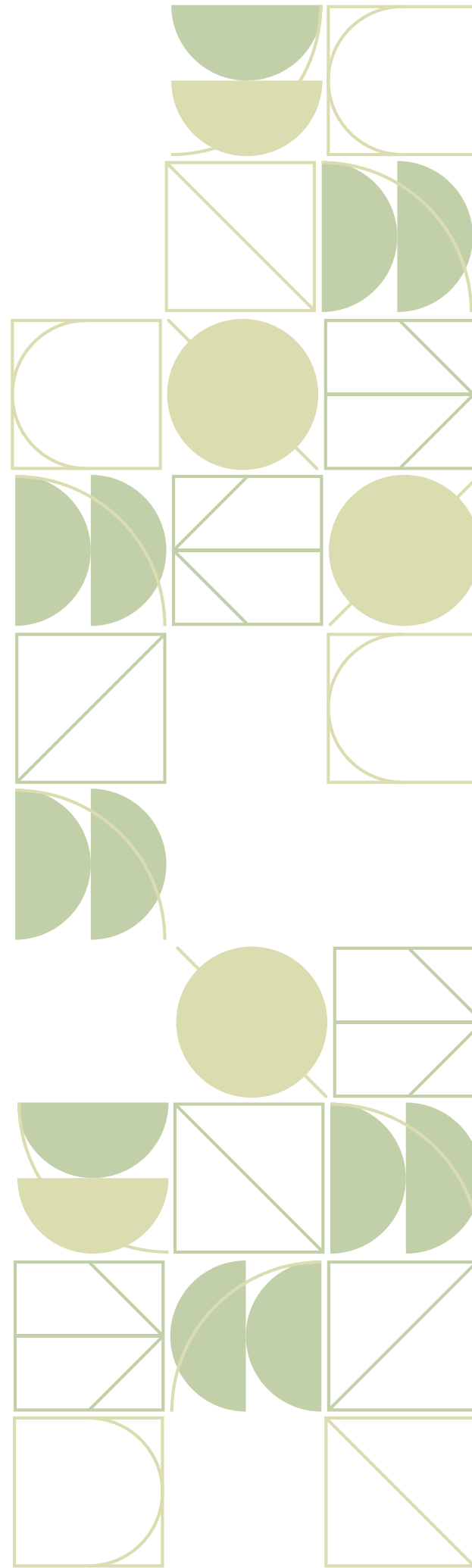
The production of high-quality statistical data to monitor access to and use and appropriation of ICT is a central activity developed by Cetic.br|NIC.br.

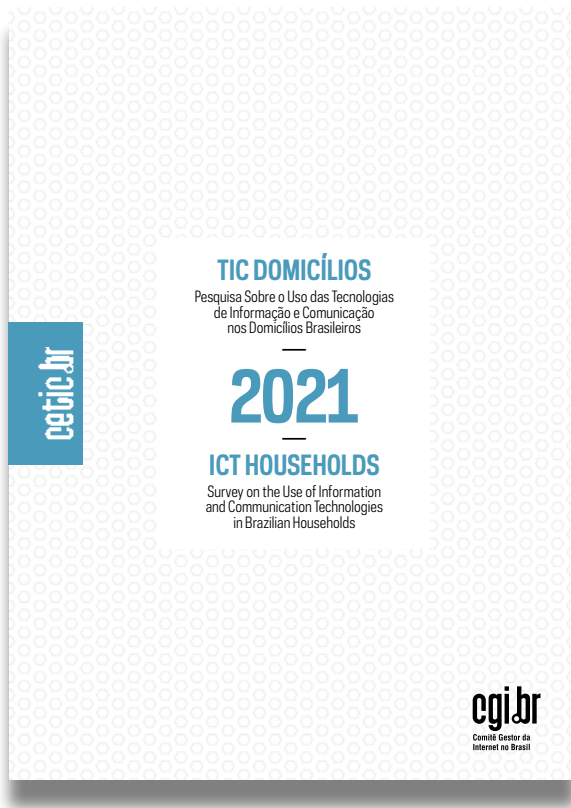
The Center carries out a set of four annual ICT survey projects – related to households, education, health, and children – in addition to regular surveys with other periodicities – such as enterprises, electronic government, cultural institutions, nonprofit organizations, Internet service providers, and Internet public access centers. Besides regular surveys, Cetic.br|NIC.br publishes other studies related to the challenges to digital technology adoption among individuals and organizations using quantitative and qualitative approaches. These projects cover critical areas for monitoring the development of knowledge and information societies, while also generating relevant data for monitoring the sustainable development goals and targets defined by the United Nations (UN) in its 2030 Agenda for Sustainable Development.

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## ICT Households

Carried out annually since 2005, the ICT Households survey aims to measure ICT use in Brazilian households, individual access to computers and the Internet, and activities developed online, among other indicators.

The 2021 edition reached a total of 23,950 households, and face-to-face interviews were carried out between October 2021 and March 2022. The survey showed an increase in the use of mobile phones and televisions to go online, with the latter devices becoming the second most-used by Brazilians for this purpose.

Since the 2015 edition, all of the ICT Households micro databases and documentation have been available for download on Cetic.br|NIC.br's website.

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## Articles published in ICT Households 2021

### **Economic impact of last-mile infrastructure in Brazil**

Raul Katz, Hernán Galperin & Fernando Callorda

### **The challenges confronting the platformization of work in Brazil**

Rafael Grohmann

### **Digital payment adoption in Brazil during the COVID-19 pandemic**

Marcelo Henrique de Araujo, Eduardo Diniz & Lauro Gonzalez

### **Quilombola women, digital divide, and ICT access strategies during the pandemic**

Ivonete da Silva Lopes, Jéssica Suzana Magalhães Cardoso & Daniela de Ulysséa Leal

### **Social networks and news deserts: Regional differences in Internet access**

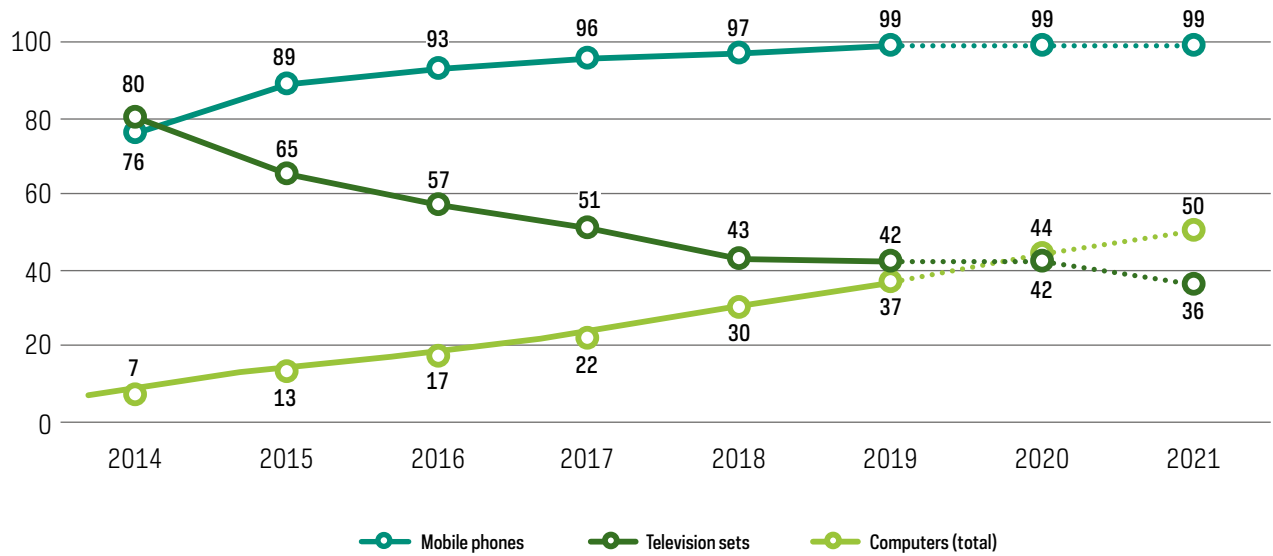
Taís Seibt, Marília Gehrke, Marcos Carreiro & Leonardo Hüffner

### **Evidence on intra-municipal connectivity using non-official data**

Luciano Charlita de Freitas, Sergio Augusto Costa Macedo, Daniel da Silva Oliveira & Humberto Bruno Pontes Silva

### INTERNET USERS BY DEVICES USED (2014 - 2021)

Total number of Internet users (%)



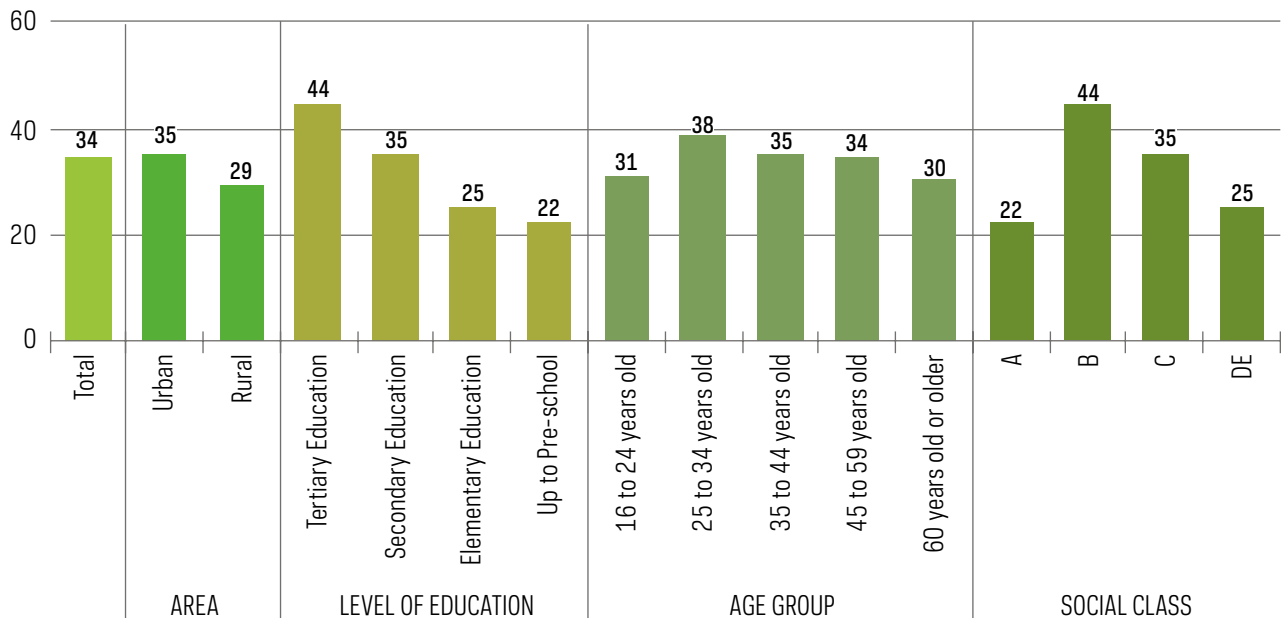
### INTENSIFICATION OF INTERNET USE

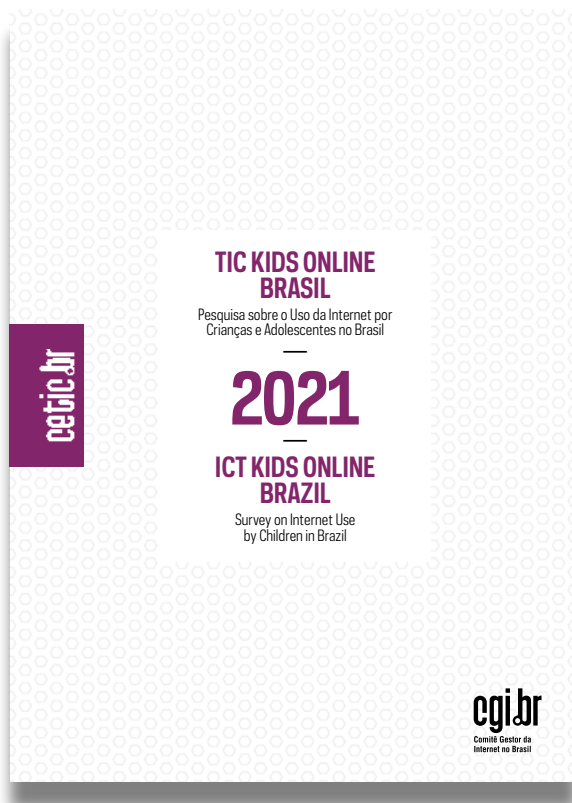
148 million Internet users (81% of population), of which...



### INTERNET USERS WHO CARRIED OUT PUBLIC SERVICES ONLINE RELATED TO PUBLIC HEALTH (2021)

Total number of Internet users 16 years old or older (%)





## ICT Kids Online Brazil

The goal of the ICT Kids Online Brazil survey is to understand how the population 9 to 17 years old uses the Internet and how they deal with risks and opportunities related to its use. It is fully aligned with the methodological framework of the Global Kids Online network and the Latin America Kids Online network.

The 2021 edition presented data on the scenario of online participation of children after the onset of the health crisis caused by COVID-19. It showed that the period was especially challenging for populations living in situations of socioeconomic vulnerability, and those with poor connectivity conditions. Interviews were carried out face-to-face with the target population (children 9 to 17 years old and their parents or legal guardians) in a total of 2,939 households.

Since the 2015 edition, the micro databases and documentation of the ICT Kids Online Brazil survey have been available for download on Cetic.br|NIC.br's website.

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## Articles Published in ICT Kids Online Brazil 2021

### **The National Common Curricular Base and activities of children on the Internet: A comparison and evaluation**

Guilherme Forma Klafke, Deíse Camargo Maito, Cecília Barreto de Almeida, Marina Feferbaum & Kelli Angelini

### **Advertisement policy on child content: Gaps for digital citizenship on YouTube**

Renata Tomaz, Brenda Guedes & Maria Clara Monteiro

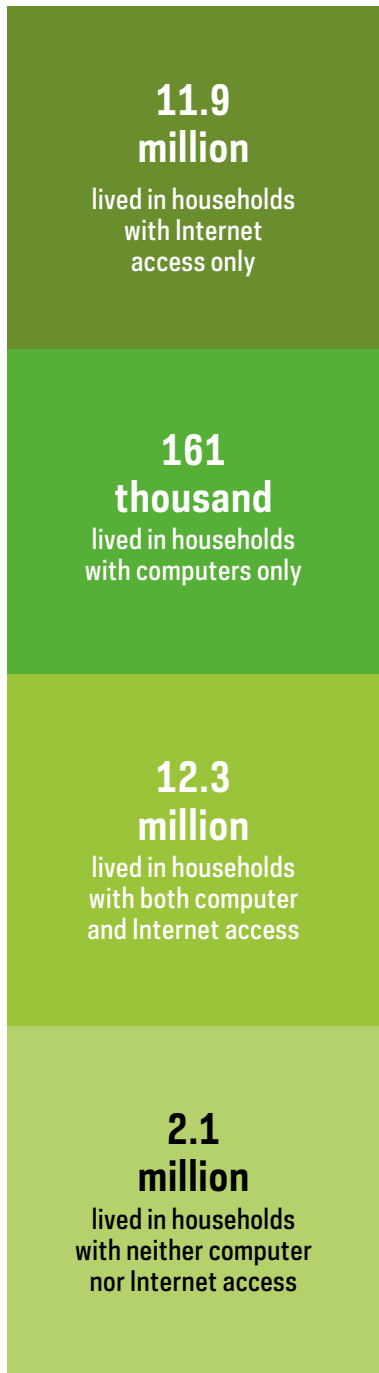
### **Conditions for the development of digital literacy of children**

Mônica Daisy Vieira Araújo

### **Internet and childhood: The impacts of inequalities on children in rural communities and traditional territories**

Iara Moura, Olívia Bandeira, Paulo Victor Melo & Tâmara Terso

Among Internet users aged 11 to 17 years, **32%** reported **seeking online help** for dealing with negative experiences or sharing their emotions when they felt sad.



**CHILDREN BY ACTIVITIES CARRIED OUT ON THE INTERNET (2021)**

Total number of Internet users 9 to 17 years old (%)



Played games online without other players



Played games online with other players



Downloaded applications



Looked up information on the Internet for schoolwork



Watched videos, shows, films or TV series online



Listened to music online



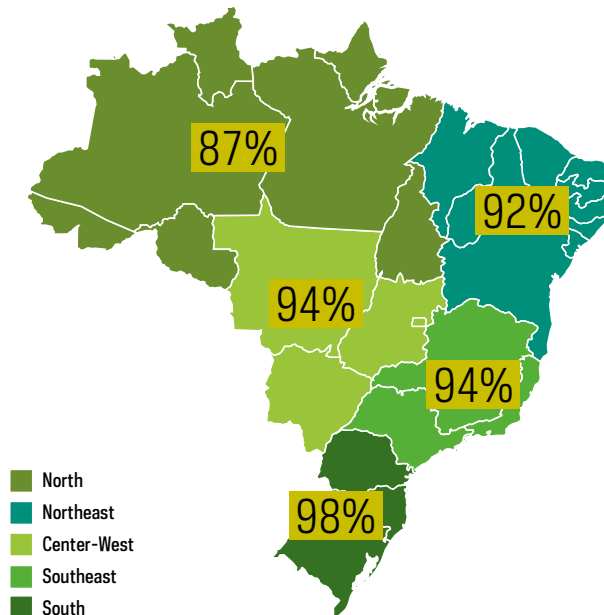
Sent instant messages

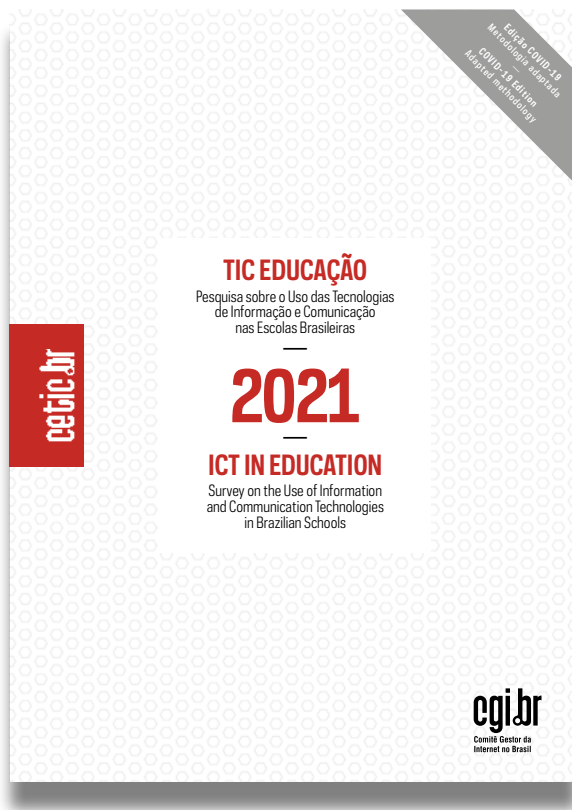


Accessed social networks

**CHILDREN WHO WERE INTERNET USERS (2021)**

Total number of Internet users 9 to 17 years old (%)





## ICT in Education

Carried out annually since 2010, the ICT in Education survey aims to investigate ICT access, use, and appropriation by students, educators, and school managers in Brazilian public and private Primary and Secondary educational institutions located in urban and rural areas.

The 2021 edition mapped the pedagogical practices carried out during the COVID-19 pandemic and encouraged reflection on post-pandemic education. Interviews were carried out with 1,865 teachers and, for the first time, it was possible to interview teachers from schools located in rural areas, providing data of great relevance for educational policies.

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### Articles published in ICT in Education 2021

**From inclusion to literacy: Skills for a less asymmetric insertion in the digital world**

Rafael de Almeida Evangelista

**Platforms, algorithms, and de-citizenship: The school curriculum as an antidote**

Fernando José de Almeida, Maria da Graça Moreira da Silva & Tatiana Sansone Soster

**Education, computing, and Artificial Intelligence**

Rosa Maria Vicari & Helder Coelho

**The empowerment of peripheral girls in São Paulo city through digital information and communication technologies and media and information literacy to leave no one behind**

Maria Rehder

**Non-face-to-face education and evidence of inequality during the COVID-19 pandemic**

Ana Lucia Lima, Esmeralda Correa Macana & Matheus Nunes de Freitas

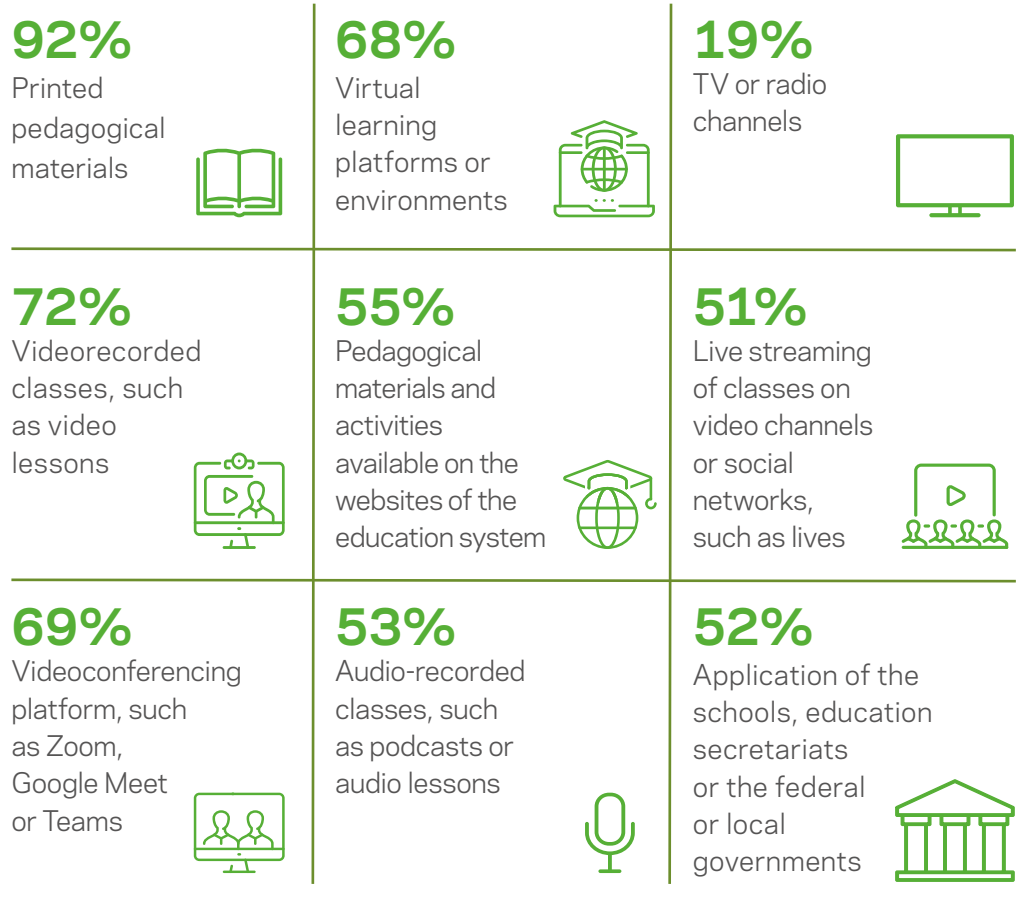
**How to connect Brazilian schools: An overview of the challenges of connection and coverage**

Ana Luiza Prado de Almeida, Beatriz de Moraes Rodrigues & Flavio Prol

91% of teachers used instant messaging applications to answer students' questions during remote activities

**MEANS OF COMMUNICATION USED BY TEACHERS IN REMOTE OR HYBRID CLASSES OFFERED BY SCHOOLS (2021)**

Total number of Primary and Secondary Education teachers whose schools offered remote or hybrid classes (%)



**65%** of public school teachers participated in continuing education courses in the 12 months prior to the survey

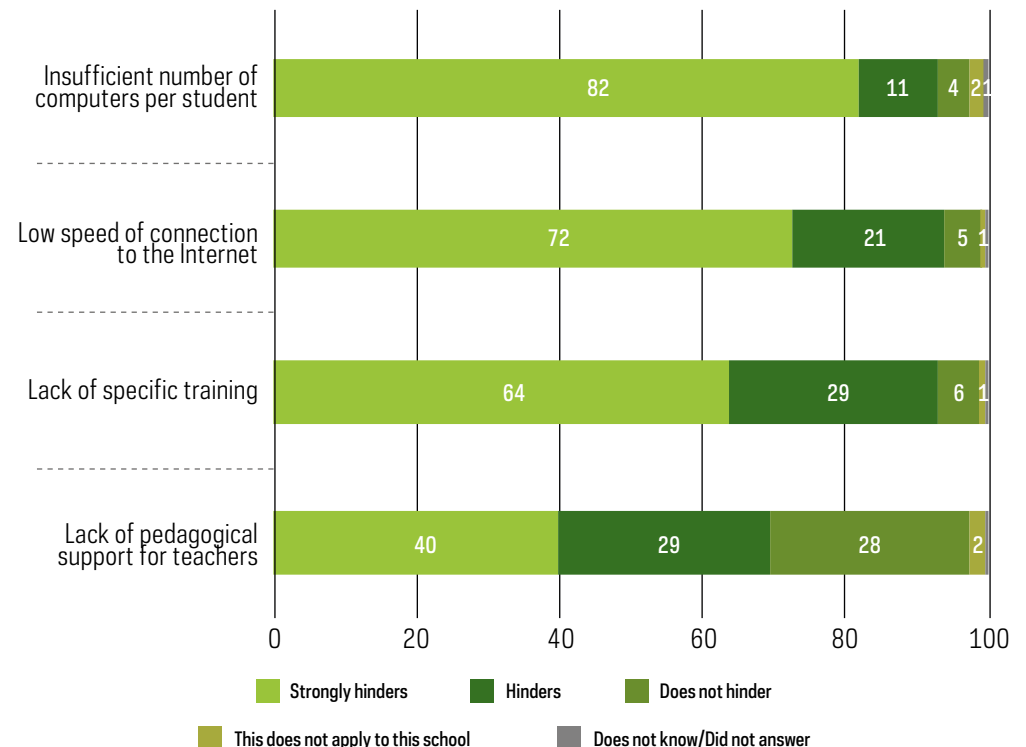
**55%** participated in training courses about distance and hybrid education

**52%** participated in training courses on the use of digital technologies in student assessment

**37%** participated in training courses on ways to guide students regarding safe use of digital technologies

**PERCEPTIONS OF PUBLIC SCHOOL TEACHERS OF BARRIERS TO ICT USE IN SCHOOLS (2021)**

Total number of Primary and Secondary Education teachers of public schools (%)





## ICT in Health

Since 2013, the ICT in Health survey has been conducted to produce indicators on the adoption of ICT in Brazilian healthcare facilities and their usage by healthcare professionals such as physicians and nurses.

For the 2022 ICT in Health survey, interviews were conducted in 2,127 healthcare facilities and with 1,942 healthcare professionals. The survey showed an increase in the use of technologies by healthcare professionals compared to the scenario before the pandemic. It also investigated the use of new technologies by healthcare facilities, including Big Data analysis and AI.

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## Articles published in ICT in Health 2022

### **Digital health in Canada**

Elizabeth M. Borycki, Evangeline M. Wagner & Andre W. Kushniruk

### **On the reputation of medical AI: Metrics and concepts to evaluate AI systems in medicine**

Federico Cabitza & Andrea Campagner

### **The use of information and communication technologies in continuing education in healthcare**

Alessandra Aniceto Ferreira de Figueirêdo, Fernanda Pereira de Paula Freitas, Lucas Pinto de Amorim, Rafael Oliveira Pitta Lopes & Renata de Carli Rojão

### **Capacity building in digital health: Experience at Hospital Italiano de Buenos Aires – Argentina**

Paula Otero

### **The future of health and the KIWs – Digital health, multiprofessionalism, and hospitals in the future**

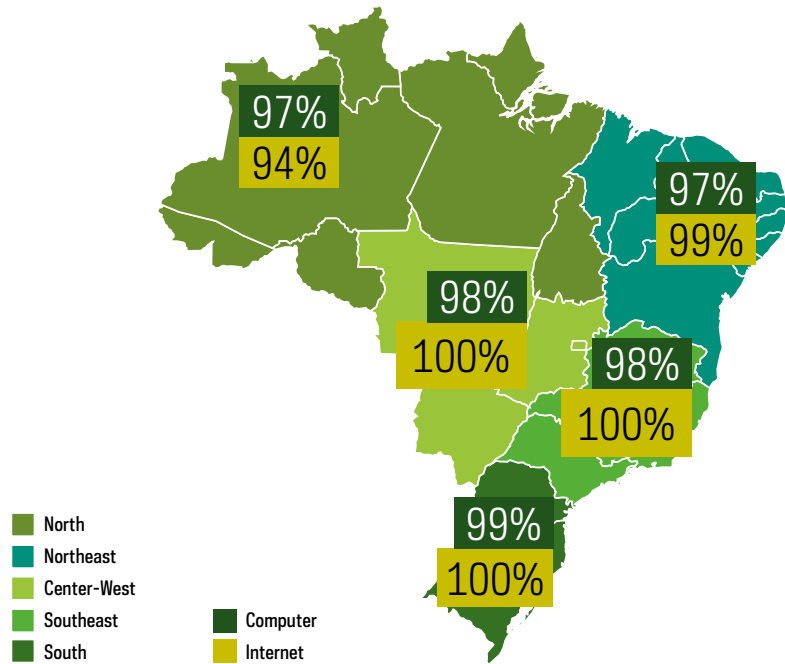
Henrique Manuel Gil Martins



The use of **computers and the Internet** is almost universal in Brazilian healthcare facilities, and the primary healthcare units are also advancing with **97%** of them with access to computers and Internet. The main disparities are between the regions of the country.

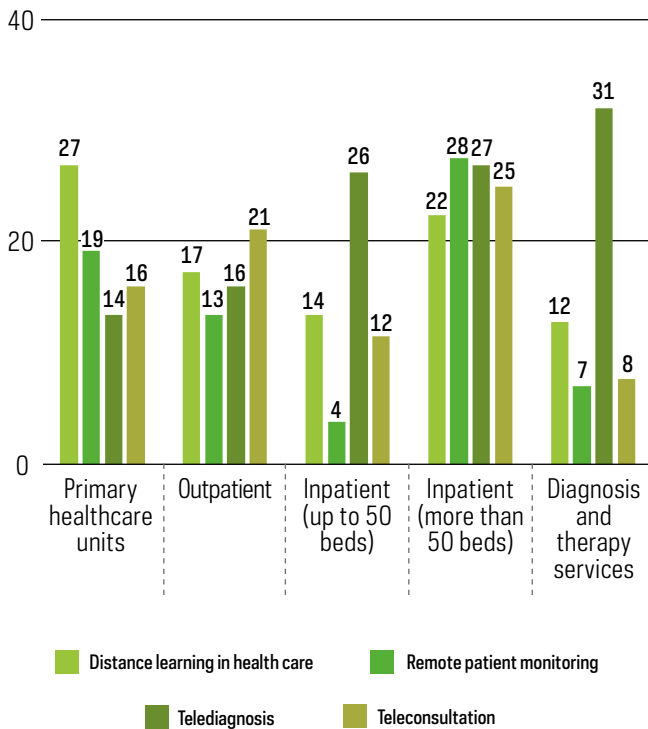
### USE OF COMPUTERS AND THE INTERNET IN HEALTHCARE FACILITIES IN THE LAST 12 MONTHS (2022)

Total number of healthcare facilities (%)



### HEALTHCARE FACILITIES BY TELEHEALTH SERVICES AVAILABLE (2022)

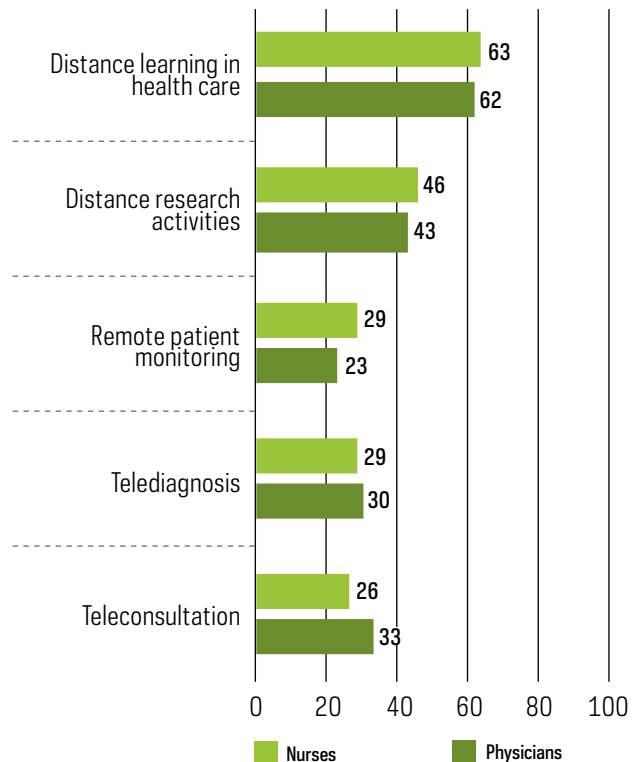
Total number of healthcare facilities that used the Internet in the last 12 months (%)



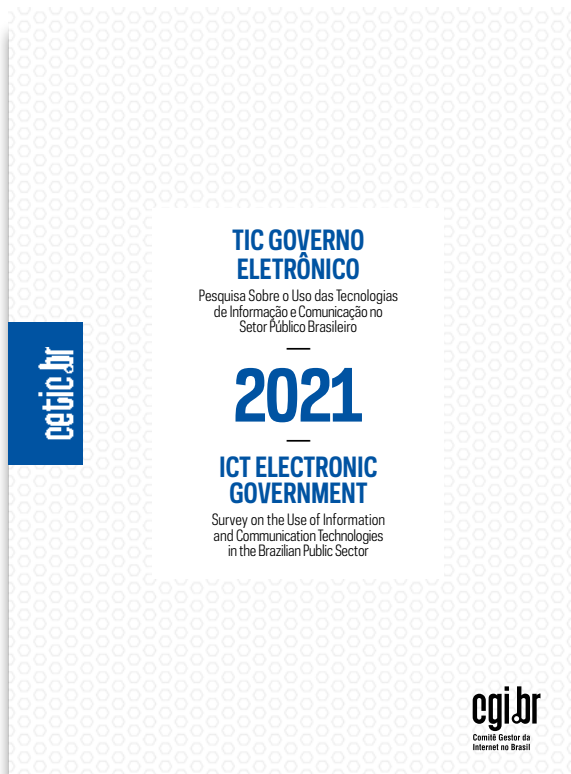
**Medical prescription:** 68% do it on the computer and 21% do it both on the computer and manually

### HEALTHCARE PROFESSIONALS, BY TELEHEALTH FUNCTIONALITIES AVAILABLE AT THE FACILITY (2022)

Total number of nurses and physicians with computer access at the healthcare facility (%)



**Nursing prescription:** 51% do it on the computer and 27% both on the computer and manually



## ICT Electronic Government

Conducted every two years since 2013, the ICT Electronic Government survey investigates the supply of e-government services in Brazil. With the aim of analyzing this scenario, interviews are conducted with ICT managers and people responsible for the digital content of governmental organizations at the three levels of government (federal, state and local), and in all branches (Executive, Legislative, Judiciary, and Public Prosecutor's Office).

In its 5<sup>th</sup> edition, the survey identified the main changes that occurred in government organizations during the COVID-19 pandemic. The 2021 edition included modules related to actions aimed at personal data protection and privacy, the use of ICT in the fight against the pandemic, and the adoption of new technologies by government organizations, such as AI, blockchain, and the Internet of Things (IoT).

### Articles published in ICT Electronic Government 2021

#### **United Nations E-Government Survey: Local Online Service Index (LOSI)**

Digital Government Branch, Division for Public Institutions and Digital Government (DPIDG), United Nations Department of Economic and Social Affairs (UN DESA)

#### **The provision of online municipal information and services in the COVID-19 pandemic**

Erico Przeybilovicz, Maria Alexandra Cunha, Ana Flavia Martins, Isabela Bertolini Coelho, Marcelo Trindade Pitta & Thiago José Tavares Ávila

#### **The limits of algorithmic transparency**

María Paz Herмосilla & Pablo Lapostol

#### **Public policy and the data protection impact assessment: Case analysis of the NHS**

##### **COVID-19 app**

Maria Cecília Oliveira Gomes

#### **Anatel and ICT in times of exceptional remote work**

Eduardo M. C. Jacomassi & Patrícia Rodrigues Ferreira

#### **Challenges for digital government faced by Brazilian states during the COVID-19 pandemic**

Beatriz Lanza, Thiago Ávila, Daniel Valotto, Maria Aparecida de Oliveira, Mariano Lafuente & Lutiano Silva

In 2021, for the first time, ICT Electronic Government survey measured the use of **new technologies**, such as AI, among federal and state government organizations

**99%** of federal government organizations had profiles or accounts on social networks

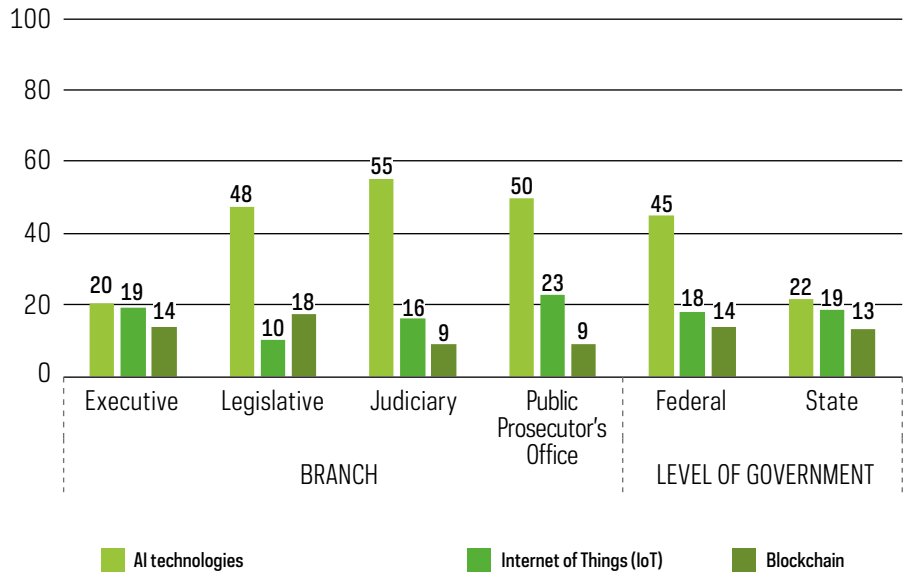
**21%** of federal government organizations with profiles or accounts on social networks offered automated customer service with virtual assistants or chatbots

**94%** of local governments had profiles or accounts on social networks

**9%** of local governments with profiles or accounts on social networks offered automated customer service with virtual assistants or chatbots

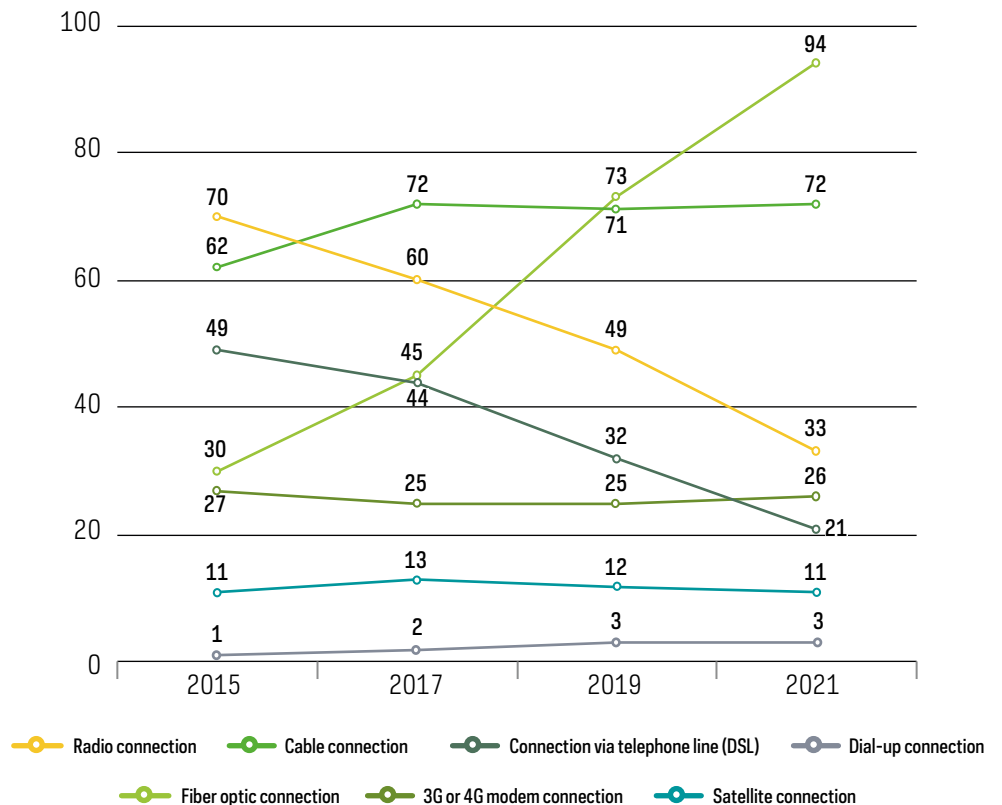
**FEDERAL AND STATE GOVERNMENT ORGANIZATIONS THAT USED NEW TECHNOLOGIES IN THE LAST 12 MONTHS, BY TYPE OF TECHNOLOGY, BRANCH AND LEVEL OF GOVERNMENT (2021)**

Total number of federal and state government organizations (%)

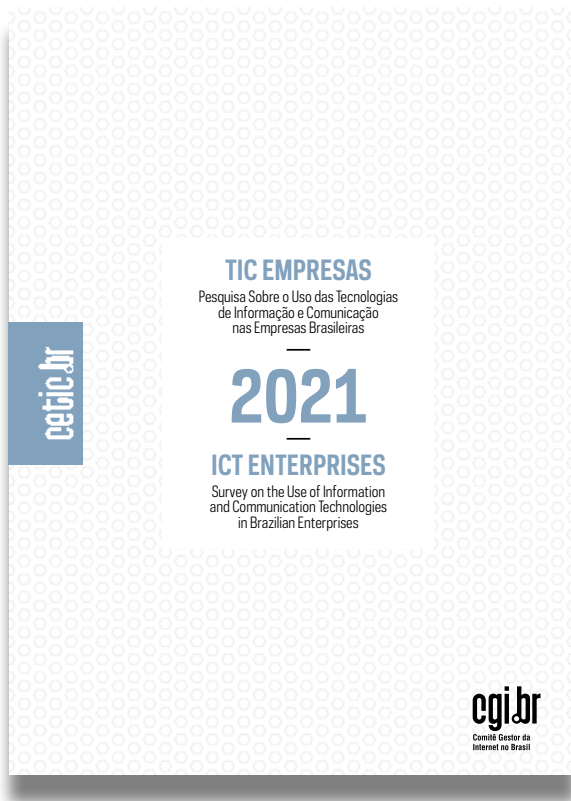


**LOCAL GOVERNMENTS WITH INTERNET ACCESS BY TYPE OF CONNECTION IN THE LAST 12 MONTHS (2015 - 2021)**

Total number of local governments with Internet access (%)



The 2021 survey showed the growth of Internet access by **fiber optic connection** among Brazilian local governments



## ICT Enterprises

Since 2005, the ICT Enterprises survey has been conducted to measure the adoption of ICT in enterprises with 10 or more employed persons. Its objective is to investigate access to infrastructure, as well as use and appropriation by the private sector of new technologies, mapping their perceptions of associated benefits.

In its 14th edition, the survey interviewed a total of 4,064 enterprises between August 2021 and April 2022. It investigated the state of the digital economy in Brazil through indicators that characterize the connectivity of enterprises, their online operations, and electronic commerce. In addition, it presented indicators on the use of advanced technologies, such as AI.

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## Articles published in ICT Enterprises 2021

### **Data governance for the promotion of well-being**

Bertrand de La Chapelle & Lorryne Porciuncula

### **The ICT production chain in the state of São Paulo**

Luis Fernando Novais & Vagner Bessa

### **Lack of IT professionals and development of a national project**

Andriei Gutierrez

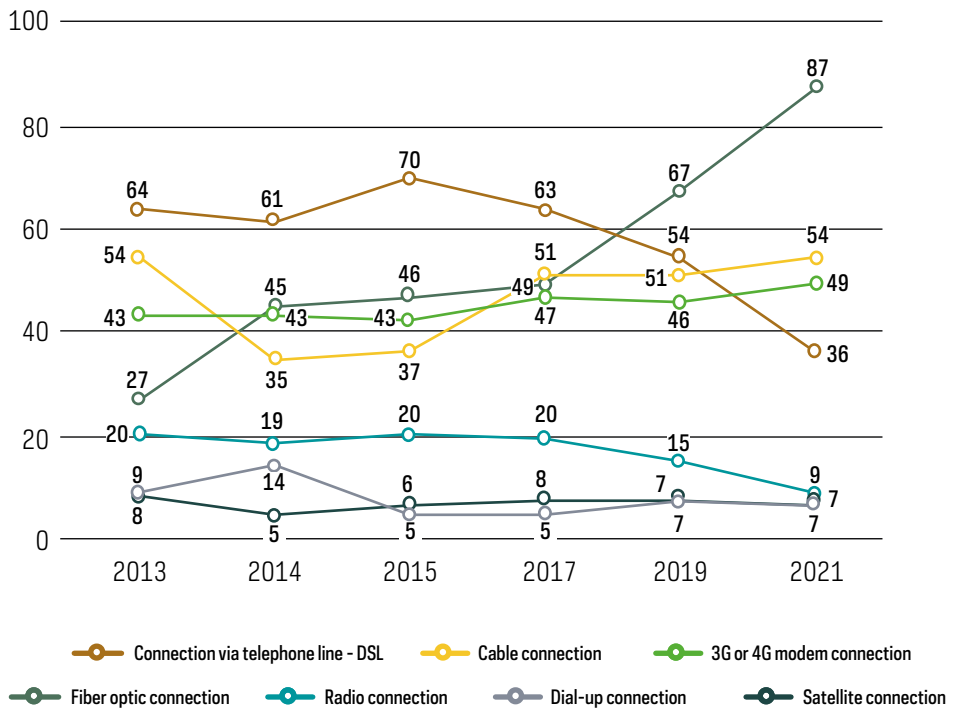
### **Determinants of the use of Big Data in Brazilian enterprises**

Leonardo Melo Lins

There was an increase of **20 percentage points** in the proportion of enterprises with Internet access via **fiber optic connection**, compared to 2019

**ENTERPRISES WITH INTERNET ACCESS BY TYPE OF CONNECTION (2013 - 2021)**

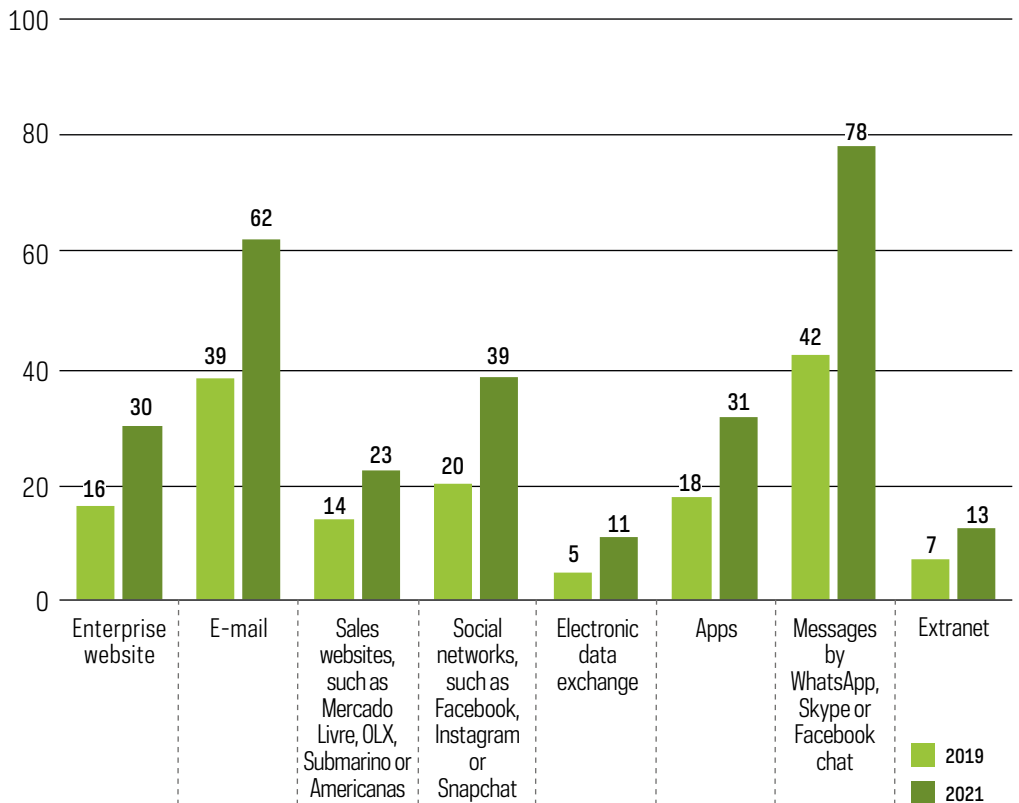
Total number of enterprises with Internet access (%)



In 2019, 57% of Brazilian enterprises **sold over the Internet**, a proportion that rose to **73%** in 2021, an increase largely influenced by the growth of electronic commerce among small enterprises

**ENTERPRISES THAT SOLD ON THE INTERNET IN THE LAST 12 MONTHS BY TYPE OF ONLINE MEDIA USED FOR TRANSACTIONS (2019 - 2021)**

Total number of enterprises with Internet access (%)

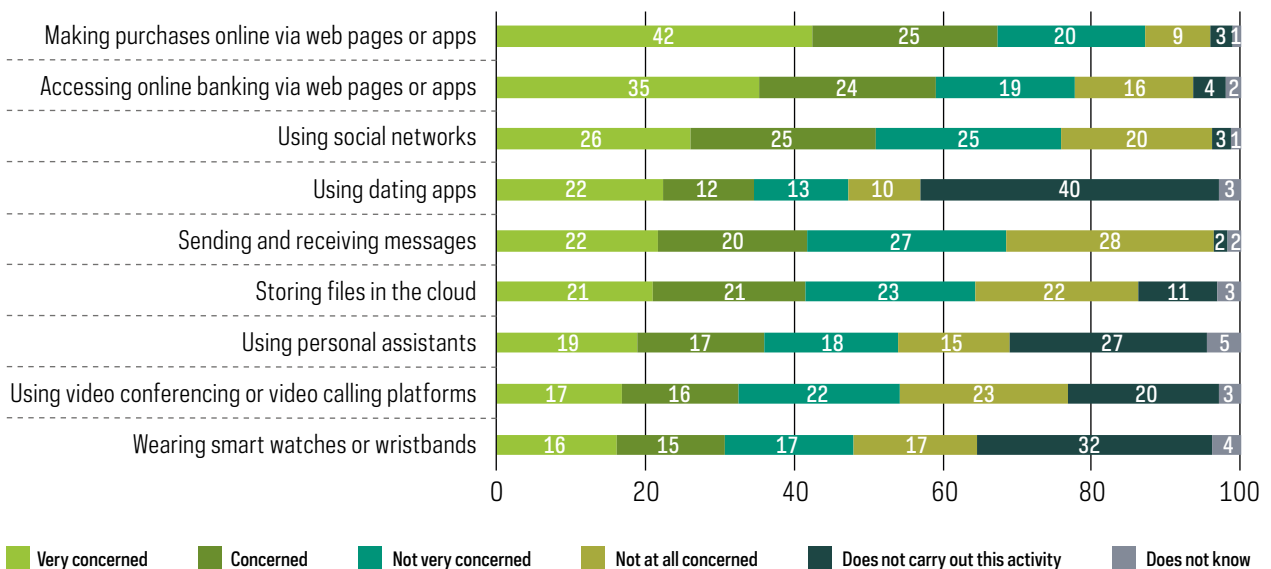




## Privacy and Personal Data Protection

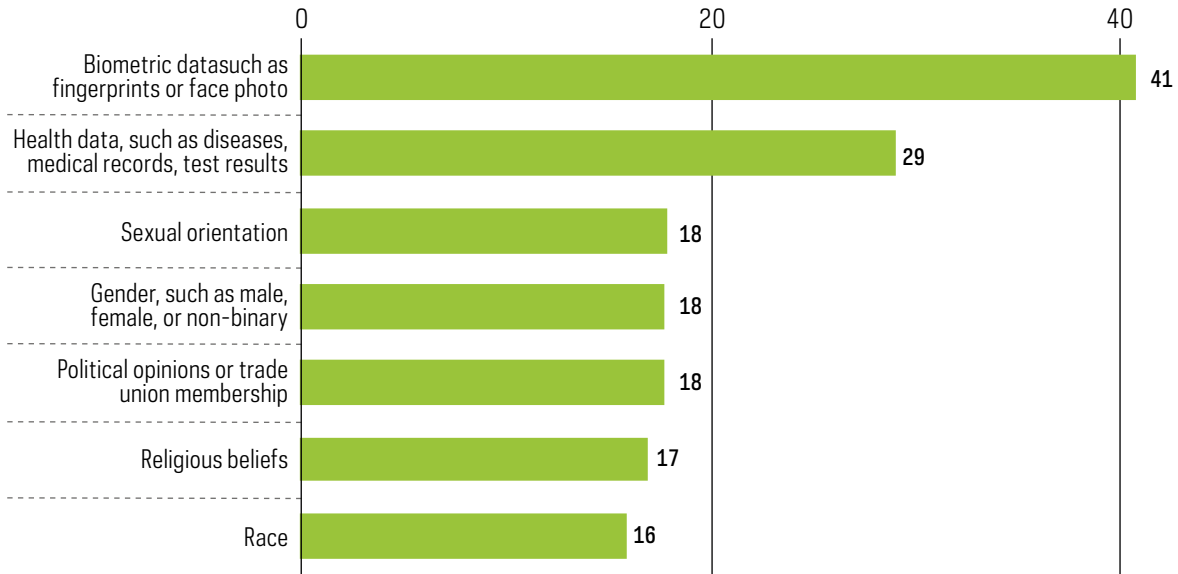
With the growing adoption of digital technologies by public and private organizations and by individuals, it was essential to understand how privacy and personal data protection is perceived in Brazil and identify the strategies they adopt to ensure it. In this context, Cetic.br|NIC.br launched the publication Privacy and personal data protection 2021: Perspectives of individuals, enterprises, and public organizations in Brazil. The publication was divided into three chapters focused on dimensions: individuals (based on data collected in a new wave of the ICT Panel survey); enterprises (based on data from the ICT Enterprises 2021 survey); and public organizations (based on data from the ICT Electronic Government 2021, ICT in Health 2021, and ICT in Education 2020 surveys).

### INTERNET USERS BY LEVEL OF CONCERN OVER PERSONAL DATA (2021)



### INTERNET USERS VERY CONCERNED ABOUT PROVIDING SENSITIVE PERSONAL DATA (2021)

Total number of Internet users 16 years old or older (%)



### HAVE APPOINTED A DATA PROTECTION OFFICER (DPO):

Government organizations			Healthcare facilities		Enterprises		
81% of federal government organizations	33% of state government organizations	14% of local governments	39% of private healthcare facilities	20% of public healthcare facilities	41% of large enterprises	29% of medium enterprises	15% of small enterprises

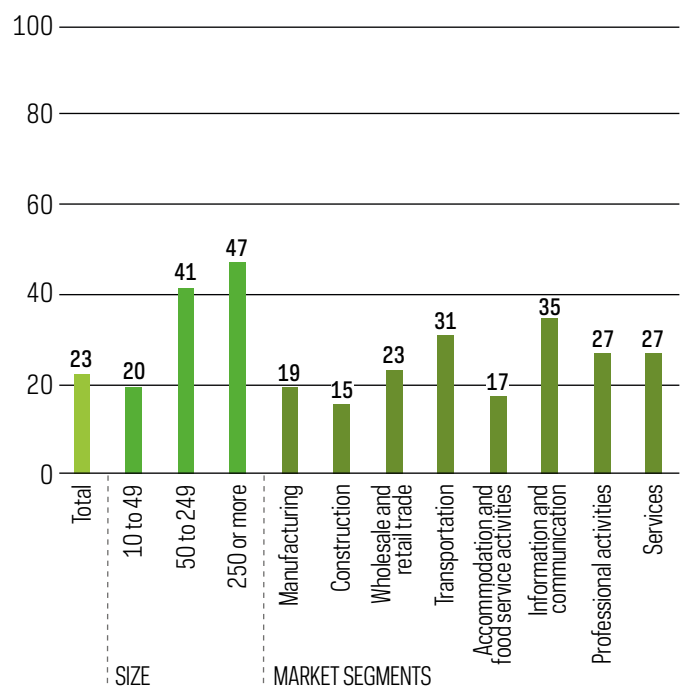
### ENTERPRISES BY TYPE OF PERSONAL DATA STORED AND SIZE (2021)

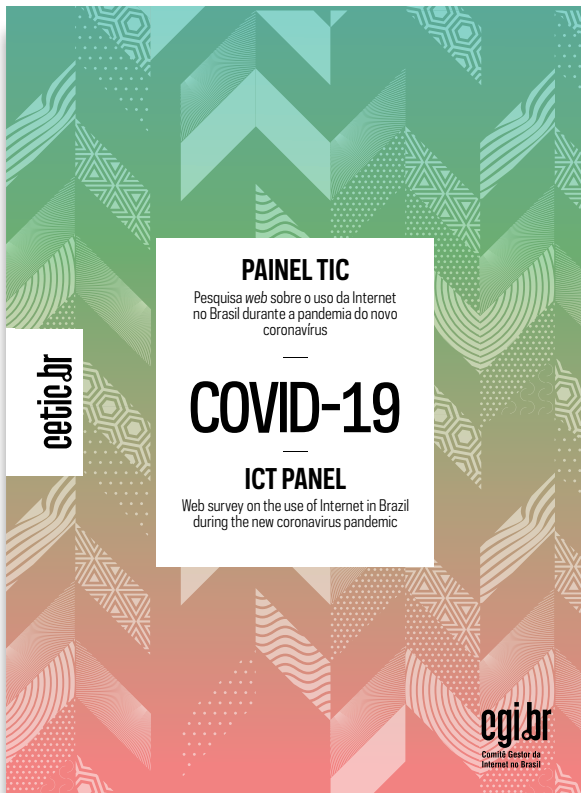
Total number of enterprises (%)



### ENTERPRISES WITH SPECIFIC AREAS OR EMPLOYEES RESPONSIBLE FOR PERSONAL DATA PROTECTION (2021)

Total number of enterprises (%)





## ICT COVID-19 Panel

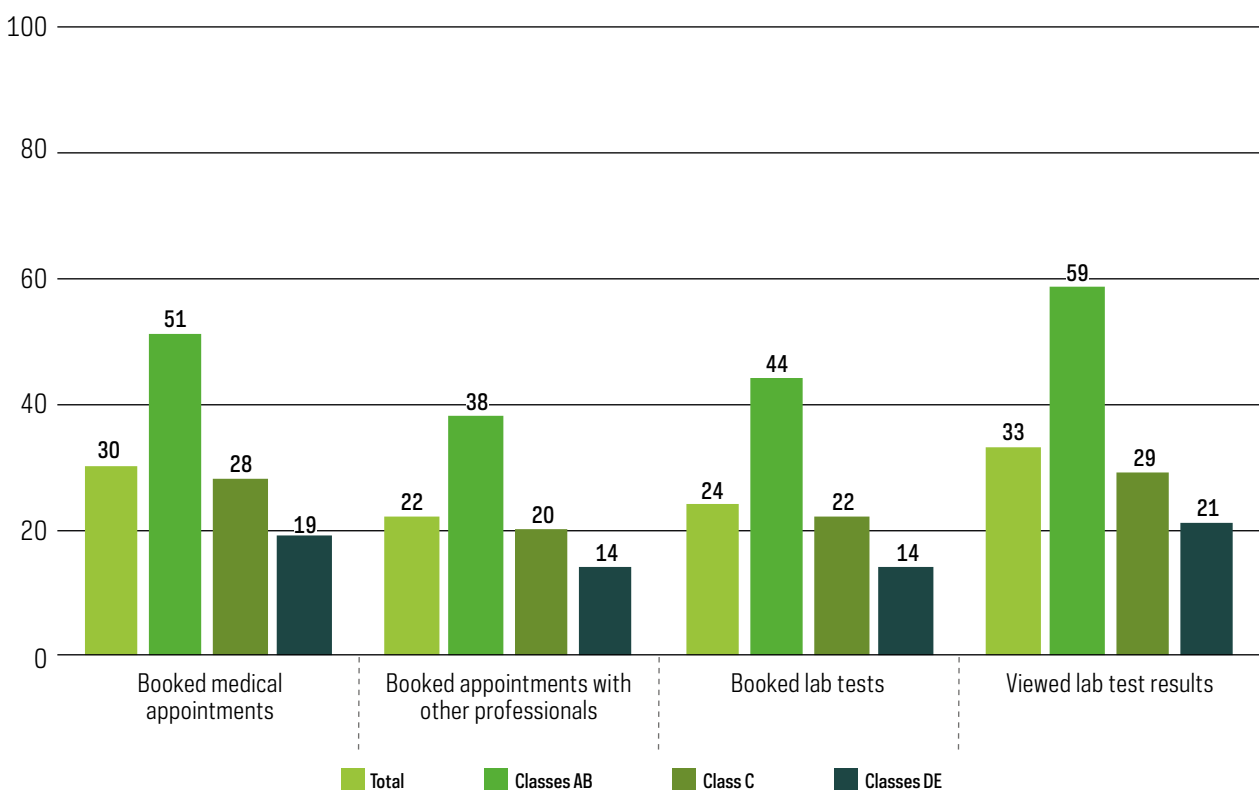
The ICT Panel COVID-19 investigates activities carried out online during the pandemic, collecting indicators validated by the ICT Households survey as its framework, in addition to custom-designed thematic modules covering topics such as telehealth, remote education, culture, e-commerce, e-government, etc.

The 4th edition of the survey was carried out a few months after the most severe stage of the COVID-19 pandemic, in 2021, and it was launched in April 2022. It included modules related to culture, e-commerce, online public services, telehealth, remote education, and telework, providing data on the effects of the pandemic on the digital habits of the population and the digital transformation of private and public organizations.

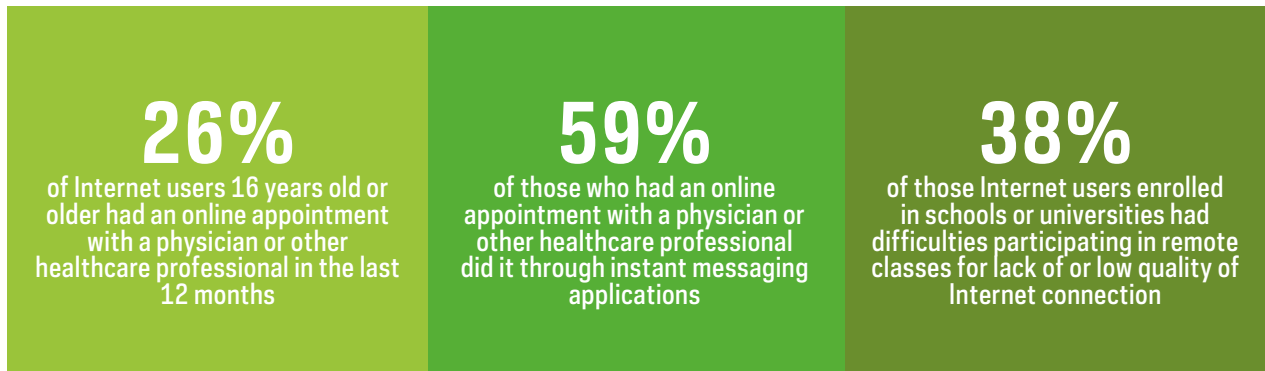
For the first time, the population represented in the Panel was equivalent to the entire target population of the ICT Households survey, which allows direct comparison of the results of both surveys.

### INTERNET USERS BY HEALTH SERVICES CARRIED OUT ON THE INTERNET IN THE LAST 12 MONTHS BY CLASS (2021)

Total number of Internet users 16 years old or older (%)

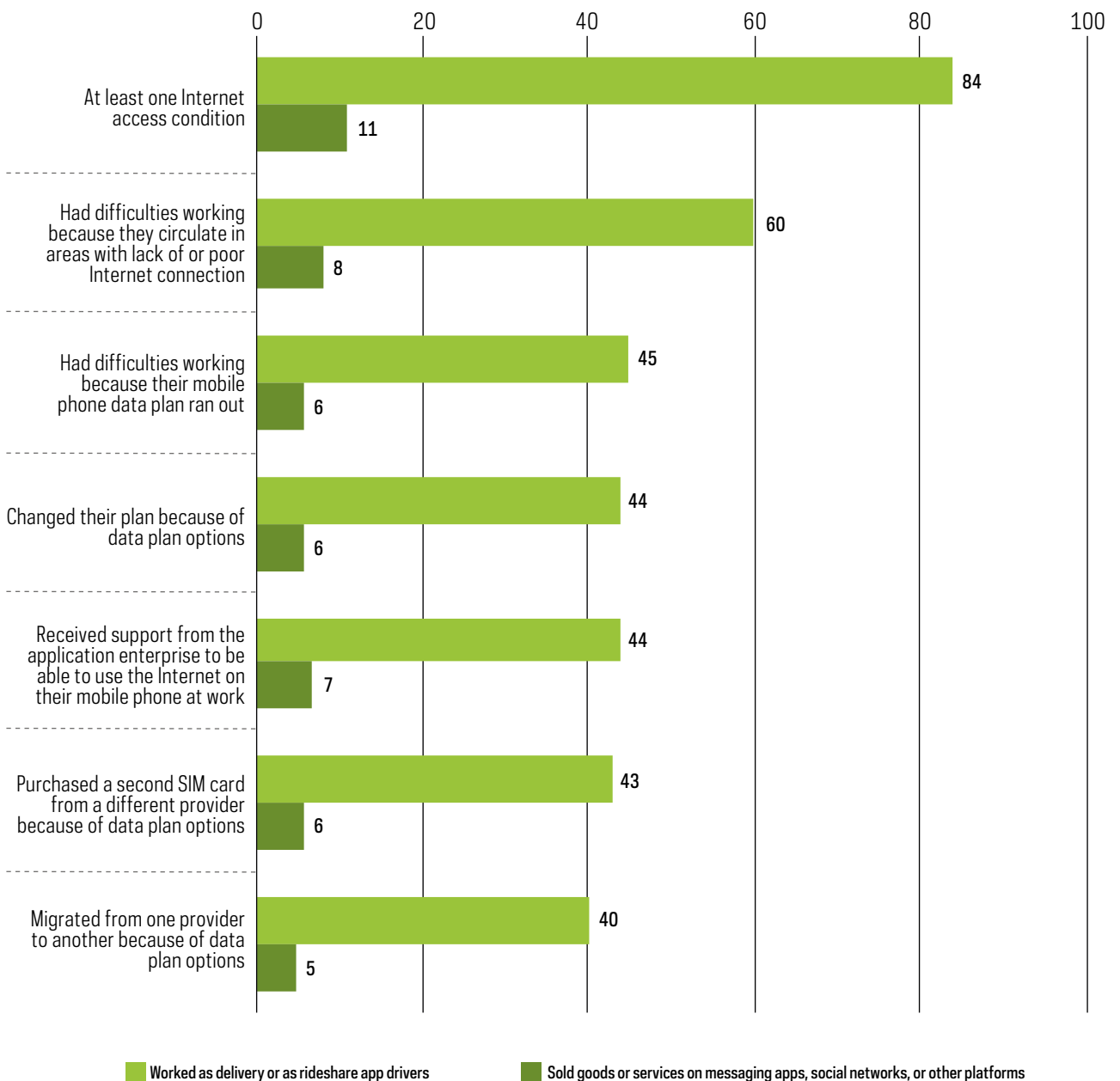






**INTERNET USERS WHO CARRIED OUT WORK ACTIVITIES VIA APPLICATIONS, BY INTERNET ACCESS CONDITIONS (2021)**

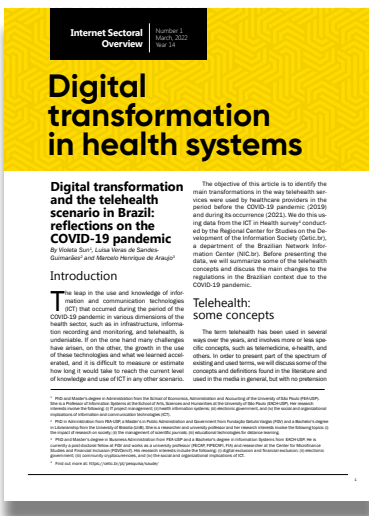
Total number of Internet users 16 years old or older who worked via applications (%)



# Internet Sectoral Overview

The Internet Sectoral Overview is a quarterly publication produced by Cetic.br|NIC.br that addresses different themes related to access to and use of digital technologies in various sectors of society. Available in Portuguese and English, the articles, interviews, and infographics featured in the publication explore current debates on digital inclusion and also draw on data and

findings that derive from the research conducted by Cetic.br|NIC.br. In 2022, the Internet Sectoral Overview addressed the overarching theme “Digital transformation in organizations: Pandemic-driven advances and challenges.” Four editions were published in 2022 addressing the digital transformation in healthcare facilities, schools, enterprises, and government organizations.



## Year 14 - No. 1: Digital transformation in health systems COLLABORATORS:

- **Article I** - “Digital transformation and the telehealth scenario in Brazil: Reflections on the COVID-19 pandemic,” by Violeta Sun (EACH-USP), Luisa Veras de Sandes-Guimarães (USCS) and Marcelo Henrique de Araujo (FGV EAESP)
- **Article II** - “Open public health: The way not to leave anyone behind,” by Marcelo D’Agostino (PAHO), Felipe Mejía Medina (Independent consultant), Myrna Marti (PAHO), Victoria Malek Pascha (Independent consultant), Jennifer Nelson (IBD), Cristina Pombo (IBD), Karina Pesce (Hospital Italiano, Argentina), María Isabel Inigo (Independent consultant), Walter H. Curioso (Universidad Continental), Marina Rojo (Independent consultant), Luis Tejerina (IBD) and Sebastián García Saiso (PAHO)

- **Interview I** - “Personal data protection and technologies in health,” with Analluza Bolivar Dallari
- **Interview II** - “Technology and innovation in health,” with John Halamka (Mayo Clinic Platform)
- **Domain Report** - “Domain registration dynamics in Brazil and around the world”
- **Answer to your questions** - “Internet users and telehealth in the pandemic”



## Year 14 - No. 2: Digital technologies, current trends, and the future of education COLLABORATORS:

- **Article I** - “Technology and education: The legacy of the experiences of the COVID-19 pandemic for the future of schools,” by José Armando Valente (Unicamp) and Maria Elizabeth Bianconcini de Almeida (PUC-SP)
- **Article II** - “The platformization of education: A framework to map the new directions of hybrid education systems,” by Axel Rivas (UDES)
- **Interview I** - “Digital technology and innovative pedagogical practices,” with Liane Tarouco (UFRGS)
- **Interview II** - “Education technologies and privacy implications,” with Velislava Hillman (LSE)

- **Domain Report** - “Domain registration dynamics in Brazil and around the world”
- **Answers to your questions** - “Digital technologies in schools”



**Year 14- No. 3: New technologies and innovation in enterprises COLLABORATORS:**

- **Article I** - “Adoption of the Internet of Things, cloud computing, and Artificial Intelligence: A comparison between Brazil and European countries,” by Luis Claudio Kubota (Ipea) and Leonardo Melo Lins (Cetic.br|NIC.br)
- **Article II** - “Small and medium enterprises going digital: Policy challenges and recommendations,” by Sandrine Kergrouch (OECD)
- **Interview I** - “Digital transformation in enterprises,” with Johannes M. Bauer (Michigan State University)
- **Interview II** - “Micro, small and medium enterprises and digital technologies,” with Georgina Núñez and Filipe da Silva (UN ECLAC)
- **Domain Report** - “Domain registration dynamics in Brazil and around the world”

- **Answer to your questions** - “E-commerce by Brazilian enterprises”



**Year 14- No. 4: Emergent technologies and digital services in the public setor COLLABORATORS:**

- **Article I** - “Digital transformation in government: Trends and legacies of the pandemic,” by Manuella Maia Ribeiro (Cetic.br|NIC.br), Javiera F. Medina Macaya (Cetic.br|NIC.br) and Luciana Piazzon B. Lima (Cetic.br|NIC.br)
- **Article II** - “Basic concepts about Artificial Intelligence in public sector,” by María Isabel Vélez, Mariusti Alexandra Osorio-Sanabria (Maria Cano University Foundation) and Cristina Gómez Santamaría (Mercado Libre)
- **Interview I** - “Digital public services and innovation in government,” with Vitor Cipriano de Fazio (Innovatiom Laboratory of the city of São Paulo)

- **Interview II** - “Data openness and governance in the public sector,” with Fernanda Campagnucci (Open Knowledge Brasil)
- **Domain Report** - “Domain registration dynamics in Brazil and around the world”
- **Answers to your questions** - “Use of Artificial Intelligence in the Brazilian public sector”

## NIC.br Sectoral Studies

The NIC.br Sectoral Studies publication series addresses a variety of emerging themes that explore the interface between ICT and society. In 2022, two editions were published: the first discussed experiences and challenges of community networks in Brazil; and the second addressed the use of Artificial Intelligence in the cultural sector. Both editions are available in Portuguese and English. Additionally, the NIC.br Sectoral Studies publications “Digital security: An analysis of risk management in Brazilian enterprises” and “Community networks and the Internet in Brazil: Experiences and challenges for digital inclusion” were also made available in English.

### Community networks and the Internet in Brazil: Experiences and challenges for digital inclusion

The book *Community networks and the Internet in Brazil: Experiences and challenges for digital inclusion* was published by Cetic.br|NIC.br as an edition of the NIC.br Sectoral Studies. The publication, available in Portuguese and English, was launched on September 5th at ‘Casa dos Meninos’ – a nonprofit organization that has its own experience of network community and is located in a São Paulo vulnerable district – at an event organized by Cetic.br|NIC.br and CGI.br. The book offers an updated diagnosis of the role of community networks in Brazil, including the main challenges and opportunities for digital inclusion in the country, based on a study that was carried out in two consecutive stages, combining qualitative and quantitative methods. Data collection and analysis were coordinated by Cetic.br|NIC.br, CGI.br and the Brazilian Center for Analysis and Planning (Cebap). The publication is made up of the following chapters:

#### Foreword

Demi Getschko (NIC.br).

#### Presentation

Laura Tresca and Percival Henriques (CGI.br).

#### Prologue

Community networks: Resuming collective appropriation of connectivity

Laura Tresca (CGI.br).



#### Methodological Notes

**Chapter 1 - Challenges, opportunities, and the state of the art of community networks in Brazil: A qualitative study.**

**Chapter 2 - Mapping the experiences of community networks in Brazil: A quantitative study.**

**Final Considerations**

## Artificial Intelligence and culture: Perspectives for cultural diversity in the digital age

The book *Artificial Intelligence and Culture: Perspectives for Cultural Diversity in the Digital Age* was published by Cetic.br|NIC.br as an edition of the NIC.br Sectoral Studies. The publication, available in Portuguese and English, was launched in September during the online side event at the UNESCO World Conference on Cultural Policies (MONDIACULT 2022), organized by Cetic.br|NIC.br. The book explores the opportunities and challenges posed by the use of AI in the cultural sector, and presents new qualitative data collected by Cetic.br|NIC.br. The publication is made up of the following chapters, which were written by experts from different national and international organizations.

### Presentation

Demi Getschko (NIC.br).

### Prologue

Marielza Oliveira (UNESCO).

### PART 1 - ARTICLES

#### **Culture, platforms, and machines: The impact of Artificial Intelligence on the diversity of cultural expressions**

Octavio Kulesz (Editorial Teseo and UNESCO).

#### **Artificial Intelligence and culture: Opportunities and challenges for the Global South**

Lucia Santaella (PUC-SP).

### PART 2 - QUALITATIVE RESEARCH ABOUT ARTIFICIAL INTELLIGENCE AND CULTURE

#### **Theoretical and methodological framework**

Cetic.br|NIC.br

#### **An analysis of Artificial Intelligence uses and its implications for cultural diversity in Brazil**

Luciana Piazzon Barbosa Lima, Tatiana Jereissati, Javiera F. M. Macaya, and Guilherme Varela

### CONCLUSIONS

#### **Artificial Intelligence and culture: A long-term look**

Daniela Ribas Ghezzi



## Frontiers of Digital Inclusion: Social Dynamics and Public Policies of Internet Access in Small Brazilian Municipalities

The study sought to comprehend the socioeconomic dynamics and capacities of public and private organizations and their effects on the connectivity of the population in Brazilian municipalities with up to 20,000 inhabitants. The empirical research was conducted in two stages. First, quantitative data collected by the National Telecommunications Agency (Anatel) and indicators from the ICT Providers 2020 and the ICT Electronic Government 2019 surveys were used to create two composite indicators – connectivity and local capacities – that guided the division of the municipalities into four homogeneous groups. Second, in-depth interviews with managers of Internet service providers (ISPs), information technology managers of local governments, and leaders of non-governmental organizations, and discussion groups with residents, were conducted in four municipalities per group, distributed in the five Brazilian macro-regions (20 municipalities in total).

The qualitative analysis showed that there was a recent expansion of the Internet in these municipalities, resulting in the diversification of activities carried out in the online environment by the population. However, barriers still existed, especially among residents of rural, remote, and hard-to-reach areas, and vulnerable groups. The analysis also highlighted that the differences in the connectivity levels between the four groups were explained by the ISP capacities and services, since fragile digital inclusion policies feature the municipalities analyzed. This study was conducted in partnership with the National Telecommunications Agency (Anatel), the British Embassy, and departments of the Brazilian Network Information Center (NIC.br).



## Other ICT Survey Projects



### ICT in Culture

Conducted since 2016, The ICT in Culture survey investigates the presence of ICT infrastructure and the use of these technologies in Brazilian cultural facilities, focusing on internal management, public relations, and collection digitization. It also presents information about IT management in these institutions and the perceptions of the contributions and challenges of computer and Internet use in cultural facilities, including archives, heritage sites, libraries, cinemas, museums, culture points, and theaters.



### ICT Nonprofit Organizations

Conducted since 2012, the ICT Nonprofit Organizations survey investigates administrative and financial capacities of nonprofit organizations, their access to and use of information and communication technologies. The survey also measures their ICT infrastructure, capabilities, and skills, barriers these organizations face to ICT access and use, and data protection and privacy initiatives adopted by them.



### ICT Providers

Carried out since 2011, the objective of the ICT Providers survey is to map the Internet access provision sector in Brazil. To this end, the survey established the characteristics of Internet service providers in terms of the services they offer, market operations, and technologies adopted.



### ICT Public Access Centers

The ICT Public Access centers survey presents a mapping of information on the provision of Internet access by public access centers in Brazil supported by the federal government, particularly telecenters, in view of the importance of these sites in fighting digital exclusion and reducing inequalities related to technology adoption and use in Brazil.

# Public Debates: Advancing Information and Knowledge Societies

Cetic.br|NIC.br sponsors widespread public debates and technical meetings with key stakeholders from the government, academia, the private sector, and international and civil society organizations to discuss the socioeconomic and cultural implications of digital technologies in societies and the development of knowledge and information societies. Debates are based on an interdisciplinary approach to discussing the multifaceted aspects related to access to, and use and appropriation of, technologies by different segments of society.

During 2022, the Center held public events that marked the launch of new publications and also served as a forum for discussing relevant themes, encouraging informed public debate on digital technologies and society. Among several public debates organized by the Center throughout the year, several focused on relevant findings from the national ICT surveys conducted by Cetic.br|NIC.br. Public debates are one of the transparency mechanisms that legitimize its work on data production. Below are some of the main events that took place in 2022.

## Artificial Intelligence and Culture

August 2022 - Online

The Regional Center for Studies on the Development of the Information Society (Cetic.br|NIC.br) organized and coordinated a roundtable in the XVIII Enecult - Encontro de Estudos Multidisciplinares em Cultura (Conference on Multidisciplinary Studies in Culture).

Based on the Sectoral Study on AI and Culture, being developed by Cetic.br|NIC.br in partnership with the Culture and Democracy Institute, the debate addressed the adoption of AI systems in the cultural sector and its implications for cultural diversity in Brazil. The panel's intention was to include this theme on the agenda of cultural studies and policies and to promote the development of possible regulatory strategies and public policies.



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**Speakers:** Daniela Ribas (Sonar Cultural), Dalton Martins (UNB), Gisele Beiguelman (USP), Guilherme Varella (Culture and Democracy Institute), and Luciana Lima (Cetic.br|NIC.br).



## Artificial Intelligence and Culture: Perspectives for Cultural Diversity in the Digital Age

September 2022 - Online

The Regional Center for Studies on the Development of the Information Society (Cetic.br|NIC.br) released the publication *Artificial Intelligence and culture: Perspectives for cultural diversity in the digital age*. The publication was based on qualitative research conducted by Cetic.br|NIC.br that explored the uses of AI in the Brazilian cultural sector and their implications for diversity.

The event was carried out in September as an online side event at the UNESCO World Conference on Cultural Policies (MONDIACULT 2022). The panel organized by Cetic.br|NIC.br discussed the adoption of AI in the cultural sector and its implications for cultural diversity in Latin America and Brazil. It brought together national and international actors to discuss the subject matter from different perspectives, including recent findings of a qualitative study that addressed AI



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and cultural diversity in Brazil. The webinar recordings are available in English, Portuguese, and Spanish and can be accessed on NIC.br's YouTube channel.<sup>2</sup>

**Speakers:** Alexandre Barbosa (Cetic.br|NIC.br), Daniela Ribas (Sonar Cultural), Guilherme Varella (Culture and Democracy Institute), Lucia Santaella (PUC-SP), Luciana Lima (Cetic.br|NIC.br), Marielza Oliveira (UNESCO), and Octavio Kulesz (Editorial Teseo and UNESCO).

## Community Networks and the Internet in Brazil: Experiences and Challenges for Digital Inclusion

September 2022 - São Paulo (Brazil)



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The event, which took place on September 5th, included the presentation of the results of the study conducted jointly by Cetic.br|NIC.br, the Advisory Team for CGI.br activities, and the Brazilian Center for Analysis and Planning (Cebrap). In addition to reflections on the results of the research, specialists

addressed the prioritization of a common agenda of community networks for digital inclusion.

The study launched aimed to detect the stage of development of these networks in Brazil, understand their operating modes and their effects in the territories where they operate, as well as identify barriers and ways to foster their sustainability.

**Speakers:** Alexandre Costa Barbosa (CGI.br), Daiane Araujo (Casa dos Meninos), Daniel Mariano (Rede Comunitária Novo Futuro), Erick Terena (Mídia Índia-Oficial), Fabio Storino (Cetic.br|NIC.br), Graziela Castello (Cebrap), Juliano Cappi (CGI.br), Laura Tresca (CGI.br), Percival Henriques (CGI.br), and Vanilda Aparecida (Quilombo Ribeirão Grande/Terra Seca).

<sup>2</sup> <https://www.youtube.com/playlist?list=PLQq8-9yVHyOaGCptdvg6oxaK6QZKs-HT->

## Panel “Digital Skills and Competencies in an Increasingly Connected Everyday Life” // Launch of 2021 Edition of the ICT Households, ICT Education, ICT Kids Online Brazil, and ICT Enterprises Surveys

November 2022 - São Paulo (Brazil)

Digital technologies have intensified their presence in the daily lives of individuals and companies. However, the skills that allow the proper appropriation of the potential benefits arising from the use of the Internet continue to be unevenly distributed. The formation of digital skills from Basic Education and their importance in the world of work are at the center of the digital agenda of governments around the world.

Robust evidence has associated the presence of digital skills and competences with taking advantage of the economic and social benefits of adopting digital technologies. At the same time, the promotion of digital skills is central to facing the risks associated with the new digitalization scenario, including resilience against misinformation, the relationship with online platforms, and the protection of personal data.

The Panel “Digital skills and competencies in an increasingly connected everyday life,” held

in November 2022, promoted reflections on the role of digital skills in this new digitalization scenario. The indicators of the 2021 Edition of the ICT Households, ICT in Education, ICT Kids Online Brazil, and ICT Enterprises Surveys, whose publications were launched during the event, were the basis for the discussions promoted by the panel. The webinar recordings are available in Portuguese and Spanish and can be accessed on NIC.br’s YouTube channel.<sup>3</sup>

### Keynote speaker:

Paul Blikstein (Columbia University)

### Panelists:

Sonia Jorge (telecommunications and connectivity specialist)

Magdalena Claro (Catholic University of Chile)

Mario Volpi (UNICEF Brazil Office)

### Panelists:

Fernando Almeida (PUC-SP).



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<sup>3</sup> <https://www.youtube.com/watch?v=tQaRgBWWNoQ&list=PLQq8-9yVHyObZuEoxo8BQNrvd7APo4Q5R&index=1> and <https://www.youtube.com/watch?v=C4R7hRTNYN0&list=PLQq8-9yVHyObZuEoxo8BQNrvd7APo4Q5R&index=2>

## Launch of the ICT in Health 2022 Survey Results

December 2022 - Campinas (Brazil)



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The ICT in Health 2022 launch panel was held as part of the activities of the Brazilian Congress on Health Informatics (CBIS), held in the city of Campinas (São Paulo), and included the presentation of the main results on the use and adoption of ICT by Brazilian healthcare facilities and professionals (physicians and nurses). It also had the participation of experts in digital health that discussed the importance of providing statistics and information on the subject of digital health for the elaboration of public policies and decision-making.

### **The panel was composed of:**

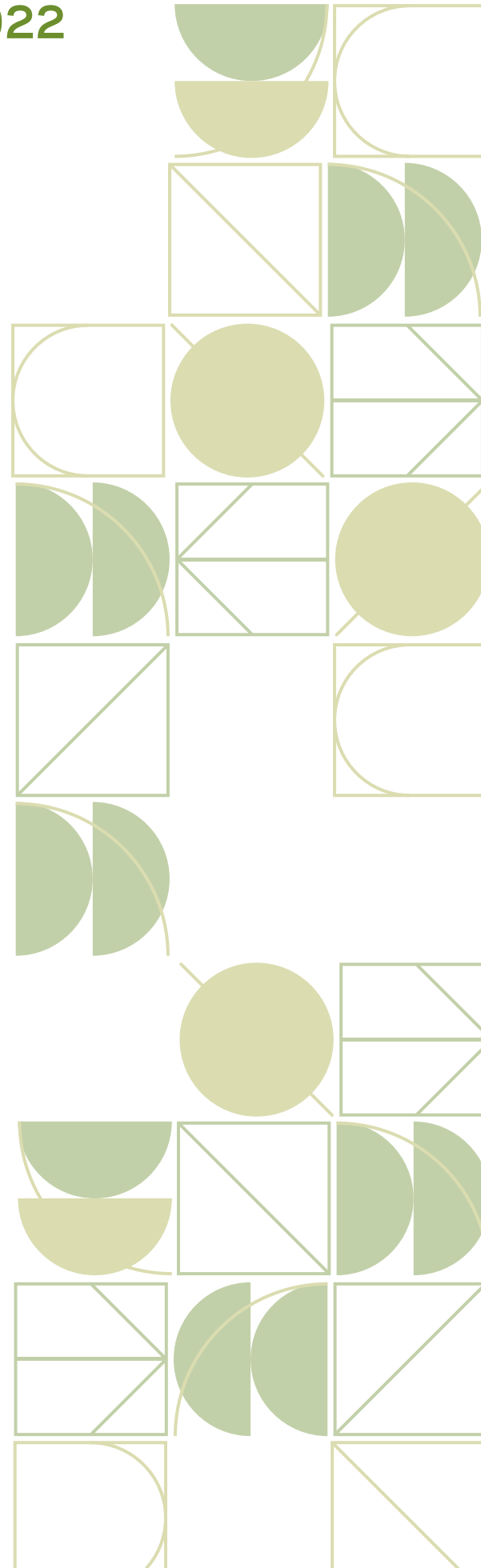
Alexandre Barbosa (Cetic.br|NIC.br)

Luciana Portilho (Cetic.br|NIC.br)

Heimar de Fátima Marin (Scientific coordinator of the ICT in Health survey)

Marizelia Leão Moreira (Conasems)

Nereu Henrique Manzano (Conass)



# Capacity-building and Awareness-raising

Cetic.br|NIC.br's capacity-building programs aim to bring together the main stakeholders involved in the production, analysis, and use of ICT indicators in public policies, academia, and sectoral market analysis. These programs are directed toward data producers and users, such as national statistical institutes, ministries, regulatory agencies, international organizations, and academic institutions.

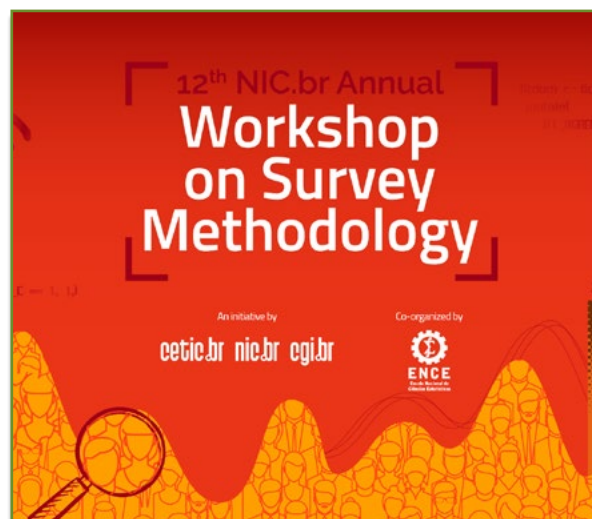
In addition to disseminating technical knowledge about survey methodology, they are a forum for promoting debates about the importance of ICT statistics for evidence-based policymaking and

for discussing new measurement possibilities, while highlighting the potential of ICT for development. In addition to regular capacity-building and awareness-raising activities about the importance of ICT statistics and the massive open online course (MOOC) "ICT and Sustainable Development," in 2022 the Center supported the development and launch of a MOOC on the subject of AI in the judiciary – a UNESCO initiative with The Future Society, Cetic.br|NIC.br, the National Judicial College, and the Institute of Electrical and Electronics Engineers (IEEE).

## 12th NIC.br Annual Workshop on Survey Methodology

With the main theme "Methodological challenges for the production of data in the context of emerging digital technologies", the 12<sup>th</sup> Annual NIC.br Workshop on Survey Methodology gathered a group of guests composed of public managers, researchers, and representatives of civil society and international organizations. The meeting, promoted by the Regional Center for Studies on the Development of the Information Society (Cetic.br) in partnership with the National School of Statistical Sciences (ENCE) of the Brazilian Institute of Geography and Statistics (IBGE), featured short courses, thematic sessions, lectures and discussions of practical cases related to Artificial Intelligence, machine learning, and other disruptive technologies.

The workshop event took place at the NIC.br head office from August 29th to September 1st and had 98 participants who were able to attend in person or remotely.



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### DAY 1

**Keynote:** Artificial Intelligence and the Political Philosophy of the Future

**Speaker:** Prof. Gray Cox, College of the Atlantic (USA)

**Discussant:** Prof. João Paulo Veiga, USP/C4AI (Brazil)

**Session 1:** ROAM-X Framework: A Human Rights Perspective and AI

**Speaker:** Marielza Oliveira, UNESCO (France)

**Session 2:** Informing AI policy: How Can We Move from Principles to Practice?

**Speaker:** Luis Aranda, OECD (France)

**Moderator:** Alexandre Barbosa, Cetic.br|NIC.br (Brazil)

**Session 3:** Skills, Technology, and Careers in the Future of Work

**Speaker:** Morgan Frank, University of Pittsburgh (USA)

**Moderator:** Prof. Alvaro Comin, USP/C4AI (Brazil)

**Session 4:** Measuring Digital Skills through Surveys

**Speaker:** Prof. Ellen Helsper, LSE (UK)

**Moderator:** Fabio Senne, Cetic.br|NIC.br (Brazil)

## DAY 2

**Short Course I:** Maintaining Quality When Switching to Multi-Mode Data Collection

**Speaker:** Prof. David Marker, Marker Consulting, LLC (USA)

**Moderator:** Prof. Denise Britz, ENCE/IBGE (Brazil)

**Short Course I:** Can We Reduce/Measure Potential Bias in Big Data Enough to Use it to Produce Official Statistics?

**Speaker:** Prof. David Marker, Marker Consulting, LLC (USA)

**Discussant:** Prof. Denise Britz, ENCE/IBGE (Brazil)

**Session 5:** Combining Data Sources for Modelling Internet Connectivity

**Speaker:** Fredrik Otto Lennart Eriksson, ITU (Switzerland)

**Session 6:** UN Big Data Hub in Brazil

**Speaker:** Augusto Fadel, IBGE (Brazil)

**Moderator:** Prof. Pedro Silva, ENCE/IBGE (Brazil)

**Keynote:** Bias, Fairness and Accountability with Artificial Intelligence and Machine Learning Algorithms

**Speaker:** Augusto Fadel, IBGE (Brazil)

**Moderator:** Prof. Pedro Silva, ENCE/IBGE (Brazil)

## DAY 3

**Short Course II:** Methods for Dealing with Nonresponse

**Speaker:** Raphael Nishimura, UMICH (USA)

**Moderator:** Marcelo Pitta, Cetic.br|NIC.br (Brazil)

**Session 7:** Introduction to Machine Learning

**Speaker:** Prof. Vijay Nair, Wells Fargo & UMICH (USA)

**Moderator:** Prof. Pedro Silva, ENCE/IBGE (Brazil)

**Keynote:** Combining Probability and Non-Probability Samples

**Speaker:** Augusto Fadel, IBGE (Brazil)

**Moderator:** Marcelo Pitta, Cetic.br|NIC.br (Brazil)

## DAY 4

**Short Course III:** Learning from Qualitative Research

**Speaker:** Prof. Marlei Pozzebon, HEC Montreal (Canada) & FGV-EAESP (Brazil)

**Moderator:** Tatiana Jereissati, Cetic.br|NIC.br (Brazil)

### Cases Part I

**Speakers:** Alton Grizzle, UNESCO (France); João Pita Costa, IRCAI (Slovenia); Marcus Zimmermann and Isis Peixoto, ENCE (Brazil)

**Moderator:** Prof. Denise Britz, ENCE/IBGE (Brazil)

### Cases Part II

**Speakers:** Fabio Cozman, USP/C4AI (Brazil); Carlos Torres Freire & Lucas Gelape, SEADE Foundation (Brazil); Ana Gabriela Faria da Silva, IBGE (Brazil); and Euler Rodrigues de Alencar, STF (Brazil)

**Moderator:** Fábio Storino, Cetic.br|NIC.br (Brazil)

## Escuela de Transformación Digital 2022 (School of Digital Transformation 2022)



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The 2022 edition of the School of Digital Transformation was co-organized by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), the Development Bank of Latin America (CAF), the Regional Center for Studies on the Development of the Information Society, department of the Brazilian Network Information Center (Cetic.br|NIC.br), Agesic - Uruguay and the Datasphere Initiative, and took place on November 14 and 15, 2022 in Montevideo, Uruguay.

To help navigate new trends and address emerging data policy issues, the 2022 Program on Digital Transformation and Innovation in Latin America was conceived as a capacity-building program to engage policymakers in a multistakeholder and cross-sectoral debate on the challenges of digital transformation and innovation in Latin America and the Caribbean, and has been held annually for more than one decade now. The 2022 edition of the Program counted on more than 30 regional and international panelists from academia, governments, international organizations, private enterprises and civil society, and an audience of policymakers, data producers and researchers that actively engaged in group discussions and exchanges of experience.

## MOOC // “Tech for Good: The Role of ICT in Achieving the SDGs”

This program, offered in a massive open online course (MOOC) format through the edX Platform, is a joint initiative by Cetic.br|NIC.br, UNESCO, and the SDG Academy. Set up as a self-paced course, it provides students with a set of 10 modules that address ICT as a critical component for achieving the SDGs. The course brings together thought leaders and changemakers from all regions of the world in fields related to ICT and sustainable development. It addresses the role of ICT in achieving the SDGs in five important areas: i) how digital technologies are empowering billions of people around the world by providing access to education, healthcare, banking, and government services; ii) how ICT is being used to inform smarter, evidence-based policies to improve people’s lives in fundamental ways; iii) how these

technologies can be used for measuring and monitoring the achievement of the SDGs; iv) new challenges that technology can introduce, such as privacy, data management, risks to cybersecurity, e-waste, and the widening of social divides; and v) ways in which stakeholders are coming together to answer big questions about what our future will look like in a hyper-digitized world.

In its latest edition, the course received 1,489 enrollments, which included learners from the United States, India, Brazil, Indonesia, and Nigeria, among other countries. Since its launch in 2018, more than 8,000 learners from diverse backgrounds have enrolled in the course, reaffirming the relevance of continued discussions around the role of technologies for achieving the SDGs.

**Course modules:**

- **Module 1:** Welcome to the Digital Age
- **Module 2:** Technology for Governments and Citizens
- **Module 3:** ICT Infrastructure
- **Module 4:** ICT Innovations in Health
- **Module 5:** Learning in Knowledge Societies
- **Module 6:** Promoting Financial Inclusion
- **Module 7:** Measurement and Metrics for ICT and the SDGs

- **Module 8:** Artificial Intelligence for Development
- **Module 9:** Concerns for our Digital Future
- **Module 10:** The Way Forward

**Languages:** Videos in English; transcriptions in English, Spanish, Portuguese and Russian.

**Registration and more information:**

<https://sdgacademy.org/course/tech-for-good/>

## MOOC // “AI and the Rule of Law”

The 2022 edition of the massive open online course (MOOC) “AI and the Rule of Law” began in March 2022, reaching over 4,500 judicial operators globally. Developed by UNESCO and The Future Society, with the support of Cetic.br|NIC.br, the National Judicial College, and the Institute of Electrical and Electronics Engineers Standards Association (IEEE SA), and the contribution of the UNESCO Multi Donor Programme on Freedom of Expression and Safety of Journalists (MDP) and the Open Society Foundations, it is an introductory course engaging judicial operators in a global discussion around AI’s application and impacts on the rule of law. The MOOC is structured in six modules, enabling the unpacking of the opportunities and risks associated with the adoption of AI technologies across justice systems, as well as their impact for the administration of justice, with a focus on human rights, AI ethics, and governance issues.

The target audience of the MOOC is judges, prosecutors, public defenders, and other stakeholders working for judiciary branches, prosecution services worldwide, and sectors including legal technology companies. Other relevant audience groups include policymakers, academics, and civil society representatives.



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**Languages:** English, French, Spanish, Russian, Chinese, Arabic and Portuguese.

**More information:**

<https://www.unesco.org/en/articles/training-judges-lawyers-and-prosecutors-artificial-intelligence-and-rule-law>

# Methodological Support on Data Measurement for Strategic Partners

In 2022, Cetic.br|NIC.br continued to work alongside strategic partners in the area of ICT-related statistics production, data provisioning and sharing, data analysis, and capacity-building on survey methodologies and innovative methods of data collection. Based on a multistakeholder approach, Cetic.br|NIC.br works in close cooperation with partners from relevant areas of government (regulators, national statistical offices, various ministries), academia, research institutes, and international organizations to develop an ICT measurement ecosystem that allows

for the production of sound and updated data for policymaking and research. Cetic.br|NIC.br also provides technical support and capacity-building programs to decision-makers and data producers in Latin America and Portuguese-speaking countries in Africa. Cetic.br|NIC.br is also an active player in the international arena. In recent years Cetic.br|NIC.br has been cooperating with some national statistical offices in Latin America and with ECLAC, UNESCO, ITU, and OECD in the area of measurement, indicators, and survey methodologies.

## UNESCO Internet Universality Indicators



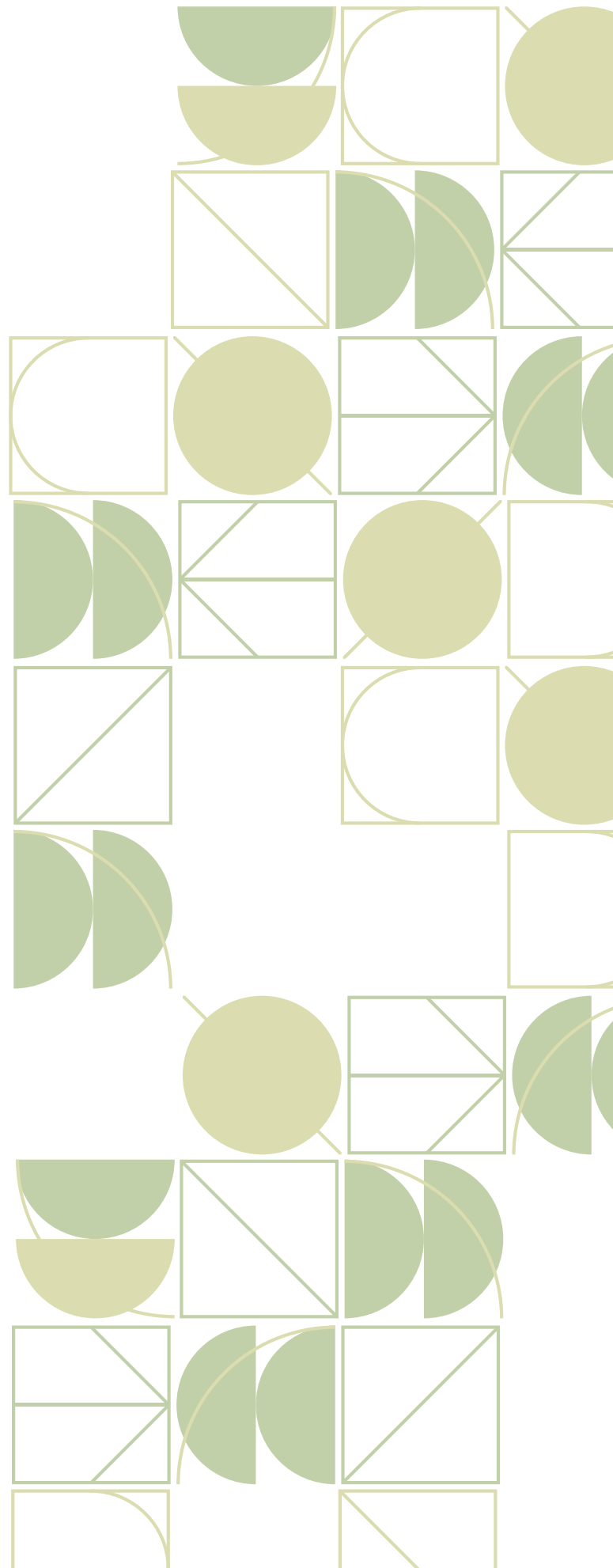
The UNESCO Internet Universality Indicators were designed to enable stakeholders to assess Internet development at the country level and offer policy improvement recommendations, all in accordance with UNESCO’s ROAM-X principles: R - Human Rights; O - Openness; A - Accessibility to All, and M - Multistakeholder Participation. Brazil was the first country to complete an assessment based on the ROAM-X indicators. Cetic.br|NIC.br prepared the national assessment report, which was launched at a UNESCO-led event in 2019.

Throughout 2022, Cetic.br|NIC.br participated in several meetings to disseminate the results of the Brazilian report and support implementation in other countries. Among the main events were:



- ICEGOV 2022 - Roundtable Session  
“Advancing digital inclusion and sustainable development with the Internet Universality ROAM-X Indicators”, October 6, 2022.
- IGF 2022 - Shaping Global Digital Governance and Measuring Meaningful Connectivity for All: The ROAM approach, Day 0 Event, November 28, 2022.
- IGF 2022 - UNESCO Expert Workshop on ROAM-X Indicators: Capacity Building and Update, November 29, 2022.
- IGF 2022 - UNESCO’s IGF Dynamic Coalition on Internet Universality, December 2, 2022.

In the process of implementing the indicators, technical meetings were held with several countries. In 2022, Cetic.br|NIC.br’s teams also contributed to reviews in other Latin American countries, such as Argentina.



# Debating the Challenges of ICT Measurement in International Forums: Sharing Experiences with Data Production

Cetic.br|NIC.br is dedicated to the systematic production of indicators and statistics about ICT access and use in Brazil in various sectors of society. With 18 years of experience, the Center adopts the methodological recommendations established by international organizations that work with the measurement and analysis of ICT statistics, enabling the comparison of its indicators

with those of other countries. Cetic.br|NIC.br also contributes to the development of these recommendations and actively participates in discussions about the indicators. In 2022, the Center participated in discussions held in various national and international forums dedicated to ICT methodologies and indicators, which focused on their review and definition. Some of those events are highlighted below.

## Working Group on Measuring E-Commerce and the Digital Economy

Cetic.br|NIC.br has been part of a working group led by the United Nations Conference on Trade and Development (UNCTAD), which aims to promote cooperation on measuring electronic commerce and the digital economy. The 2022 event took place on November 28 and 29, and participants from several countries presented

the advances and challenges of measuring the digital economy, with special focus on the dissemination of good practices, comparability, and support for developing countries. Cetic.br|NIC.br presented its Big Data projects in the panel “Web scraping and private sector data for official statistics.”<sup>4</sup>

## Working Party on ICT Indicators for Measurement and Analysis of the Digital Economy (WPMAD), Organisation for Economic Co-operation and Development (OECD)

April – 2022

Since 2011, Cetic.br|NIC.br has been an active participant in the OECD Working Party on Measurement and Analysis of the Digital Economy (WPMAD). The goal of this working party is to share countries’ experiences with measuring the digital economy, including tools and methodologies to produce relevant

data for public policymaking. Participants in WPMAD are OECD member countries and invited experts. It is also a forum for debate about the socioeconomic impacts of new disruptive technologies on the digital economy and their contribution to economic growth and well-being.

<sup>4</sup> More information about the event can be found on UNCTAD’s website: <https://unctad.org/meeting/working-group-measuring-e-commerce-and-digital-economy-third-meeting>

In 2022, a WPMADe meeting was held on April 7 and 8th, including topics such as the measurement and valuation of data and data flows and measuring the trustworthiness of online environments and new technologies. The meeting also covered the measurement

of the Internet of Things (IoT). In this meeting, Alexandre Barbosa and Fabio Senne (Cetic.br|NIC.br) and Martin Lundborg (WKI-Consult) presented a set of case studies on manufacturing firms in Brazil and Germany, respectively.

## Expert Group on ICT Household Indicators (EGH) and Expert Group on Telecom / ICT Indicators (EGTI), International Telecommunication Union (ITU)

The mission of both the Expert Group on ICT Household Indicators (EGH) and the Expert Group on Telecommunication/ICT Indicators (EGTI), which are led by the International Telecommunication Union (ITU), is to bring together representatives from various countries to discuss ICT indicators to measure ICT supply and demand, based on the methodological framework developed by ITU.

The EGH and EGTI group meetings are open to ITU members, targeting experts from ministries, regulatory agencies, and national statistical offices.

The 10th Meeting of the ITU Expert Group on ICT Household Indicators (EGH) took place in a fully virtual format on September 14-15, 2022, back-to-back with the 13th Meeting of the ITU Expert Group on Telecommunication / ICT Indicators (EGTI), which was held on September 12-14, 2022. A joint session with EGTI was held on September 14th. There were 259 participants attending the meeting, including experts from

regulators, telecommunication operators, ministries and national statistical offices (NSOs) from 90 countries, as well as ITU-D Sector Members, other UN agencies, and regional organizations.

The objective of the meeting was to examine the contributions sent by members concerning the topics covered during the current working period, with the intent of finalizing the items under discussion. Cetic.br|NIC.br chaired the Joint Subgroup on Measuring Over-the-Top (OTT) Services jointly with EGTI, with a presentation by Winston Oyadomari summarizing the results achieved during the year by the subgroup on the demand side perspective.

Other topics discussed included e-waste indicators in household surveys and methods of aggregation for skills indicators. This included a presentation by Marcelo Pitta on a pilot study based on data from the Brazilian ICT Households survey testing the methods of aggregation proposed.

## Expert Group for the Review of the Tier System of the Fifth Global Cybersecurity Index

The Global Cybersecurity Index (GCI) is a multistakeholder initiative led by the ITU that serves as a reference on measuring the commitment of countries to cybersecurity at a global level, with the objective of raising awareness of the importance and different dimensions of the issue. The ITU Global Cybersecurity Agenda (GCA) provides the general foundation and framework for the initiative.

The objective of the Expert Group is to improve the quality of the index by defining and implementing a tier system for the publication of results. In partnership with Anatel, Cetic.br|NIC.br is contributing to methodological discussions and data analysis from previous editions, trying to determine appropriate methods to classify the member states within the index, as well as promoting discussions on how to improve the analysis and reporting of the results.

# Accelerating SDGs through ICT

## Contributions to the 2030 Agenda



### SDG 4

### QUALITY EDUCATION

Cetic.br|NIC.br's contribution to SDG 4 (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all) ranges from producing ICT and education statistical data, to engaging in the development of international frameworks, to supporting policymakers in designing evidence-based ICT policies.

Cetic.br|NIC.br annually carries out the ICT in Education and ICT Kids Online Brazil national surveys, measuring key indicators of access to and use of ICT and digital skills among students, teachers, directors of studies, and school principals. In addition, the ICT Households survey measures digital skills in the general population, following the ITU framework. These sources are capable of providing information about progress on Target 4.4 (increase skills for employment, including technical and vocational skills), particularly Indicator 4.4.1 (the proportion of youth and adults with ICT skills).

In 2022, Cetic.br|NIC.br collaborated with the Brazilian chapter of the Global Education Monitoring Report (GEM Report, UNESCO), which has informed national, regional and global debates on education for two decades. In partnership with the UNESCO Country Office in Brasilia and GEM Report leaders based in Paris, Cetic.br|NIC.br organized two consultation rounds involving experts, policymakers, teachers, and representatives. The Center's staff also

participated in the Latin American GEM Report consultation round, along with experts from all the countries in the region.

In 2022, Cetic.br|NIC.br also joined the Broadband Commission Working Group on Data for Learning, aimed at promoting all learners' data protection, advocating for the democratization of data delivery through open data initiatives in education, and developing scenarios for future development of data-driven learning ecosystems. In support of UNESCO's knowledge production, the Center actively collaborated in the translation into both Spanish and Portuguese of key UNESCO publications in the thematic area of AI and Education, such as "K-12 AI curricula: A mapping of government-endorsed AI curricula." Cetic.br|NIC.br also co-organized the regional launch of "Artificial intelligence and education: A guide for policymakers," together with the UNESCO Regional Bureau for Education in Latin America and the Caribbean (OREALC/UNESCO Santiago) and the UNESCO Office in Paris.

The indicators produced by Cetic.br|NIC.br surveys and its experience with themes related to access to and use of digital technologies in schools, and meaningful connectivity were important sources of data for both national public policies in the country and projects developed by international organizations such as UNESCO, UNICEF, and ITU.



## SDG 5

### GENDER EQUALITY

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To measure progress in gender equality in the field of access to and use of ICT by women and girls, all surveys conducted by Cetic.br|NIC.br with individuals and professionals allow for disaggregation by gender. In addition, they offer data users access to a wide set of specific indicators on the subject. The topic is highlighted, in particular, in the two household surveys conducted annually by the Center: ICT Households and ICT Kids Online Brazil.

Additionally, in 2021, Cetic.br|NIC.br contributed to the debate on gender inequality

in the labor market, as part of the book *ICT, Internet Governance and Gender - Trends and Challenges*, launched by CGI.br, as well as by contributing the chapter “Youth, gender and digital inequalities in Latin America and the Caribbean: Progress and pending debts (in free translation),” to a publication coordinated by the UNESCO Montevideo Regional Office, CLACSO and El Colegio de Mexico.

Cetic.br|NIC.br also adopts gender balance criteria in the integration of panels at events, authors invited to its publications, capacity-building activities, and research teams.



## SDG 9

### INDUSTRY, INNOVATION AND INFRASTRUCTURE

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Cetic.br|NIC.br has continued developing its core projects and activities that support relevant action under SDG 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation). The Center’s knowledge production strategies directly contribute to measuring SDG 9 via nationwide surveys measuring ICT adoption in enterprises, households, and by Internet service providers (ISPs). These surveys are critical to understanding both the supply and demand sides for ICT goods and services in Brazil, which are critical for the development of the digital economy. Cetic.br|NIC.br also participates in international working groups discussing definitions, concepts, and frameworks for measuring the digital economy, such as those promoted by the Organisation for Economic

Co-operation and Development (OECD), the International Telecommunication Union (ITU), and the United Nations Conference on Trade and Development (UNCTAD). These international efforts are aimed at fostering the production of comparable data among countries. In particular, Cetic.br|NIC.br’s activities directly contribute to monitoring Target 9.c, which focuses on increasing access to ICT and providing universal and affordable access to the Internet in least developed countries.

In addition, Cetic.br|NIC.br produces regular publications focusing on the innovative use of technologies and the digital transformation. Capacity-building strategies developed by the Center also contribute to raising awareness among policymakers and key actors about emerging issues such

as AI, innovative data collection methods, and alternative data sources such as Big Data. The main activities related to SDG 9 carried out during 2022 have included: i) the 12th NIC.br Annual Workshop on Survey Methodology, whose theme was “Methodological Challenges for Data Production in the Context of Emerging Digital Technologies”; and ii) the organization

of the School of Digital Transformation and Innovation in Latin America and the Caribbean, held in Montevideo, Uruguay in partnership with the Economic Commission for Latin America and the Caribbean (ECLAC), the Development Bank of Latin America (CAF), the Agency for the Development of E-Government and Information Society and Knowledge (Agesic - Uruguay), and the Datasphere Initiative.



## SDG 16

### PEACE, JUSTICE AND STRONG INSTITUTIONS

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Cetic.br|NIC.br’s ICT Electronic Government survey is the main contribution to SDG 16 (Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels). This survey is aimed at measuring the digital transformation in the public administration of Brazilian states and cities, providing key inputs to digital government policies. This survey also includes a module on technologies for urban management that allows better understanding of the level of adoption of ICT for local services at the municipal level. Cetic.br|NIC.br is actively engaged in international debates on this topic.

In addition, Cetic.br|NIC.br monitors the transformations in the health and education sectors, measuring advances, barriers, and

innovations in embracing digital innovations and ICT solutions, all key elements for advancing SDG 16. The ICT Enterprises survey provides useful inputs for policies promoting innovative ICT solutions in business.

Another contribution to SDG 16 occurs via a massive open online course (MOOC), “Artificial Intelligence (AI) and the Rule of Law,” which is an introductory course engaging judicial operators in a global and timely discussion around AI’s application in and impact on the rule of law.

# Cooperation Networks

In 2022, Cetic.br|NIC.br strengthened its cooperation efforts with government agencies and regional collaboration networks in Latin America and Portuguese-speaking African countries, which made it

possible to promote evidence-based policy design. These efforts, in turn, allow for knowledge exchange, sharing of common frameworks for ICT data collection, and regional comparability.

## Cooperation with Portuguese-Speaking African Countries

On March 23 and October 19, 2022, Cetic.br|NIC.br hosted the visits of the delegations of the National Institute of Information and Communication Technologies (INTIC) and the Mozambican Regulatory Authority of Communications (INCM), both from Mozambique. On these

occasions, the Mozambican delegations got detailed information about key projects at NIC.br and discussed cooperation alternatives to fuel the innovation initiatives projected in their mid-term work plans. Technical cooperation lines were open for implementation in 2023.

## UN Big Data Regional Hub in Brazil

In 2022, Cetic.br|NIC.br participated as a member of the council and the technical advisory group of the UN Big Data Regional Hub in Brazil, working closely with IBGE, which is a Brazilian National Statistical Office (NSO) and the host of the hub. The hub aims to contribute to advancement in the use of Big Data to improve the production of official statistics, promoting the sharing of knowledge and the development of innovative initiatives in Latin America and the Caribbean. The initiatives planned or already carried out during 2022 were:

- Getting to know what is going on in the region: Web scraping and surveying NSO.
- Fostering the use of Big Data for official statistics among youth: Participating in lectures and training.
- Supporting research on the use of Big Data and data science: Research on Web scraping (CPI/social media/industries).
- Organizing and hosting seminars and conferences: Portraying what is going on in the region in using Big Data for official statistics.
- Organizing a series of conferences on relevant issues.

## ICT in Health

### Cooperation with Ministries of Health in Latin America and the Caribbean, in partnership with the Inter-American Development Bank (IDB)

In addition to monitoring the transformations in the health sector, and measuring advances, barriers, and innovations in embracing digital innovations and ICT solutions, Cetic.br|NIC.br offers technical cooperation on these matters. In the framework of the Memorandum of Understanding with the Inter-American Development Bank (IDB), signed in 2020, in March 2022 the Center offered a “Methodological Workshop for Implementing

Surveys on ICT in the Health Sector,” in which participated the ministries of health of Colombia, Argentina and Suriname, with the support of the Pan American Health Organization (PAHO). This cooperation initiative aims to develop capacities for the design and implementation of surveys on access to and use and appropriation of ICT in the health sector, comparable and based on international reference standards. These projects will continue in 2023.

### Cooperation with the World Health Organization for Europe

In 2022, Cetic.br|NIC.br was commissioned to coordinate the project “Monitoring the implementation of digital health: An overview of selected national and international methodologies,” in partnership with the Regional Office for Europe of the World Health Organization (WHO Europe). The objective of

this project was to consolidate and examine the available information on recent digital health monitoring activities at the international and regional levels, as well as at the national level, in selected countries, allowing for the development of future recommendations on the implementation of internationally comparable indicators.

## ICT in Education

In 2022, Cetic.br|NIC.br participated in consultations leading to the establishment of the Brazilian Chapter of The Global Education Monitoring Report (GEM Report), in partnership with the UNESCO Office in Brasilia. The first round of consultation took place during the ICT in Education Survey Expert Meeting, and the second round took the shape of a webinar held on August 24, 2022, in which evidence-based academic and policy reflections on technology and education in Brazil were collected, as well as concrete cases and examples. More than 50 experts, including academics, policymakers, and representatives from the education community, participated in the consultation, which focused on three key issues: governance and regulations for the use of technology in education in Brazil;

policies to promote access to technology for vulnerable populations; and federal policies and laws to protect teachers and students from the negative effects of the use of technology in education, such as cyberbullying and the use and protection of personal data.

Cetic.br|NIC.br, in collaboration with UNESCO’s Education Sector (Paris Headquarters), and the UNESCO Regional Office for Education for Latin America and the Caribbean, (OREALC/UNESCO Santiago), co-organized the regional launch for Latin America and the Caribbean of the UNESCO publication *Artificial Intelligence and education: A guide for policy makers*. The event was held on April 26, 2022, and aimed to give the Member States of the region the opportunity



to share achievements in and future plans for the development and implementation of AI in education. The webinar counted on a high-level panel composed of ministries of education from the region, and a presentation by Fenchung Miao, Chief of the Unit for Technology and Artificial Intelligence in Education at UNESCO.

Cetic.br|NIC.br also supported the translation into Spanish and technical revision

of UNESCO's recent publication *Guidance for ICT in Education policies and masterplans*, also available in English and Arabic, and supported its dissemination among policymakers and educational researchers and practitioners in the Latin American and Caribbean region.

## ICT and Children

### Youth and Gender

In 2022, Cetic.br|NIC.br participated in the South America launch of the publication *Género y juventudes en un entorno desigual: realidades y perspectivas para América Latina y el Caribe* (Gender and youth in an unequal context: Realities and prospects for Latin America and the Caribbean, in free translation), coordinated by the

UNESCO Montevideo Regional Office, the Latin American Council of Social Sciences (CLACSO), and El Colegio de México, which took place in Montevideo, Uruguay, in the context of the V Latin-American and the Caribbean Social Sciences Congress, organized by the Latin American School of Social Sciences (FLACSO).

### Kids Online Networks

Cetic.br|NIC.br organized the 2022 meeting of the Latin America Kids Online network, along with UN ECLAC officials, which took place in November 22 and 23 in São Paulo, Brazil in a hybrid format. The objective of the meeting was to plan 2023

activities, share experiences, and provide methodological support for new countries in implementing the survey. UNICEF officials, academic researchers, and members of civil society from Uruguay, Chile, Costa Rica, Colombia and Perú participated in the meeting.

## ICT and Government

### 15th edition of the International Conference on Theory and Practice of Electronic Governance (ICEGOV 2022)

On October 5, a roundtable session organized by Cetic.br|NIC.br, "Challenges for achieving meaningful connectivity in Latin American countries and its implication for Digital Government" took place with the participation of experts. The panel highlighted the main challenges to bridging the persistent digital gap in Latin America, particularly in Brazil and Argentina. The roundtable also

discussed the implications of meaningful connectivity for digital government and how Latin American countries can increase access to digital government that meets citizens' demand for public services.

Speakers included Gonzalo Bustos, researcher at the Studies in Society Technology (CETYS) of the University of San Andrés (UDESA); Professor Maria Alexandra

Cunha from the Getulio Vargas Foundation (FGV); Teddy Woodhouse, consultant in digital inclusion and meaningful connectivity; and Manuella Maia Ribeiro, researcher and

coordinator of the ICT Electronic Government survey at Cetic.br|NIC.br. Alexandre Barbosa, Head of Cetic.br|NIC.br, was responsible for moderating the roundtable session.

## Expert Group Meeting (EGM) on Development Trends and Assessment of Global Open Government Data

On May 26, Cetic.br|NIC.br participated in the EGM on Development Trends and Assessment of Global Open Government Data, organized by the United Nations Department of Economic and Social Affairs (UN DESA) through its Division for Public Institutions and Digital Government (DPIDG). With

participants from all regions of the world, the online meeting aimed at providing a platform for digital government and open government data (OGD) experts to share their diverse perspectives on the development trends in OGD and the proposed Open Government Data Index (OGDI).

# Dialogue With Stakeholders

ICT as a key cross-cutting technology that impacts multiple sectors and requires the involvement of multiple and diverse stakeholders in the development of knowledge and information societies. Dialogue among these stakeholders can be established in many ways: cooperation agreements between institutions; sharing microdata bases; participation in forums and discussion groups; and meetings to present the indicators produced by the Center. In 2022, there were 24 ongoing cooperation agreements with government and international organizations, which, in addition to consolidating long-term cooperation and strengthening the Center's relationships with these organizations, allow the establishment of joint activities, and the sharing of experiences, data, and methodologies among institutions. Below are some of the important actions carried out by the Center in 2022 that allowed for closer ties with multiple and diverse stakeholders throughout the year, reinforcing its commitment to the dissemination of information and knowledge.

## Policy Dimension: Digital Economy

In 2022, Cetic.br|NIC.br continued its involvement in pilot international research projects developed by OECD.

One example is the project "Measuring the Internet of Things: Case studies in the Industrial Internet of Things (IIoT)." The objective of the project is to gain a richer understanding of the uses of the Industrial Internet of Things (IIoT) in the manufacturing sector in Brazil and Germany. The study investigates the main IIoT functions used and their related impacts.

Another project is the "OECD-BCG-INSEAD International Survey of Artificial Intelligence in Enterprises." The objective of the study is to support the design and implementation of a new and exploratory survey of AI in enterprises. The survey explores why medium and large companies in the manufacturing and ICT sectors "do and do not use AI, as well as the policy and institutional conditions needed to increase the use of AI" (OECD, 2021).

## Digital Government

In 2022, strengthening cooperation with the United Nations University Operating Unit on Policy-Driven Electronic Governance (UNU-EGOV), Cetic.br|NIC.br was invited to submit a roundtable session for the 15th edition of the International Conference on Theory and Practice of Electronic Governance (ICEGOV). In the same conference, Alexandre Barbosa, head of Cetic.br|NIC.br, was one of the chairs in Track 7 – Inclusive, equitable, and resilient governments for the SDGs. For ICEGOV 2023, Cetic.br|NIC.br was invited to be part of the organizing committee, since the 16th edition will take place in Belo Horizonte (Brazil).

## ICT in Education

In 2022, several national and international organizations implemented projects to measure and recover from the impacts of the pandemic on education, with a special focus on the role played by digital technologies in reducing or increasing social inequalities. Cetic.br|NIC.br is involved in many of these projects, by offering indicators on access to and use of technologies by educators, children, adolescents and young people and in Basic Education schools, as well as through participation in working groups and expert meetings and in the elaboration of policy briefs.

An example was the participation of Cetic.br|NIC.br in the meeting of the Education Recovery Strategy in Brazil project on indicators of meaningful connectivity in schools, which was led by the World Bank, with the participation of the Alliance for Affordable Internet (A4AI) and the Brazilian Ministry of Education (MEC). Cetic.br|NIC.br also participated in the review of the document Challenges and opportunities for sustainable and effective connectivity policies in Brazilian schools (in press), prepared by the International Telecommunication Union (ITU).

During 2022, Cetic.br|NIC.br worked together with the Center for Innovation in Brazilian Education (Cieb) and the National Institute for Educational Studies and Research

“Anísio Teixeira” in the revision and elaboration of new connectivity indicators for the Brazilian Basic Education School Census. Cetic.br|NIC.br also participated in the Working Group on Data for Learning, promoted by the Broadband Commission for the Sustainable Development, on the use of data to improve the provision of quality education.

## ICT in Health

In 2020, the Technical Committee (CT) on Digital Health of the National Education and Research Network (RNP) was launched. It aims to be a forum to study the future of applications, products, and services, and aspirations in digital health in several areas of research, development, and innovation. Cetic.br|NIC.br was invited to participate in this Committee and has contributed more directly, coordinating the group “Accelerating the training of workers and professionals in digital health practice.” In 2022, Cetic.br|NIC.br participated in the development of the report Vision of the future of digital health 2022, which presented the main challenges and trends for digital health in Brazil.

Cetic.br|NIC.br also participated in a workshop on the Digital Maturity Index in Healthcare Facilities (IMDS) organized by the Digital Health Strategy Management Committee of the Brazilian Ministry of Health. Contributions were related to the methodology and data collection instrument of the pilot project for calculating the index and its amplitude, using the experience and indicators of the ICT in Health survey.

Cetic.br|NIC.br also established a partnership with the Brazilian Company of Hospital Services (EBSERH), which is responsible for the administration of some of the university hospitals in Brazil that are included in the survey sample. The results were presented at seminars to the EBSERH's technical staff, organized by this institution.

Cetic.br|NIC.br has a cooperation agreement with the National Council of Municipal Health Secretaries (Conasems) that aims to expand

the dissemination of the results of the ICT in Health survey in municipalities and guarantee that a representative of the Council will serve as a specialist who participates in Cetic.br|NIC.br's expert group meetings for the survey consultations, among other contributions. In 2022, the cooperation contributed to the dissemination of the ICT in Health survey to municipal health secretaries.

Based on the cooperation agreement established with the Brazilian Ministry of Health, Cetic.br|NIC.br contributed to the discussion and mapping of education and training needs in digital health, based on the objectives established for Priority 5 of the Digital Health Strategy for Brazil 2020-2028 (ESD28): Training in Human Resources. Cetic.br|NIC.br also participated in the I Broad Participation Forum of the Digital Health Strategy for Brazil 2020-2028 (ESD28), supporting its evaluation and revision.

Another activity in the sector was participation in the Strategic Meeting for the Development of an Operative Plan for the Implementation of the Route for the Digital Transformation of the Health Sector in the Americas, held by the Pan American Health Organization/World Health Organization (PAHO/WHO). This meeting featured several experts from different Latin American countries who discussed and determined the main strategies that PAHO can lead with the countries to achieve advances in the digital transformation of health.

### **Policy Dimension:** Measurement and Data Production for Policymaking

In 2022, Cetic.br|NIC.br implemented actions established by an agreement with the SEADE Foundation – the statistics agency of the government of the State of São Paulo – to share information,

improve research methodologies based on technological innovations, and develop joint research and analysis. In 2022, the agency published technical notes on access to and use of the Internet in healthcare facilities and the share of ICT in the regional accounts.

## **Multi-Participative Process: Contributions from Different Sectors of Society**

In 2022, Cetic.br|NIC.br engaged in several activities organized by major private sector companies, which are increasingly relevant stakeholders in discussions about the socioeconomic and cultural implications of ICT.

Cetic.br|NIC.br participated in a cycle of meetings of the Well-Being and Technology Project, promoted by Facebook, Instagram, Google, and YouTube. The meetings brought together national and international experts in the areas of technology, well-being, and childhood to share research and actions aimed at the safety of children online.

The roundtables addressed the following topics:

- Sexual exploitation of children and adolescents on the Internet in times of pandemic. June 16
- Well-being and technology: Regulatory discussions for children. June 29.
- Well-being and technology: Mental health and suicide prevention. September 30.

# Producing Knowledge about ICT

The production and sharing of knowledge about themes related to knowledge and information societies are the most important lines of action of Cetic.br|NIC.br. In 2022, Cetic.br|NIC.br actively participated in several academic discussion forums, including presenting survey results and data analyses, debating methodological challenges, promoting thematic discussions, and proposing discussion panels with important stakeholders. Relevant events in which the Center participated in 2022 to present and share what the Center is producing are listed below.

## Culture and Technologies

- Curso Sesc de Gestão Cultural. Digitalização da cultura: instituições e práticas culturais na Internet (Sesc Course on Cultural Management. Digitization of culture: Cultural institutions and practices on the Internet, in free translation). June 2022.
- Ciclo Gestão Cultural Poiesis - Cultura e tecnologia. Práticas culturais na Internet (Poiesis Cultural Management Cycle - Culture and technology. Cultural practices on the Internet, in free translation). June 2022.
- I Simpósio Internacional de Gestão da Inovação e Transformação Digital (SIGITD). A digitalização de acervos no Brasil segundo a pesquisa TIC Cultura (I International Symposium on Innovation Management and Digital Transformation [SIGITD]. The digitization of collections in Brazil, according to the ICT in Culture survey, in free translation). July 2022.

- XVIII Enecult. Mesa coordenada Inteligência Artificial e Cultura (Coordinated roundtable on AI and culture, in free translation). August 2022.
- XVIII Enecult. Usos das TIC e práticas culturais: uma análise do Painel TIC COVID-19 (ICT uses and cultural practices: An analysis of the ICT Panel COVID-19). August 2022.
- 12<sup>th</sup> International Conference on Cultural Policy Research (ICCP). Artificial Intelligence in culture: implications for the diversity of cultural expressions. September 2022.
- 12<sup>th</sup> International Conference on Cultural Policy Research (ICCP). Online cultural practices during the pandemic in Brazil: Findings from a survey with Internet users. September 2022
- 46<sup>th</sup> Encontro Anual da Anpocs. Usos das TIC e práticas culturais no Brasil no contexto da pandemia (46th Annual Meeting of Anpocs. ICT uses and cultural practices in Brazil in the context of the pandemic). October 2022.

## Education and Children

- Webinar EdTech. Unitel Creative Camp. "As tecnologias digitais e as oportunidades de desenvolvimento da educação" (Digital technologies and opportunities for educational development). Virtual event sponsored by the government of Cape Verde. January 2022.

- Safer Internet Day. “Educação e Cidadania Digital no futuro 4.0” (Education and digital citizenship in the 4.0 future). Virtual event sponsored by NIC.br and SaferNet Brazil (São Paulo). February 2022.
- Webinar “Digital Divide, an obstacle to overcome in Honduras” organized by the National Secretary of Technology and Innovation (SENACIT). Presented the results of the chapter on Digital Gender Divides in Youth in Latin America and the Caribbean to the Danzar en las Brumas book from UNESCO. March 2022.
- Workshop “Desafios na educação para uso seguro e cidadão da Internet com adolescentes da rede pública” (Challenges in education for safe and citizen use of the Internet with adolescents in public schools). Virtual event sponsored by SaferNet Brazil and the UK Embassy in Brazil. April 2022.
- Expert group meeting “TTC Labs design for youth: Brazil expert insights session” sobre ferramentas de mediação e uso responsável para crianças, adolescentes e seus pais/responsáveis. Virtual event sponsored by Meta. April 2022.
- Round Table on Combating Sexual Exploitation of Children. Virtual event sponsored by Google. May 2022.
- Brazilian Internet Governance Forum (FIB). “Estratégias para conscientização e educação sobre privacidade e proteção de dados no contexto pós-LGPD” (Strategies for privacy and data protection awareness and education in the post-LGPD context). Natal, Brazil. June 2022.
- Brazilian Internet Governance Forum (FIB). “Proteção de criança online na pandemia: ferramentas e boas práticas para um ambiente seguro” (Child online protection in the pandemic: Tools and best practices for a safe environment). Natal, Brazil. June 2022.
- 9th Latin American and Caribbean Conference of Social Sciences - CLACSO 2022. “Youth and gender: the impact of digital gaps on labor insertion.” National Autonomous University of Mexico. June 2022.
- 9th Undime Extraordinary National Forum. “O uso das tecnologias na educação. Diversão, conhecimento, competências, habilidades e aprendizagem” (The use of technologies in education. Fun, knowledge, skills, abilities and learning). Brasília, Brazil. August 2022.
- Workshop Tecnologias de Redes do PoP-AP. “Educação e Tecnologias na Região Norte do Brasil”. Virtual event sponsored by the National Research Network (RNP). October 2022.
- International Congress of Education and Technology (CIET:EnPET|CIESUD:ESUD|2022). “Educação, Tecnologias e Cultura Digital: movimentos pela equidade, inclusão e engajamento.” São Paulo, Brazil. November 2022.
- Accessible Americas 2022: Information and Communication Technologies for ALL. (ITU/Anatel). Protecting children online: Digital inclusion with responsibility and safety. Brasilia, Brazil. November 2022.
- I International Seminar on the Presence of the Portuguese Language on the Internet (SEPREPI). “Uso de tecnologias e letramento digital no Brasil.” Virtual event sponsored by the International Institute of the Portuguese Language (IILP) of the Community of Portuguese Speaking Countries (CPLP) and the UNESCO Chair in Language Policies for Multilingualism (UCLPM). November 2022.

## E-Government

- XLVI Encontro da ANPAD - EnANPAD 2022. "Governos locais e conectividade em municípios de pequeno porte no Brasil." Virtual event. September 2022.
- 15<sup>th</sup> International Conference on Theory and Practice of Electronic Governance. Session "Challenges to achieving meaningful connectivity in Latin American countries and its implications for digital government." Guimarães, Portugal. October 2022.

## Health and Technologies

- Launch of the Connectivity in Health platform. This platform is a tool that gathers data on the quality of the Internet in public health establishments in the country. The initiative is the result of a cooperation agreement between the National Council of Municipal Health Secretariats (Conasems) and NIC.br. March 2022.
- Methodological workshop for implementing surveys on ICT in the health sector promoted by Cetic.br|NIC.br and IDB. Countries that participated: Argentina, Colombia, Surinam and Uruguay. March 2022.
- Workshop promoted by the Ministry of Health on "Training and training of human resources in digital health". April 2022.
- XXIII Workshop of the National Teaching and Research Network. Panel "Telemedicine in Brazil: The digital transformation in health." May 2022.
- Broad Participation Forum (FAP) of the Digital Health Strategy for Brazil 2020-2028 (ESD28). June 2022.
- XXII Brazilian Symposium on Computing Applied to Health. Panel "Digital technologies in health: The results of the ICT Health 2021 survey." June 2022.
- 2<sup>nd</sup> Seminar on LGPD in Digital Health. Panel "Open health and interoperability." October 2022.
- Workshop "Essential Skills of the Health Informatics Professional." Held by the Brazilian Society of Health Informatics. November 2022.

## Households and Digital Inclusion

- Working group meeting on "Mobile phone data." UN Global Working Group on Big Data. February 2021.
- Communications Policy Research Latin America (CPR LATAM). Session "Gender equality in the digital environment". Mexico. December 2022.
- CPR Latam. "Connectivity and local capacities in IT in Brazilian small municipalities." Mexico. December 2022.

## Productivity and the Digital Economy

- Rota da Transformação Digital da Federação das Indústrias do Paraná (Digital Transformation Route of the Federation of Industries of Paraná) - FIEP. June 2022.
- MF-UNCTAD-ECLAC webinar on the measurement of digital production and trade. November 2022.
- UNCTAD - Working Group on Measuring E-commerce and the Digital Economy. November 2022.
- 16<sup>a</sup> Edição do IX Fórum. Fronteiras da Inclusão digital: O caso dos provedores de pequenos municípios. October 2022.

## Privacy and Data Protection

- 13º Seminário de Proteção à Privacidade e aos Dados Pessoais (13th Seminar on Privacy and Personal Data Protection). São Paulo (Brazil). August 2022.
- FGV - Segunda Reunião do Núcleo de Estudos E-commerce (Second Meeting of the E-commerce Study Group). October 2022.

# Published Papers

### **Barbosa, A., Martinez, A. L., & Costa, D.**

(2022). Inteligência artificial e educação: o papel dos gestores públicos na aplicação qualitativa da inteligência artificial. In União dos Dirigentes Municipais de Educação. *Educação em movimento 2: o percurso histórico da BNCC até os novos currículos* (pp. 244-257). Fundação Santillana.

### **Coelho, I. B., Pitta, M. T., & Silva, P. L. N.**

(2022). Combining quota and probability sub-sampling within enumeration areas to produce more reliable estimates. *Statistical Journal of the IAOS*, 38(4), 399-410.

**Lima, L. P. B.** (2022). Artificial Intelligence in Culture: implications for the diversity of cultural expressions. *12<sup>th</sup> International Conference on Cultural Policy Research - ICCPR 2022*. Antwerp, Belgium.

**Lima, L. P. B.** (2022). Inteligência Artificial na cultura: implicações para a diversidade de expressões culturais. *Anais do Encontro de Estudos Multidisciplinares em Cultura*. Salvador, BA, Brasil.

### **Macaya, J. F., Ribeiro, M. M., & Lima, C. L.**

(2022). Brechas digitais de género en el uso de gobierno electrónico en Brasil. *Communication Policy Research Latin America*, 15, 63-72.

### **Martinez, A. L., & Portilho, L.**

(2022). Juventud, género y brechas digitales en América Latina y el Caribe: avances y deudas pendientes. In P. Aguilar, L. Carrizo, M. I. Domínguez, L. Flamand, A. Morales, J. C.

Olmeda, & L. Sánchez (Eds.), *Danzar en las brumas: género y juventudes en entornos desiguales en América Latina y el Caribe* (1<sup>st</sup> ed., pp. 129-145). UNESCO; Colegio de México; CLACSO.

**Martinez, A. L.** (2022). Brechas digitales y derecho a la educación durante la pandemia por COVID-19. *Propuesta Educativa*, 2(56), 11-27.

### **Portilho, L., Ribeiro, M. M., Lins, L. M., Storino, F., & Senne, F.**

(2022). Privacidade e proteção de dados em organizações públicas e privadas do Brasil: avanços e desafios. *Communication Policy Research Latin America*, 15, 88-94.

### **Ribeiro, M. M., & Macaya, J. F. M.**

(2022). Smart governance approaches and indicators in smart cities measurement frameworks. *15th International Conference on Theory and Practice of Electronic Governance*. Guimarães, Portugal.

### **Segatto, C. I., & Ribeiro, M. M.**

(2022). Capacidades estatais em tecnologias de informação e comunicação dos municípios brasileiros. In E. J. Grin, D. J. Demarco & F. L. Abrucio (Eds.), *Capacidades estatais municipais: O universo desconhecido do federalismo brasileiro* (pp. 248-286). Editora da UFRGS/CEGOV.

### **Segatto, C. I., & Storino F.**

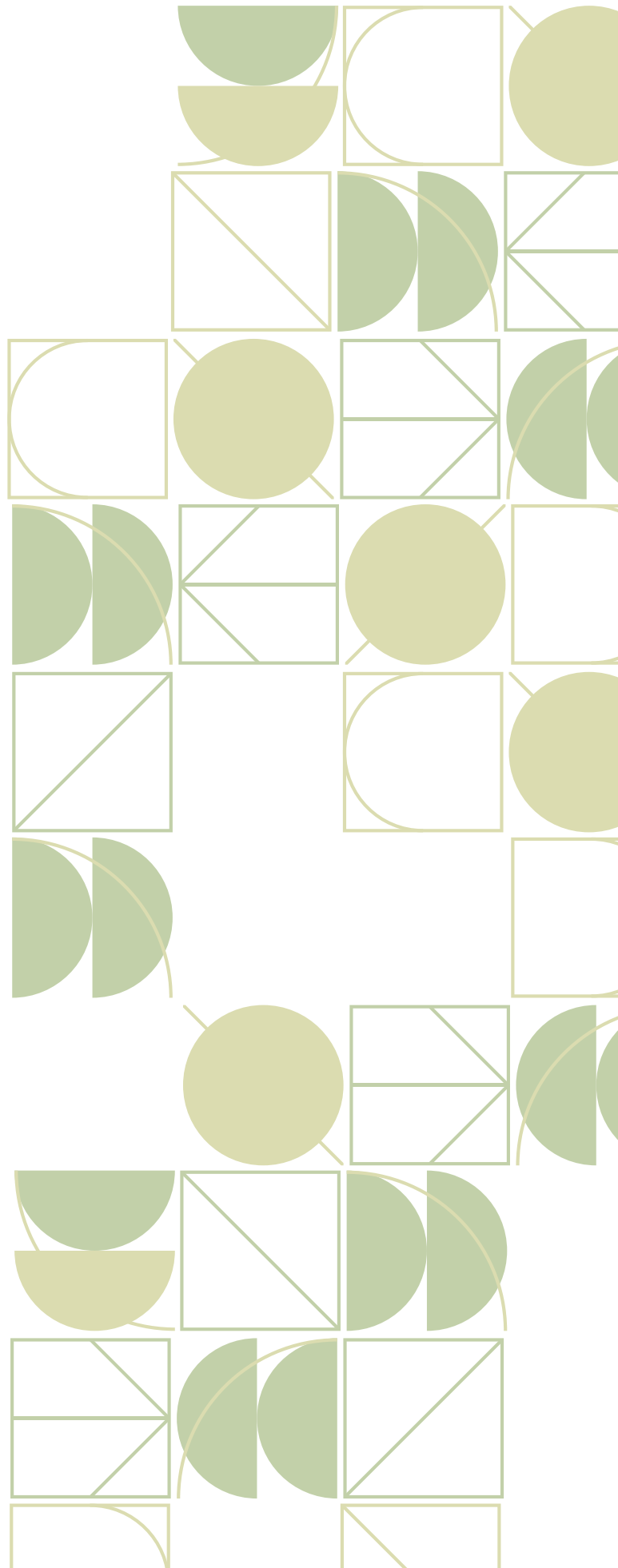
(2022). Usos das TIC e práticas culturais: uma análise do Painel TIC COVID-19. *Anais do Encontro de Estudos Multidisciplinares em Cultura*. Salvador, BA, Brasil.



**Segatto, C. I., & Storino, F.** (2022). Online cultural practices during the pandemic in Brazil: Findings from a survey with Internet users. *12<sup>th</sup> International Conference on Cultural Policy Research - ICCPR 2022*. Antwerp, Belgium.

**Segatto, C. I.** (2022). Usos das TIC e práticas culturais no Brasil no contexto da pandemia. *Anais do 46º Encontro Anual da Anpocs*. São Paulo, Campinas, Brasil.

**Segatto, C. I., & Storino, F.** (2022). Efeitos da pandemia nas atividades culturais. *Revista .br*, 13(19), 40-43.



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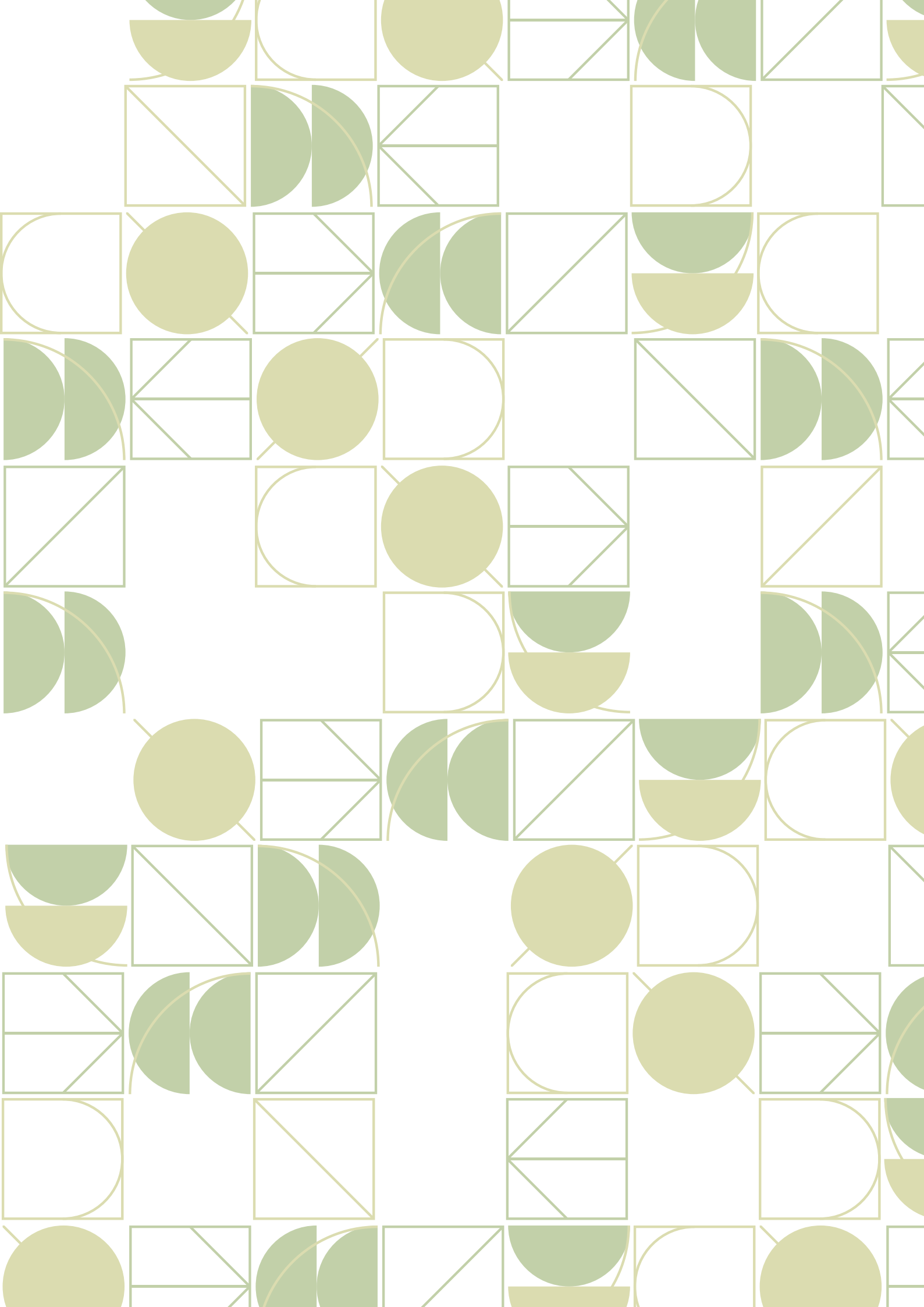
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