PRESENTATION

An agenda for the digital society of the future.

This Brazilian Strategy for Digital Transformation (E-Digital) is the result of an initiative of the Federal Government, coordinated by the Ministry of Science, Technology, Innovations and Communications, with the active participation of the members of the Interministerial Working Group responsible for its elaboration. This formulation center interacted with a group of more than 30 entities of the Federal Public Administration throughout the entire process.

This document represents the conclusion of a path initiated by a presidential determination based on a recommendation of the Economic and Social Development Council (CDES) at its 46th Plenary Meeting1. The Presidency of the Republic has determined that a proposal for a long-term strategy for the digital economy should be drawn up by the end of 2017.

The result also reflects the broad engagement of the productive sector, the scientific and academic community and civil society in various stages of the work. There was a significant participation in the seminars and workshops during the process of formulating the Strategy, as well as in the Public Consultation to the base document, which received thousands of accesses and contributions. This led to the revision and improvement of E-Digital, which is consolidated as a public policy to be implemented.

The rapid changes in the economy and society provided by the digital environment impose new challenges on government action. Defined strategic actions focus on the role of government as an enabler and facilitator of this digital transformation in the productive sector of the country, in the capacity of society for this new reality, and in the State's performance as a service provider and rights-holder.

E-Digital offers a broad diagnosis of the challenges to be faced, a vision of the future, a set of strategic actions that bring us closer to that vision, and indicators to monitor progress in achieving our goals.

It is important to emphasize that the Strategy must be a "living" public policy, constantly monitored, evaluated and adjusted, as the global pace of digital transformation tends to accelerate.

However, perhaps the most important aspect is the country facing digital transformation as an opportunity for the country to make a qualitative leap. Digital technologies provide the tools for a deep transformation in government performance, business competitiveness and productivity, as well as empowerment and inclusion in society, so that everyone can develop and thrive.

INTRODUCTION

Take advantage of the full potential of digital technologies to achieve increased productivity, competitiveness and levels of income and employment throughout the country, aiming to build a free, fair and prosperous society for all.

Digital technologies are increasingly present in everyone's life: at home, at work, in schools, in the media and in social relations. In order for Brazil to take full advantage of the digital revolution, reaping all the benefits that the information and knowledge society has to offer, the national economy must transform itself with dynamism, competitiveness and inclusion, absorbing the digitization of its processes, values and knowledge.

The economy of the future will be digital and should reach all Brazilians. It is not possible to design a modern and dynamic economy that does not provide equal opportunities in all regions of the country.

The digital area has proved to be a new vital center of modern economies and the leading countries have strategically positioned themselves on the subject. In the international arena, several countries seek to leverage their core competencies and advantages, while filling important gaps to maximize the benefits of the digital economy. Depending on economic dynamism and major productive forces, some

countries seek to be leaders in specific and promising sectors, such as robotics, artificial intelligence, high-precision manufacturing, or digital fnancial innovations, while others manage their regulatory frameworks in order to the potential of digital technologies. Among the priorities of digitization initiatives around the world are the pursuit of competitiveness in digital business, digitalization of public services, creation of jobs qualified in the new economy and policies for a better and more advanced education.

With Brazil it will not be different. The Brazilian advantages should be used to overcome challenges and to advance the digitalization of the economy. Although Brazil possesses strong and significant competitive advantages in certain areas - developed agribusiness, solid sectors of industry and services, cultural diversity, large and diversified economy, attractive consumer market - it is perceived that the country still has important challenges to face.

With these issues in mind, a work of scenario evaluation and long-term strategy elaboration was carried out, the result of which is the present Brazilian Strategy for Digital -E-Digital Transformation. A working group involving various government agencies, in collaboration with sectoral representatives and civil society, has drawn up diagnoses and visions of the future, proposing initiatives linked to a strategic vision.

An important focus for E-Digital is the contextualization of strategic actions in the major international agendas for development. Among them, the Sustainable Development Objectives 2 of the United Nations Agenda 2030 stand out.

Among the 17 Sustainable Development Objectives and 169 associated goals, one is specific and has indicators related to Information and Communication Technologies3. However, digital transformation can directly or indirectly influence several of the other ODS goals and objectives:

• Objective 1 - Poverty Eradication: fnancial inclusion of the poorest by combining mobile terminals with Internet access, mobile payments and new financial instruments in the digital environment.

• Objective 2 - Zero Hunger: Internet of Things, increasing productivity in agriculture, reducing losses in the field and transportation logistics and distribution.

• Objective 3 - Health and Welfare: use of mobile terminals with access to medical databases and enabling electronic medical records; and the Internet of Things, with remote monitoring and diagnostics.

• Objective 4 - Quality Education: computers with access to digital content, distance learning, teacher training and professional training.

• Objective 9 - Industry, Innovation and Infrastructure: expansion of Internet access infrastructure, digital entrepreneurship, and Internet of Things.

• Objective 13 - Combating Climate Change: Sensor networks combined with Internet-enabled terminals enable rapid action on natural disaster prevention and mitigation.

In addition to UN activities, it is important to mention the World Economic Forum, which compiles the Global Competitiveness Index (GCI) 4 annually.

This index compares the economies of 137 countries and defines competitiveness as a set of institutions, public policies and other factors that determine the level of productivity, seeking to re fl ect the level of prosperity that each country can attain. The GCI combines 114 different indicators that seek to capture these metrics, incorporating statistical data from various international organizations.

Currently, Brazil occupies the 80th position of the GCI. It is a position short of the possibilities that the country can achieve, impacting the level of attractiveness of Brazil for new investments, the Brazilian image in the international scenario, with damages to its economic and social development. It is the objective of this Strategy to significantly increase Brazil's position in this index over the next five years.

Progress in this and other indicators will be associated with the success of the Brazilian economy, including the country's digital economy.
A recent study5 points out that the digital economy represented around 22% of the Brazilian GDP of 2016, reaching 25.1% of GDP in 2021, and pointing out that an optimized digital strategy can bring 5.7% increase (equivalent to US $ $ 115 billion) to the estimated GDP for a given year. Another study6 indicates that in the coming years, the global digital economy is expected to grow 2.5 times faster than the growth of the world economy in general. This global digital economy should amount to $ 23 trillion by 2025.
As a way of observing the contribution of digital transformation to Brazil's global competitiveness, E-Digital adopts some indicators and metrics of international comparability, notably those elaborated by specialized agencies of the United Nations, including:

- Infrastructure: ITU ICT Development Index (IDI)
- Cybersecurity: ITU Global Cybersecurity Index (GCI)
- Electronic Commerce: UNCTAD B2C E-commerce Index
- Electronic Government: An E-Government Development Index (EGDI)

It is certain that changes must occur for the betterment of society, and that transformations can affect some people more positively than others. However, E-Digital's role is to coordinate various public policies so that the appropriation of digital technologies occurs broadly, without serious social harm or to entire sectors of the economy, in favor of building a more free, fair, prosperous economy.
Scanning opens up new opportunities on countless fronts. Today it is possible to imagine access to educational resources equally, no longer affected by geographical location, income, race, gender and other factors. There are more and more economic advantages through automation, data analysis and better decision-making based on the use of algorithms and data. New issues of privacy and human rights protection arise from the rapid dissemination of data and the increasing economic value of its use. Affordable, cheaper and higher quality health care for all is also a promising opportunity for digital technologies.
Like digital strategies in other countries, E-Digital seeks to coordinate the various governmental initiatives related to the theme around a unique, synergistic and coherent vision, in order to support the digitization of productive processes and the training for the digital environment , promoting value creation and economic growth. Digital innovations also imply the creation and updating of appropriate regulatory frameworks. In addition, they require a digital strategy governance support framework, which will coordinate existing institutional mechanisms and prioritize the implementation, monitoring and evaluation of the results of the initiatives. Based on these premises and initial elements, we arrived at the conceptual model to follow.
The following chart details the various topics detailed from the initial concept:

The division of themes for the digital transformation of the economy and society is suggested as an aid to understanding the chain of actions proposed. The process of digitization is more complex, comprising transversal themes and reciprocal crosses. The actions identified with this work were conceived in view of such interdependence, with a strategic vision, without isolation, each contributing to mutually reinforce their impact.
From the conceptual model above, the E-Digital was based on two major groups of thematic axes: enabling axes and axes of digital transformation.

The enabling axes aim to create an environment conducive to the development of the digital transformation of the Brazilian economy, with initiatives essential to leverage the digitization. Such initiatives include infrastructure and access to information and communication technologies; research, development and innovation; development of an appropriate regulatory environment; standards and regimes that promote trust in the digital world; acquisition of educational and professional skills appropriate to the digital economy; and the international insertion of Brazil.
This enabling environment fosters activities in favor of digital transformation, both in government and in the productive sector. Thus, the specific actions were grouped into axes:
Digital transformation of the economy (axis of the data-based economy, axis of a world of connected devices, and axis of new business models made possible by digital technologies), and;
• Digital transformation of the government, aiming at the full exercise of citizenship in the digital world and the provision of services to society.
The challenges for implementing such initiatives are not few. This strategy therefore includes the coherence and synergy between different actors, aiming to take advantage of all the potential that digital technologies have to offer, with real growth in the country and distribution of the benefits of the economy of the future for all.

METHODOLOGY ADOPTED
The activities aimed at the formulation of the first Brazilian Strategy for Digital Transformation started on February 17, 2017, with the publication of the MCIT Ordinance No. 842/2017, which established an Interministerial Working Group (GTI), which was designated to conduct the activities for the elaboration of a base document that was submitted for public consultation.
For the organization of the work, subgroups of work were created, divided according to the main themes of the Brazilian Strategy for Digital Transformation. The results of each subgroup were presented, reviewed and approved by the IWG. The five subgroups dealt, respectively, with: i) Infrastructure; ii) Citizenship and Digital Government; iii) Research, Development and Innovation; iv) Security and Confidence in the Digital Environment; and v) Digital Economy.
In all, nine IWG meetings and 25 sub-group meetings were held to present and discuss the sub-items. The work of the subgroups was marked by the intense performance of all the participating bodies and entities, facilitating an exchange of knowledge and ideas on the subject matter of each group, as well as the concertation of government initiatives related to the digital economy around a common vision and coherent.
At the same time, a Focused Consultation was held for a group of 130 specialists, working in the government, academia and private sector entities. This consultation, carried out in an electronic platform with the support of the Center for Management and Strategic Studies (CGEE), aimed at identifying relevant topics for a strategy for the country's digital transformation, as well as the identification of priority strategic actions.
In addition to the activities of the ITG, sectoral meetings were held to consult representatives of the private sector, nongovernmental entities and government bodies associated with specific topics: education, ICT in health, industry and application providers, social impacts of digitization, investors and banks, among others. In particular, four workshops and seminars were held - Privacy and Data Protection (03/23/2017), Education in the Digital Age (05/29/2017), ICT Indicators (05/30/2017), and Cyber Security (08/06/2017) - which had the participation of representatives of civil society, academia, private sector and governmental entities.

The following chart illustrates the activities of the E-Digital construction process, which occurred between February and June 2017.
Following the conceptual model adopted for E-Digital, the participants of the WG, through their respective subgroups, as well as invited presenters were guided to adopt a common standard for the organization of the work results:
• Diagnosis: where we are and what the challenges are;
• Vision: where we want to reach;
• Strategy: how will we get there;
• Indicators: to monitor progress in strategic actions.
The conclusions of this process of activities were the basis for the first version of this document, which was submitted for public consultation. Launched officially on August 1, the consultation was open for 50 days, until September 20, 2017. It was conducted via the Internet, in a platform specially dedicated to the process, made available by the Center for Strategic Studies and Management (CGEE), and accessed by more of 2,000 participants. Among them, more than 700 individuals and organizations contributed responses and comments, including representatives of Government (at Federal, State and Municipal levels), the productive sector (companies and associations), scientific and academic community (institutes, universities and schools) and civil society (associations, entities, NGOs and citizens).
Based on the contributions received during the public consultation process, the E-Digital base document was reviewed and supplemented. This final consolidated version, accompanied by a draft normative instrument, was submitted to the President of the Republic for consideration by presidential determination, based on a recommendation from the Economic and Social Development Council (CDES).

THEMATIC SHAFTS - ENABLERS

A. Infrastructure and Access to Information and Communication Technologies

Broaden the population's access to the Internet and digital technologies, with quality of service and economy.
Telecommunications have emerged as the main driver of economic and social development in a global scenario of intense growth and demand for knowledge. Telecommunications services are gears of various sectors of the economy, aiding social development and attracting large sums of domestic and foreign investment. These services also generate multiple employment opportunities in various segments.
In a country of enormous territorial dimensions such as Brazil, the need for expansion of the Internet imposes continuous challenges for the expansion of telecommunications infrastructure.
There is ample space to increase the provision of terrestrial telecommunication infrastructure in the Country through market solutions, expanding the offer of broadband Internet access with efficiency and economics. Various public policies and government agencies, as well as the updating of the normative framework for telecommunications, aim to improve the offer of these services.
In two World Bank studies (20027 and 20108) on expanding telecommunications and Internet infrastructure in developing countries, the main difficulties were identified for the universalization of access. According to the studies, there are persistent areas in the coverage of infrastructure ("access gap"), with high attendance costs and low income population, although the expansion of the market will spread access in economically more viable regions (reducing, thus, the "market gap").
The following figure illustrates schematically the opportunities for expanding the offer to meet the demand for telecommunications services, in this case Internet access on broadband networks. This expansion must initially take place through the increase in supply through the market, in response to a

repressed demand (frontier of market efficiency). However, there is also a segment for which service delivery can be made possible by the combination of market action and complementary induction mechanisms (sustainability frontier). However, portions of the national territory and of the population will persist, for which the guarantee of supply and demand can only be served by the existence of a service with characteristics of universalization.

In more remote areas satellite network solutions are often needed, either in the access (to connect the population to the Internet) or in the transport of data (to connect these areas to the national backbones). In this case, public policies that ensure the provision of access to the Internet to the public presence organs are especially relevant: administrative, educational, health, public safety and also the Armed Forces facilities.
Once this access infrastructure, satellite or other alternative solution is present locally, it opens the possibility of developing several business models for Internet services to the general population. As children and young people come into contact with technology in the context of education, the offer of services for families is expanded, both for access to digital government services and for commerce and services, leisure and culture.
Diagnosis
Our population is mostly urban and concentrated - 86% of Brazilians live in 58% of the municipalities9 - which facilitated the rapid advance of Internet access for a large part of the Brazilian population in recent years. One of the determining factors behind this transformation was the rapid evolution of cellular technology with the continued expansion of the 3G access networks (now covering a significant majority of the population) 10 and 4G (now covering a large part of the population) 11 and the availability of mobile low cost.
Access to broadband fxa is present in 40% of households12, but growing at a slower pace in recent years. In this country of immense territory, with regions of difficult access and development challenges, the task of bringing all of the Internet access to the Internet must remain the focus of public policies.
The National Telecommunications Agency (Anatel) generates monthly information on the number of accesses between the various telecommunication service providers. Consolidating the data of the sector, we can see the growth in accesses to the main services of Internet access - broadband connections fxa (called Multimedia Communication Service - SCM) and connections through cell phone (Personal Mobile Service - SMP).
Despite the consistent evolution of accesses, the largest portion is concentrated in the region - the country:

In a survey carried out recently by Anatel, it was verified that, in 2015, the number of municipalities with infra-structure of optical fiber backhaul represented 48.2% of the total. In 2016, this amount increased to 57.9%, representing 3,225 municipalities served with the fbra. The population living in municipalities served with fiber optic backhaul reached 86% of the total in 2016.
According to the ICT Households Survey 2016 (Cetic.br), 107.9 million people used the Internet in a space of three months. The percentage of households with Internet access varies from 40 to 64% according to the region - on average, half of the Brazilian households have access to the Internet.
A great vector for digital inclusion, however, is the cell phone. Mobile Internet access is already greater than through computers: by 2014, 76% of Internet users accessed through the cell phone, compared to 80%
used the computer. In 2016, mobile Internet use rose to 94%, while computer access dropped to 49%. In

the lower social classes, there is a large percentage of users who access the Internet exclusively by cell phone.
The inclusion is even greater among the youngest: 86% of young people aged 16 to 24, regardless of social class, accessed the Internet. Of these, 98% used their cell phone to access. The Cetic.br report also reveals that 98% of broadband accesses are installed in municipalities served with fiber optic backhaul in 2016.
Regarding the network infrastructure of the Personal Mobile Service (mobile telephony, which includes mobile internet access), the Brazilian service scenario is marked by the presence of 4 large economic groups that concentrate 98.1% of accesses in service: Telefonica, Claro, Hi and Tim.
4G technology is present in 2,852 Brazilian municipalities (51% of the total), already covering approximately 86% of the population. In 3G technology it is already possible to provide the Internet to 98.6% of people covering 91% of the municipalities, since the country's population is concentrated in urban centers. With this, the challenge of attending to the rural areas and small urban settlements that are further away from the big centers is evident.

The non-headquarters municipal districts - those districts where the municipality is not located - confront a peculiar challenge for territorial coverage. Service providers have no regulatory obligation to provide coverage to these districts, which may represent vast areas of sparsely populated territory with little or no infrastructure, particularly in the North and Midwest.
With regard to 3G technology, for example, of the 4,717 non-existing headquarters, 2,012 do not even have an antenna (ERB) installed. However, out of the total population living in non-headquarters districts, 11% live in districts without ERB installed.
It is observed, therefore, that Brazil has a double challenge in the extension of access to broadband networks. On the one hand, it is necessary to expand the infrastructure of fiber optic data transport networks for the flow of traffic to the national backbones and, on the other hand, it is necessary to widen the access networks. The response to these challenges must be reflected in the increase in the capacity of transportation networks, backhaul and access in urban centers (with the adoption of fiber optic networks), and in the greater capillarity of networks throughout the country, in order to serve areas of (with several mobile and mobile network technologies, in non-headquarters districts of municipalities, rural areas, highway axes, among others). The following figures illustrate the scale of these challenges.

There is at present a tangible possibility of a significant contribution by telecommunications operators in the expansion of their broadband (fxo and mobile) access and data transport networks.
These are the financial amounts associated with the TAC13 (conversion of sanctions arising from breaches of investment commitments) of the telecommunications operators, and the balances resulting from the adaptation of the concession model, under the General Telecommunication Law14 , for the establishment of investment goals for the construction of transport networks and broadband access. In this sense, on the initiative of MCTIC, Public Consultation was launched regarding the proposal of Decree15 that reviews telecommunications policies. This proposal spells out the priorities to be established for network investments: (1) to expand high capacity land transport networks, (2) to increase the coverage of mobile broadband access networks, and (3) broadband access networks fxa.
Another possibility for rapidly expanding mobile broadband access networks is to accelerate the process of deploying 4G networks using the 700 MHz radio frequency band, especially in municipalities that do not depend on the release of this band by broadcasting services in the transition to the digital TV16. In

practice, this means more than 3,000 municipalities throughout Brazil, including urban and rural areas, in
to benefit from the 4G mobile service, given the excellent conditions of propagation and coverage in the 700 MHz radio frequency band, associated with the high capacity of data transmission.
Also worthy of note is the importance of updating the legal regime governing the Universal Service Fund for Telecommunications - FUST. In this sense, bills are already being processed in the Chamber of Deputies17 and in the Federal Senate18 that will amend the legislation applicable to this fund, aiming at the effective use of resources raised in the expansion of broadband.
We must also highlight the revision of the radiofrequency pricing model, currently under study at Anatel19. The proposal aims to direct resources for investments in expansion of telecommunications networks.
Some state governments have also developed effective programs to encourage the installation of infrastructure in sparsely populated regions and less coverage. States such as Minas Gerais and Ceará have implemented similar policies of fiscal incentives for the installation of antennas (Base Radio Stations - ERB) of 3G connection in municipal districts without coverage, with very positive results. Similar initiatives can be encouraged in other states as a way to extend coverage using mobile technology.
Reaching remote regions and connecting communities away from major telecommunications infrastructures are the goals of some large-scale public initiatives. The Projeto Amazônia Conectada20, for example, implements a network of subwoofer cables in the riverbanks of the Amazon basin to form a fiber optic backbone to provide telecommunication infrastructure to the most remote regions of the north of the country.
Innovation includes both aspects of technology and governance. From a technological point of view, the actions are implemented with the objective of reconciling budget constraints with technological solutions developed and marketed in Brazil.
One of the most notable aspects of the Connected Amazon Project is the governance and sustainability model, conceived as a cooperative work. The initial cost of the project is shared between public authorities, in the Federal and State spheres, who demand broadband infrastructure in the municipalities. Thus, in a second stage, based on the availability of this infrastructure, with a local offer of data transport capacity, providers can also provide a sustainable business model for the provision of telecommunications services and Internet access to the population.
More recently, the Geostationary Defense and Strategic Communications Satellite (SGDC) 21 was launched with the aim of addressing areas not yet covered by terrestrial broadband infrastructure, as well as adding communication resources to meet strategic and defense needs.
At the same time, the Brazil - Europa submarine cable project is being developed and implemented22, which will assist in the distribution of international data traffic, with improved connection quality, reduced latency, improved connection with major European research centers and cost reduction of traffic.

<<<<< Technology 5G
Fifth-generation mobile (5G) technology is currently being standardized by the International Telecommunication Union (ITU). At the end of 2015, ITU published its "vision" on 5G, bringing together the main characteristics / features that the systems in this technology should possess, including very high speeds (up to 20 Gbps), low latency (up to 1 millisecond) of connected devices.
In 2019 the ITU will promote the World Radio Conference (WRC-19), in which the bands of the spectrum

to be used by 5G should be defined and harmonized globally. From this milestone it is estimated that from 2020 onwards
the rollout of large-scale 5G technology into mobile operator networks will begin, although some countries are already planning pilot projects in 2018-2019.
In the current stage of development of 5G technology, Brazil has been engaged in research and development initiatives, with emphasis on the Reference Center for Radiocommunication (CRR) of the National Institute of Telecommunications - Inatel, and Ericsson's partnership with the University Federal of Ceará (UFC).
At the international level, cooperation in research and development in 5G has led to agreements such as the Brazil-European Union Strategic Cooperation in 5G, concluded in 2016. At the same time, Brazil has engaged in multilateral forums to discuss the subject, in a process of the world's leading 5G standardizing and defending organizations: 5GIA (Europe), 5GForum (Korea), 5Generic (USA), IMT-2020 (China) and 5GMF (Japan).
Among the next steps, the development of a roadmap for the development and deployment of 5G technology in Brazil in partnership with private initiative, the use of sources for R & D (such as Funttel and FNDCT), and interlocution between Government and private initiative through the industrial association "5G Brazil" >>>>>>

Another element of the architecture of data transport networks in Brazil are the Internet Exchange Points (IXP), which allow direct interconnection between the networks (autonomous systems - AS) that make up the Internet in Brazil. The country already has 28 of these points, operated by IX.br23 and located in metropolitan regions in the country with greater interest in Internet traffic exchange, allowing cost rationalization, better performance, quality and efficiency in Internet operation.
An expansion of IXP capillarity in Brazil can contribute to strengthening and expanding the dissemination of the Internet infrastructure in Brazil, as well as bringing the content attraction externality to local hosting (notably CDN servers). IXPs also bring benefits to competitiveness by bringing together in neutral points of convergence of data transport infrastructure, both large and small and medium-sized service providers. It is worth mentioning the fact that the IXP of São Paulo is already one of the five largest in operation globally, both in volume of traffic and number of participants.
Regarding the expansion of Internet access networks, the relevance of the use of unlicensed spectrum should be highlighted. A recent study25, with projections for 2021, indicates that 60% of Internet traffic in Brazil should be through Wi-Fi networks (including those in private and public environments).
In recent years, the provision of Internet access infrastructure with Wi-Fi networks has been widely adopted by small service providers in Brazil. The adoption of Wi-Fi access networks, as well as others using unlicensed spectrum, can this Strategy. In this sense, Anatel has updated and simplified the regulation26 that is specific in the provision of services.
At the same time, the provision of Wi-Fi access in major public places (hospitals, road terminals and airports, for example) has been adopted as an instrument for the provision of information and public services, as well as for inclusion. In fact, it is an initiative that had already been adopted in public programs of digital inclusion, such as the Broadband Program in Schools.

<<<<<< Challenges to digital inclusion
The challenges of digital inclusion in Brazil were the subject of a report by the Federal Audit Office (TCU) entitled Public Policy on Digital Inclusion (2015). In contemplating the actions of the last fifteen years, the report highlights the creation of the Electronic Government - Citizen Assistance Service (GESAC)

Program in 2002, under the responsibility of several ministries, with the aim of providing connections to the Internet, mostly via satellite, to telecenters, schools, public agencies located in remote and border regions. Other projects are also mentioned in this report, such as the Digital Inclusion Program, the Connected Citizen Project, the One Computer Per Student (UCA) project and the Telecentros.br Program. Of particular note are the Broadband Program in Schools (PBLE), the National Broadband Program (PNBL) and the Special Taxation Scheme of the National Broadband Program for the Implementation of Telecommunications Networks -
REPNBL
The Program of launch of the Geostationary Satellite of Defense and Strategic Communications - SGDC is mentioned as the most relevant PNBL action in financial terms. In addition, it also refers to the international negotiation for the construction of the new submarine cable connecting Brazil and Europe, in order to increase the capacity of traffic between the two continents, to reduce costs of transmission and to provide more security to the data transported. In addition, the TCU report points to the lack of digital literacy of the population as an obstacle to the full digital inclusion of Brazilian society, as well as the lack of formal literacy on the part of the population. However, the TCU report makes a diagnosis of the management of public policy, stressing the difficulty of coordination and articulation in different government environments: between federal government agencies that act in some way in digital inclusion, and also between central government and the state and municipal agencies. >>>>>

However, it should be noted that the Intelligent Cities Program, conducted by MCTIC, has the objective of implementing an urban fiber optic network infrastructure. These networks aim, among several objectives, to connect public agencies, offer public access points to the Internet, and stimulate partnerships between local public authorities and private entities to provide sustainability of the infrastructure implemented. The proposal for a decree recently launched in Public Consultation by MCTIC (as mentioned above) formalizes these aspects of the program.
View
A clear investment plan with short-, medium- and long-term goals is key to achieving a forward-looking vision in which:
• All Brazilian municipalities are served by high capacity transport networks;
• All municipalities have mobile broadband service, both in their municipal headquarters and in non-headquarters districts;
• Great part of the Brazilian population covered with broadband access networks, with the expansion of the access network in optical fiber;
• Remote and difficult access areas are served by broadband infrastructure, serving the population with efficiency and allowing the digitization of communications and services;
• Broad dissemination of Wi-Fi access networks in large public places, in order to provide services of public interest and opportunities for digital inclusion.
• Research, education, health and safety institutions are integrated by high-speed networks, covering connectivity, processing and storage resources, in order to stimulate scientific and technological exchange, benefiting society in general located in remote regions;
Strategic Actions

In order to achieve the desired objectives, a series of actions are required that combine sources of telecommunication sector financing, service needs, regulatory updating and specific public policies. The proposal is to establish short, medium and long term plans, implementing mechanisms that meet the

following priorities.
• Connect 22,000 public schools, urban and rural, with high-speed broadband access, in terrestrial or satellite networks, within the framework of the Connected Education Program.
• Enable the use of resources, from various sources, for the construction of data transport networks and broadband access.
◊ These sources include the fnancial amounts associated with the Telecom Operators' Terms of Conduct - TAC (conversion of sanctions arising from breaches of investment commitments), and the balances resulting from the adaptation of the concession model, under the General Telecommunications, for the establishment of investment goals for the construction of transport networks and broadband access.
• Prioritize the definition of new commitments, to be established in radio bidding bids, for the establishment of investment goals for the construction of mobile broadband access networks.
• Accelerate the deployment process of 4G networks using the 700 MHz radio frequency band, especially in municipalities that do not depend on the release of this band in the transition to digital TV. Encourage state governments to implement tax relief policies to internalize coverage of Personal Mobile Service networks, as has been done by some States.
• Reformulate the legislation of the Telecommunications Universalization Fund (FUST) to enable its application in expanding broadband access and expanding its use, both in urban environments and in rural and remote areas.
• Expand the engagement of research and development centers in the multilateral fora for the definition of international standards and radio frequency bands to be established for the fifth generation of mobile telephony (5G).
• Promote the implementation of networks (including connectivity, processing and storage) to integrate research, education, health and safety institutions with high-speed networks (including the expansion of the Giga27 Project), stimulating scientific and technological exchange and, in parallel, benefiting the society in general situated in remote regions.
• Make long-term investments and articulation between infrastructure initiatives for data communication (eg national critical infrastructure), computing (eg high performance computing or high performance computing - HPC) and data storage to meet the needs of cyberinfrastructure services for large science and technology projects, in cooperation with highly demanding ICT companies, supporting PD & I projects in this sector.
Indicators

In order to monitor and measure the performance and efficiency of the committed actions, the following indicators are proposed: (1) density of internet service, (2) percentage of mobile telephony coverage (segmented between 3G and 4G technologies) and) backhaul coverage (segmented between optical fiber and other high-capacity technology such as IP radio). Such data can be extracted from the bases of Anatel28, as well as from sectoral researches of the Center for Regional Studies for the Development of the Information Society - Cetic.br29. It is also proposed to use indicators of international comparability, such as the ICT Development Index (IDI) 30, the global index of inter-country performance developed by the ITU, which compiles a set of indicators of accessibility, effective use and ICT skills. With regard to digital inclusion, the Economist Intelligence Unit (EIU) has developed an international comparability indicator for "inclusive Internet" based on four dimensions: availability, affordability, relevance and readiness level. In the EIU Inclusive Internet (2017) 31 ranking, 75 countries are evaluated, and Brazil currently occupies the 18th position worldwide.
B. Research, Development and Innovation

Stimulate the development of new technologies with the expansion of scientific and technological production, seeking the solution of major national challenges. Information and communication technologies (ICTs) are the current economic and social vector. Investments in Research, Development and Innovation (PD & I) in this sector are fundamental for guaranteeing countries participation in global value-added chains, promoting jobs, raising income levels and economic activity, and guaranteeing their citizens access to information and knowledge generated worldwide. In addition, because it is a highly dynamic sector, investments in R & D are essential for countries to remain competitive and to appropriate the income and knowledge generated on the basis of the new technologies of the digital economy.

For a country the size of Brazil, the PD & I sector is fundamental for its internal development as well as for the expansion of its presence in the international economic scenario. It is an essential sector for the country's growth, and a central part of a successful national development strategy. In addition to the already successful efforts of the last years, the Country must do more, creating a policy of PD & I focused on the 21st Century, aligned with the advances of Industry, Agriculture and other strategic sectors, allowing the Country to extract the full potential of digital technologies.

The Brazilian initiatives for PD & I should aim for the country's leading role in the world scenario in digital technologies, advancing in relative positions in scientific production, technological development and innovation, namely in the sectors of information technology and communication. In addition, it is necessary to have in view the solution of the great national problems with the use of new digital technologies, with the increase of expertise, gains of productivity and economic and social development.

Diagnosis

The level of Brazilian investment in R & D as a proportion of GDP remains far from the leading countries in this indicator, although in line with some European countries. Figure 3 shows that while this indicator in Brazil is 1.27%, the average number of countries in the European Union is 1.95% and OECD countries is 2.39%, with countries where this percentage (4.28%), Israel (4.27%) and Japan (3.58%).

The companies of the ICT sector represent 14.6% of the total business investment in R & D in Brazil. OECD data show that this indicator is 24.7% in the average of the member countries, especially in countries with ICT companies accounting for more than 50% of total R & D spending, such as Taiwan (71%), Korea of the South (54.4%) and Finland (50.5%) (figure 2).

In the comparison between business and government investments in R & D, it is observed that in Brazil, the majority of R & D investment comes from the public sector: 53% from 47% from corporate expenditures (figure 5). This situation is different, for example, from that observed in the main European nations, whose share of corporate R & D expenditures represents an average of 64% of the total, reaching over 70% in countries such as Korea (75.7%), Japan (75.5 per cent) and China (74.6 per cent).

With regard to innovative efforts, according to data from the Innovation Survey (PINTEC / IBGE) for 201435, the innovation rate of companies in the ICT sector in Brazil is higher than the average rate of business innovation in the country, corresponding to 40 % and 36%, respectively, with the innovation rate of companies in the ICT industry corresponding to 65% and that of ICT service companies corresponding to 35% 36.

The role of government incentives as a viable instrument to leverage the innovative effort of companies in the ICT sector was important in this regard. According to data from the last PINTEC (2014), 40% of

Brazil's innovative companies used at least one of the government's innovation support instruments, the same average achieved by companies in the ICT industry, compared to 35% of service companies of ICTs. Among the instruments currently provided by the Government to support the innovative activity are the physical incentives, such as the Informatics Law37, which in the year 2014 benefited 510 companies, and the Law of Bem38, which in 2014 benefited 1,206 companies (15% of them in the ICT sector). In terms of fostering innovation, BNDES modalities for financing PD & I and purchasing machinery and equipment (such as BNDES FINAME), as well as the credit and economic subsidy lines of Finep / BNDES for the INOVA EMPRESA program) and the State Foundation for Research Support (FAPs); research and development grants from the National Council for Scientific and Technological Development (CNPq) and the Coordination for the Improvement of Higher Education Personnel (Capes), as well as programs focused on the interaction between research infrastructures and companies, such as EMBRAPII and SIBRATEC.

Data from PINTEC (2012-2014) show that among the main government support instruments for business innovation, the most accessed by innovative companies in the ICT sector was the financing for purchases of machinery and equipment (37% of them), followed by access to incentives for R & D under the Law of Good (27% of them) (figure 6).
In the case of companies in the ICT industry that implemented innovations in the analyzed period, the main instrument was access to physical exemptions granted by the Informatics Law (51% of them), followed by access to financing for purchases of machines and equipment (47% of them). Finally, for innovative ICT service companies, the main instrument of government support for innovation was the financing of machinery and equipment purchases (34% of them), followed by the Good Law (26% of them) (figure 6).
One of the instruments that has gained international prominence in governmental support for innovation is public procurement, that is, the use of public purchasing power to direct R & D efforts as a strategy for economic and social development. In Brazil, this instrument is still underutilized. The most recent edition of PINTEC (with data from 2012 to 2014) was the first to dedicate itself to mapping the number of companies that had access to this type of instrument to support innovation. In fact, only 5% of Brazilian companies that had access to some type of government support instrument accessed some form of public purchase to innovate.

The number of companies in the ICT sector that gained access to public procurement for innovation was higher than the national average (15%), and a large part of this performance is mainly due to companies in the ICT services sector, in particular, telecommunication services segment, since 25% of them used public purchasing power to innovate. In turn, only 2% of the ICT industry companies relied on this type of instrument to direct their innovative efforts (figure 6).
Despite the existence of an important range of instruments to support innovation in Brazil, companies that did not make innovative efforts in the last years of the survey conducted by the Brazilian Innovation Research confirmed that the main barriers to innovation in Brazil are: innovative activity (for 58.4% of all companies and 61.3% of ICT companies); excessive economic risks of implementing innovations (for 50.4% of the total companies and 42% of the ICT companies); scarcity of appropriate sources of innovation funding (for 41.1% of all businesses and 39.2% for ICT companies); lack of qualified staff (29.8 per cent of all enterprises and 30.1 per cent of ICT companies) and limited opportunities for co-operation with other companies or institutions (for 20 per cent of total enterprises and 21.5 per cent for ICT companies).

Human resources are a variable of great importance to research, development and innovation activities, in particular in a knowledge intensive and very dynamic sector such as the ICT sector. According to data from PINTEC / IBGE for the years 2012 to 2014, this sector employed 6,417 technicians and researchers in R & D activities, which represents 6% of the total number of professionals employed in R & D activities in Brazilian companies. As shown, among the Brazilian companies that did not make an innovative effort in the research period, 30% of them said that the lack of qualified personnel in the country was high as a justification for both, the same percentage of total companies in the ICT sector. The lack of qualified human resources for PD & I activities is an even greater weakness for companies in the IT services segment, where 36% of companies that did not make an innovation effort in the period in question considered the relevance of the lack of staff information technology as a justification for doing so.

In fact, the transformations underway in the industrial and service applications of the Digital Economy significantly altered the perfl of business demand and the parameters of the training of professionals in the ICT sector and professionals in the other economic sectors. In addition to the applications in microelectronics, automation, computing and associated platforms, the volume and speed of data production, as well as the level of detail of the information generated with high economic value, have forced companies, governments and others interested in access and treatment of this information, the adequacy to a new capacity for training. In particular, this professional profile should aggregate expertises that enable it to manage and analyze large volumes of data and information, the so-called Big Data - an extremely relevant component to guarantee today's competitive differentials.
Several countries are already making efforts to train and train these professionals. In 2012, the National Science Foundation announced the allocation of a new line of training for the training of data professionals. In addition, the agency started to encourage universities and research centers to develop interdisciplinary postgraduate programs in the training of professionals of this type . However, even nations highly embedded in the global value chains of the Digital Economy are likely to suffer from the shortage of this type of profession. A recent study shows that by 2018 the United States will have a deficit of 140,000 to 190,000 data analysts and 1.5 million professionals capable of making decisions using Big Data.
Brazil has an important national system of higher education, research and technical training. Statistics from the INEP Higher Education Census for 2016 show that, in total, the country has 195 universities, 149 university centers, 40 Federal Institutes and CEFETs. It is important to mention the technical training structure provided in Brazil by System S, in particular the National Industrial Learning Service (SENAI), which provides professional education and technical industrial training, as well as providing technical and technological assistance services to industrial companies. Much of this teaching and research structure is interconnected by the high-speed network and other connectivity services provided by the National Network of Teaching and Research (RNP), a social organization linked to MCTIC that is set up in a national education and research network worldclass. This infrastructure positively impacts scientific production, national and international research collaboration, the generation of knowledge on a global scale and the growth of the offer of courses at a technical and higher level. Today, 739 campuses of universities and federal institutes are connected to the network provided by RNP.

In addition to the consolidated training and national training system, specifically with regard to research, a study carried out by IPEA40 in 2012 identified that Brazil has 1,760 infrastructures41 dedicated to this type of activity, 14% of which are exclusively dedicated to ICT-related research. According to the study, these infrastructures are linked to 143 Brazilian institutions and are associated with a total of 7,090

researchers, which means that, on average, there are only four researchers per unit. In addition, 60% of Brazilian research infrastructures stated that the total value of their equipment and facilities does not exceed the range of R $ 500 thousand42. Thus, it is observed that a considerable part of the Brazilian research infrastructure is small, fragmented and poorly articulated, which in many cases may not guarantee the scale of resources necessary for the generation of high impact and competitive PD & I that the Country needs to be inserted into the new spheres of production and wealth appropriation established by the process of ongoing digital transformation.

In spite of the notes made by the IPEA research, it is important to emphasize that Brazil has important examples of large-scale research infrastructures, with multiuser equipment, articulated and well positioned in international scientific production, such as the National Research Center on Energy and Materials (CNPEM), the units of the Brazilian Agricultural Research Company (Embrapa) and the Oswaldo Cruz Foundation (Fiocruz) and the Integration and Testing Laboratory of the National Institute of Space Research (LIT / Inpe).

With respect to the research infrastructure associated with the ICT sector, the National Laboratory of Scientific Computation (LNCC) - with the Santos Dumont supercomputer acting as the central node (Tier-0) of the National System of High Performance Processing (SINAPAD) - CIMATEC / SENAI, the Center for Research and Development in Telecommunications (CPqD), the Center for Cyber Defense (CDCiber), linked to the Ministry of Defense, and the National Institute of Telecommunications (INATEL). In fact, the research infrastructure established in the last decades in Brazil has achieved a prominent role in the international context of scientific production. In absolute numbers, between 2007 and 2016, the number of articles by Brazilian researchers published in internationally indexed journals increased by 88% (from 36,573 to 68,908 articles). During this period, the country remained in 14th place in the world scientific production ranking, accounting for about 2.1% of total production. Patent applications in Brazil have not kept up with the same level of scientific production growth in recent years. Between 2007 and 2016, the number of patent applications with the INPI rose from 21,638 to 28,009 (29% growth in the period, despite the successive reductions in the last 3 years, from a record 30,876 applications in 2013). A positive point is that the 5,199 requests from residents in 2016 - last available data - represented a growth of 12% over the previous year and represent the highest absolute value in the period 2007-2016.

These data reflect a strong mismatch between scientific and technological production in Brazil, a situation that is the result of a myriad of interrelated factors that require appropriate addressing. Among these factors, there is a high backlog (number of patents awaiting analysis) of the INPI, which is being treated by the government with a series of measures related to INPI's management44.

It should be noted that in technologically dynamic sectors, such as the information and communication technologies sector, where the degree of technology obsolescence is high, the speed of the patent registration process is of central importance. Even so, ICTs are among the technologies with the most patent applications published in Brazil in 2016, represented by the electronics, electronics and electrical energy sector, with 4.7% of total published applications. In this context, INPI has been expanding the Patent Prosecution Highway (PPH) pilot projects network and including in the IT area, as it did with the offices of Japan and China, which will allow greater agility in the examination and granting of patents for new IT technologies in Brazil.

Among the components already highlighted in this section, other aspects should be encouraged in order to stimulate entrepreneurship in technological development and innovative activity, especially those related to the business environment established in the country. In addition to the overlapping of norms and laws affecting the subject, the companies face discontinuities in certain public actions and programs

and obstacles to public-private interaction. In recognition of the need to preserve legal certainty related to the legal framework of Brazilian innovation, the regulation of Law 13243/2016, through Decree 9.283 / 2018, is an important step in the improvement of nine legal provisions that are in some way related to this type of activity in the country.

Vision

The conduct of actions in PD & I in a Brazilian Strategy for Digital Transformation should be supported by prospection methodologies for betting on technologies capable of leveraging income level, job creation, productivity and competitiveness of industry and industry of national services, as well as ensuring the insertion and maintenance of Brazilian companies in international chains of value creation. Among the most used methodologies in the definition of such bets, we highlight studies based on foresighting and forecasting, consultation with specialists (Delphi, panels, surveys), scenarios and technological roadmaps.

With regard specifically to the ICT sector, it is important that the Brazilian Strategy for Digital Transformation prioritize actions focused on research, development, the generation of innovations and the production of technologies that stimulate and modernize the entire national productive fabric. These are so-called enabling technologies. According to the National Strategy for Science, Technology and Innovation 2016-2022 (ENCTI), 45 "among the enabling technologies with a potential impact on the manufacturing industry, stand out convergent technologies (biotechnology, nanotechnology and ICTs), as well as manufacturing additive and advanced materials ". In addition, ENCTI reinforces that the development and modernization of basic technologies, such as sensors, high-speed networks, high-performance processing, new communication standards between devices, applications, software and other technologies are essential because they translate into the base for the development of new applications in ICT, such as Internet of Things, Big Data and cloud computing.

In this way, E-Digital should stimulate PD & I, as well as the modernization of a productive structure, in areas such as: Microelectronics, in particular, actions aimed at the qualification in design house; Sensors; Automation and robotics; Supercomputer; Artifice Intelligence; Big Data and Analytics; High Performance Networks; Encrypt; Fifth generation mobile networks - 5G; cloud computing. In addition, considering the diagnoses presented, the Brazilian Strategy for Digital Transformation aimed at stimulating PD & I in the ICT sector should seek:

• Optimization of sector-oriented policies in order to expand (more than proportionately) private investment in ICT R & D, improve the competitiveness of the Brazilian economy, generate more value-added jobs, and promote greater social development.
• The articulation of enabling instruments for the promotion of PD & I, in particular, in relation to the budget perspective (capacity of complementarity between them) and from the promotion of the integration of projects among research infrastructures operating in the ICT sector.
• The expansion of the role of public policies on the demand side as a tool for inducing PD & I, in particular, from government orders for ICTs and technologies from related sectors aimed at addressing national strategic issues.
• The integration of research institutions in all regions of the country to high-speed networks in order to stimulate scientific and technological exchange and to leverage access to infrastructure in remote regions.
• The establishment of a technological road map with long-term investment goals that reflect the needs of cyberinfrastructure services for highly demanding ICT companies, supporting science, technology and

innovation projects in this sector. Encouraging the training of professionals in the ICT sector to enable them to meet the challenges of frontier information and communication technologies (Big Data analysis, manufacturing 4.0, artificial intelligence and robotics, Internet of Things, etc.).
• The promotion of a stimulating business environment, in addition to being legally secure, in order to guarantee the promotion of new investments in PD & I in the ICT sector, as well as the interaction between universities, research centers and companies.
Strategic Actions
On the one hand, enabling ICTs are able to provide inputs for the modernization and expansion of the entire national productive fabric, on the other hand, the strategic actions in PD & I within a digital strategy must also be based on bets in specific sectors. Given this, it is essential that priority be given to areas where investment in Experimental Development and Innovation in ICTs can bring gains in competitiveness to the Country, such as:
• Security and defense, such as the development of platforms to ensure interoperability and coordination between the command and control systems of the three National Defense Forces, using, in particular, radio communication tools. In addition, it is necessary to guarantee investments in the development, by national companies, of protocols of radio communication, encryption and security equipment.
• Health, in particular actions related to the automation of the Cadastro Único information, using technological orders from SUS; modernization of communication with the SUS user using data analytics tools and telemedicine applications expansion, utilizing RNP infrastructure and services - such as the RUTE telemedicine network, which promotes the exchange of experiences in university hospitals and research centers - and the SIBRATEC network.
• Agribusiness, in particular, bets on technologies aimed at precision agriculture; VANTs and sensing and monitoring, as well as agribusiness management.

• Intelligent Cities, using technologies from the Internet of Things (IoT), such as solutions for urban mobility, civil safety, optimization of utilities (energy, water, etc.) based on tools such as smart grids, among others. In addition, it is important that actions are established aimed at:
• Integrate the enabling instruments for the promotion of PD & I, as well as research infrastructures aimed at the development of digital technologies, in the framework of international technology hubs and the example of experimental environments (Testbeds) in innovative technologies, in order to guarantee scale and strategic direction of the technologies to be developed.
• Conduct scenarios to identify priorities for PD & I that have a positive impact on income levels, job creation, productivity and competitiveness, including foresight and forecasting methodologies, consultation with experts (Delphi, panels, surveys), scenarios and technological roadmaps .
• Use the public purchasing power of the state to stimulate the development of innovative solutions based on digital technologies. Improve legal frameworks - such as physical incentive laws, such as the Informatics Law and the Law of Good, among others - in order to promote legal certainty and predictability of the promotion of PD & I activities.
• Stimulate the interaction between universities, research institutions (ICTs) and companies in PD & I actions in digital technologies, through the use of development mechanisms (such as the Human Resources Training Program in Strategic Areas - RHAE), as well as by stimulating the strengthening of incubators, technological parks and other innovative environments.
• Promote ongoing dialogues between government, academia and industry representation bodies to ensure that PD & I policies and initiatives associated with digital transformation are comprehensive,

convergent and coordinated.
• Expand the scientific and technological production carried out in partnership with other countries, through the launching of joint calls for international cooperation in PD & I.
• Strengthen government institutions linked to scientific and technological production, improving performance and increasing the sharing of information among such entities.
• To support projects in the digital technologies identified in this Research, Development and Innovation axis, based on resources derived from the revision of the Informatics Law (object of MPV 810/201746), focusing on the formation of technology hubs.
Indicators

• In addition to the traditional PD & I indicators for monitoring the performance of the national economic aggregate (eg, level of investment in relation to GDP, level of sectoral investment in relation to total business, level of technical training, etc.), it is It is important that the monitoring and evaluation of actions in PD & I of the Brazilian Strategy for Digital Transformation be based on specific cases (companies), or particular sectors.
• In addition, it is important that the indicators rely on consolidated international benchmarks, particularly from nations that have succeeded in stimulating the composition of the main national players in the ICT sector, such as Asian nations (Korea, China and Japan), Nordic countries (Finland and Sweden) and other countries with key indicators, such as Israel.
• As a reference, existing and consolidated international indicators such as the Global Innovation Index, 47 in which Brazil obtained a 69th position in 2016 and 2017, may be used.
C. Confidence in the Digital Environment
Transforming the Internet into a safe, trustworthy environment conducive to services and consumption, with respect for citizens' rights. The Internet is still seen by many as a separate dimension of our daily lives. In common parlance, the expression "entering the Internet" is commonly used. The increasing volume of commercial transactions, fnancial movements and the provision of public services in a virtual environment, however, makes this barrier more and more tenuous.
The expansion of the digital environment translates into enormous opportunities for economic development, social inclusion and technological innovation. It also affects the exercise of fundamental rights: on the one hand, facilitate the implementation of such rights, such as the use of the internet for citizens to express their thoughts and opinions; on the other hand, put us at risk, such as the use of digital tools to unduly expose the privacy and intimacy of others. In this context of opportunities and challenges, if risks are not mitigated through coordinated action between government organizations and private actors, the sense of insecurity may slow the pace of development of the digital economy. This evaluation, which is largely present in digital strategies and country planning documents and specialized consultancies, is synthesized in the concept of digital environment trust. Ensuring that users and the private sector feel confident to develop their activities in the digital environment is a complex task that involves different dimensions of state performance here grouped into the broad categories of 1) protection of rights and privacy and 2) defense and security in the environment digital.

1. Protection of Rights and Privacy
Diagnosis
Guaranteeing rights in the digital environment is the cornerstone of trust in the digital environment. It is not enough that companies and individuals feel protected against cyber attacks and security incidents; they must see the digital environment as a space where the exercise of rights is fully assured. Therefore,

new technologies should be directed towards the protection of rights and the public interest.
In Brazil, there are important legislative advances on the subject. The Internet Civil Code provides principles, guarantees, rights and duties, and does not exhaust the treatment of the subject, leaving space for future details of important topics related to the network, such as personal data protection, e-commerce, cyber crimes, Internet governance, digital citizenship, among others.
The first and most fundamental is the human rights dimension. Freedom of expression, communication, manifestation, association and rights of access to information and non-discrimination need to be incorporated into the architecture and governance of the Internet. Violations of these freedoms and rights by the state, corporations and even by users need to be vigorously monitored and repelled. The Civil Internet Framework (Law No. 12.965, of April 23, 2014) makes clear in its first two chapters the commitment of the Brazilian legal system to the protection of human rights on the Internet.
Ensuring the right to privacy and protection of personal data is a particularly relevant topic for Brazil, given Brazil's massive membership in social networks, instant messaging applications, internet banking and e-commerce platforms. The Internet Civil Registry already brings a number of important provisions on privacy and personal data, assuring users a certain number of users. C. Confidence in the Digital Environment Transforming the Internet into a safe, reliable, service-oriented and consumer-friendly environment with respect to the rights of citizens.
The Internet is still seen by many as a separate dimension of our daily lives. In common parlance, the expression "entering the Internet" is commonly used. The increasing volume of commercial transactions, fnancial movements and the provision of public services in a virtual environment, however, makes this barrier more and more tenuous.

The expansion of the digital environment translates into enormous opportunities for economic development, social inclusion and technological innovation. It also affects the exercise of fundamental rights: on the one hand, facilitate the implementation of such rights, such as the use of the internet for citizens to express their thoughts and opinions; on the other hand, put us at risk, such as the use of digital tools to unduly expose the privacy and intimacy of others. In this context of opportunities and challenges, if risks are not mitigated through coordinated action between government organizations and private actors, the sense of insecurity may slow the pace of development of the digital economy. This evaluation, which is largely present in digital strategies and country planning documents and specialized consultancies, is synthesized in the concept of digital environment trust. Ensuring that users and the private sector feel confident to develop their activities in the digital environment is a complex task that involves different dimensions of state performance here grouped into the broad categories of 1) protection of rights and privacy and 2) defense and security in the environment digital.
1. Protection of Rights and Privacy
Diagnosis
Guaranteeing rights in the digital environment is the cornerstone of trust in the digital environment. It is not enough that companies and individuals feel protected against cyber attacks and security incidents; they must see the digital environment as a space where the exercise of rights is fully assured. Therefore, new technologies should be directed towards the protection of rights and the public interest.
In Brazil, there are important legislative advances on the subject. The Internet Civil Code provides principles, guarantees, rights and duties, and does not exhaust the treatment of the subject, leaving space for future details of important topics related to the network, such as personal data protection, e-commerce, cyber crimes, Internet governance, digital citizenship, among others.

The first and most fundamental is the human rights dimension. Freedom of expression, communication, manifestation, association and rights of access to information and non-discrimination need to be incorporated into the architecture and governance of the Internet. Violations of these freedoms and rights by the state, corporations and even by users need to be vigorously monitored and repelled. The Civil Internet Framework (Law No. 12.965, of April 23, 2014) makes clear in its first two chapters the commitment of the Brazilian legal system to the protection of human rights on the Internet.
Ensuring the right to privacy and protection of personal data is a particularly relevant topic for Brazil, given Brazil's massive membership in social networks, instant messaging applications, internet banking and e-commerce platforms. The Internet Civil Registry already contains an important set of provisions on privacy and personal data, assuring users some
<<<<<< Digital Certification
In Brazil, digital certification was officially introduced with the creation of the Public Key Infrastructure - ICP-Brazil, subject of Provisional Measure 2,200-2 / 2001. Today the country has approximately 7 million active digital certificates, of which 61% are issued to legal entities and 39% to individuals. ICP-Brazil currently operates 76 certifying authorities, 614 registration authorities and 8 time-stamping authorities. Certifcado Digital is an electronic document, using a cryptographic key and a specific standard (X.509), which contains the data of its holder (individual or legal entity) and that certifies its identity, guaranteeing authenticity, authenticity, authorship and not repudiation of any electronic transactions signed, as well as the exchange of information with integrity, secrecy and security. The first application to use the digital certificate widely was the Brazilian Payment System - SPB, under the coordination of the Central Bank of Brazil. The Brazilian Internal Revenue Service pioneered the adoption of the digital certificate in services such as the e-CAC Virtual Service Center, SPED - Digital Public Bookkeeping System and Electronic Nota Fiscal (NF-e). The Brazilian Judicial Branch also makes extensive use of digital certification, especially in the electronic petition, available to the Federal Supreme Court, the Superior Court of Justice and various courts. New technologies present great potential for application in this field (such as blockchain and advanced biometric identification), and are already subject to analysis and pilot experiments, including in the Federal Public Administration. However, so far, the digital certificate is still the only technology that has the essential attribute of legal validity in the country.
It is opportune for Brazil to establish its legal framework, protecting citizens' rights and providing legal security for investments in the digital economy. There are, however, several legal and infralegal norms that currently address the issue at the sectoral level, such as: the Consumer Defense Code (Articles 43 and 44), which safeguards the personal data of consumers; the Law on Access to Information (article 31 of Law 12,527 / 2011), which protects personal data while promoting the transparency of public power; the Positive Registration Law (Law No. 12,414 / 2011), which safeguards personal data in the context of credit analyzes; among others. The Civil Internet Framework itself (article 3, sections II and III, 7 to 17 of Law 12.965 / 2014) ensures the protection of privacy and protection of personal data.

There are sensitive issues related to consumer rights and consumer relations with the use of digital technologies. Issues of consumer protection, such as trust in transactions, corporate responsibility, transparency in contractual terms, transnationality of services, advocacy (exchanges, withdrawals, complaints) and so on, take on complex dimensions in the digital environment. Emphasis on the so-called collaborative economy intensifies this complexity, since innovative business models generate doubts about the legal framework and competent jurisdiction.
The protection of children and adolescents in the digital environment is a topic that requires increased

attention, since the Internet and other digital technologies pose risks to their safety and privacy. Brazil already has legislation and specialized enforcement units to fight serious crimes such as pedophilia, but it is necessary to curb other threats, such as abusive advertising aimed at children and adolescents and improper use of their personal data.

There are also a number of other dimensions where it is necessary to determine more clearly how the protection of rights in the digital environment will take place. The debate around automated algorithms and decisions is a prime example of this. The understanding that the individual has the right to know what parameters are guiding the operation of a particular algorithm that may have effect in his personal life is consolidating, along with the possibility of appealing to a human decision in certain cases. New themes such as algorithmic transparency, artificial intelligence, and Internet of Things will require capacity for institutional innovation by the state, which must seek to protect its citizens without inhibiting innovation and the beneficial use of new technologies.

View

The protection of human rights in the digital environment must be accomplished through the development of institutional cooperation mechanisms between public institutions and partnerships with market agents. There is a long list of rights guaranteed by the Federal Constitution, the international treaties to which Brazil is a signatory, and, more specifically, by the Civil Internet Framework that has full applicability in cyberspace. Its guarantee depends on the proactive performance of public power and the participation of large private Internet agents. The guarantee of privacy, on the other hand, still depends on advances in the normative and institutional field. The adoption of a law on the protection of personal data and the creation or designation of a national authority for its application are important measures for the establishment of an environment of trust in the digital world. It is also necessary to introduce and encourage the voluntary adoption of international standards of privacy by design and default and security by design and default53, both in the production of national technology and in the acquisition of hardware, software and applications products.

In the consumer field, the challenge is to perfect the mechanisms of consumer protection in the digital environment. It is necessary to discuss the peculiarities of defending these rights (access, trust, transparency, accountability, dispute settlement, etc.) in the digital environment. All of the above efforts should take a special focus on the protection of children and adolescents online, through specific and more protective normative provisions for this public. Institutional cooperation and educational campaigns are also important instruments for the effective protection of children and adolescents.

However, it is essential to open a broad debate on new digital technologies and the protection of rights in the digital environment. It is necessary to evaluate the legal and ethical implications of applications of artificial intelligence, Internet of Things and other areas of the technological frontier.

Strategic Actions

- Promote the approval of a specific law for the protection of personal data.
- Stimulate mechanisms of cooperation and partnership between public institutions and market agents with a view to protecting human rights in the network, with special attention to the rights of children and adolescents, in order to ensure the principles set forth in the Civil Internet Framework and in the Federal Constitution .
- Strengthen instruments of international cooperation between authorities and between providers of access and content in different countries, in order to ensure law enforcement in the digital environment.
- Establish or designate a national authority with competences relating to the protection of personal

data and the international data flow, which can standardize best practices and provide legal certainty.
• Disseminate the adoption of digital technology in the validation of transactions and electronic documents produced in the digital environment.
• Stimulate defnition and adoption of standards and certification of privacy by design and default and security by design and default.
• Understand and adapt the specificities of consumer relations in the digital environment, seeking flexibility for new ventures and adequate consumer protection.
2. Defense and Security in the Digital Environment
Diagnosis
The data presented in the section Infrastructure and access to information and communication technologies show that levels of Internet access are growing in Brazil. According to ANATEL data, broadband fxa is present in 40% of households, the 3G access network covers 95% of the population and the 4G network, 72% - numbers that must be expanded through policies to expand access telecommunications services. The indicators are positive, but we must recognize that more access and greater digitization increase the chances of cyber security incidents and network vulnerability. Brazil has been making progress in the area of cyber defense in recent years. The creation of the Center for Cyber Defense and the Cyber Defense Command, specialized autarchy and command linked to the Brazilian Army, and the prioritization of the topic within the scope of the National Defense Strategy54 are important milestones in this history. Continued investment, including in research and development, and trained human resources training is crucial for national defense. Most threats in cyber space, however, consist of illicit actions aimed at obtaining undue advantages by exploiting security breaches in devices and software. Cyber crimes bring enormous losses to the economy. There are no reliable and constant statistics on the size of the losses of Brazilian companies due to cyber crimes or even on the volume of their investments in the cybersecurity sector, although studies of companies and international consultancies point to Brazil as one of the largest targets and origins of attacks.
Brazil occupies an intermediary position in the Global Cybersecurity Index56 of the International Telecommunication Union (ITU): the country is in 38th place in a list of more than a hundred countries. ITU's analysis considers various aspects, such as criminal legislation, sector regulation, incident analysis and response structures, public policies for the subject, training of specialized public agents and the existence of government agencies dedicated to information security. The ITU classifies the analyzed countries into three broad categories related to the robustness of cyber security: initiating, maturing and leading. Brazil is in the middle group, since it already has practical experience and an institutional architecture in development: there are criminal and compliance legislation, Disseminate the adoption of digital technology in the validation of transactions and electronic documents produced in the digital environment.

• Stimulate defnition and adoption of standards and certification of privacy by design and default and security by design and default.
• Understand and adapt the specificities of consumer relations in the digital environment, seeking flexibility for new ventures and adequate consumer protection.
2. Defense and Security in the Digital Environment
Diagnosis
The data presented in the section Infrastructure and access to information and communication technologies show that levels of Internet access are growing in Brazil. According to ANATEL data, broadband fxa is present in 40% of households, the 3G access network covers 95% of the population and

the 4G network, 72% - numbers that must be expanded through policies to expand access telecommunications services. The indicators are positive, but we must recognize that more access and greater digitization increase the chances of cyber security incidents and network vulnerability. Brazil has been making progress in the area of cyber defense in recent years. The creation of the Center for Cyber Defense and the Cyber Defense Command, specialized autarchy and command linked to the Brazilian Army, and the prioritization of the topic within the scope of the National Defense Strategy54 are important milestones in this history. Continued investment, including in research and development, and trained human resources training is crucial for national defense. Most threats in cyber space, however, consist of illicit actions aimed at obtaining undue advantages by exploiting security breaches in devices and software. Cyber crimes bring enormous losses to the economy. There are no reliable and constant statistics on the size of the losses of Brazilian companies due to cyber crimes or even on the volume of their investments in the cybersecurity sector, although studies of companies and international consultancies point to Brazil as one of the largest targets and origins of attacks.

Brazil occupies an intermediary position in the Global Cybersecurity Index56 of the International Telecommunication Union (ITU): the country is in 38th place in a list of more than a hundred countries. ITU's analysis considers various aspects, such as criminal legislation, sector regulation, incident analysis and response structures, public policies for the subject, training of specialized public agents and the existence of government agencies dedicated to information security. The ITU classifies the analyzed countries into three broad categories related to the robustness of cyber security: initiating, maturing and leading. Brazil is in the middle group, since it already has practical experience and an institutional architecture in development: there are criminal and compliance legislation, public and private sector - including for the protection of critical infrastructure - a crucial factor for the effectiveness of the actions foreseen in the strategy and action plans. To measure Brazil's success in the areas of cybersecurity and defense, as well as to calculate the cost of failure, public authorities and the private sector must also unite to produce reliable data and statistics on vulnerabilities and economic costs of cybercrime in Brazil. Appropriate metrics and information sharing models can be developed through international cooperation with pioneer countries in this sector.

In the world of cyber security, the limits of national jurisdiction are constantly challenged by transnational attacks and threats. International cooperation, therefore, is crucial for effective prevention and response to cybercrime. In addition to the signing of multilateral or bilateral cooperation instruments, the exchange of strategic information and the exchange of human resources between agencies are important measures for coordinated work between agencies in different countries. The ultimate goal should be to improve the country's relative position in international indices in the segment and demonstrate that the Brazilian State is prepared to face the challenge of defending its sovereignty and applying the law in the digital environment.

Strategic Actions

- Edit a national cyber security policy, including the definition of a national body responsible for the articulation of a national cyber security system, involving the public and private sectors.
- Consolidate the legal framework for cyber security by harmonizing existing criminal and procedural provisions in Brazilian legislation and advancing the forecast of new research tools for the digital world.
- Develop national and subnational plans for prevention, response to incidents and mitigation of cyber threats, including in the context of critical infrastructures.
- Establish mechanisms for cooperation between government entities, federated entities and the

private sector, with a view to adopting best practices, sharing information, adopting adequate safety standards, coordinating incident response and protecting critical infrastructure.
• Train public agents in cyber risk safety and mitigation and develop partnerships for private sector human resources training.
• Conduct comprehensive educational campaigns to expand public awareness of information security.
• Form specialized human resources and invest in research and development in the area of cyber defense and security, with a view to promoting national technological autonomy in terms of skills and products.
Strengthen instruments of international cooperation between authorities and between providers of access and content in different countries, in order to ensure law enforcement in the digital environment, especially in cases where the transnational character of cyber crimes and threats forces the involvement of more than jurisdiction.
Indicators
• ITU Global Cybersecurity Index57.
• Public-private cooperation for the construction of reliable indicators of the number, nature and cost of cyber attacks and incidents, focusing on national (CETIC and CERT.br) and international indicators, with comparability between countries.
D. Professional Education and Training

Form society into the digital world with new knowledge and advanced technologies, and prepare it for the work of the future. Digital education will increasingly be an important step towards the exercise of citizenship and a precondition for successful professional activity. Our capacity for self-determination and critical judgment in the digital world, in its various spheres - at work, in virtual communities, as consumers and citizens - will depend on a critical and well-targeted digital education. As for Brazil, the provision of quality education is fundamental for the socioeconomic development of the nation and the increase of Brazilian prosperity and competitiveness in relation to the other countries of the world. The importance of education in the Digital Age requires a proactive and decisive attitude of government, business and society on the subject.
Several countries around the world faced major educational challenges with a high strategic sense, and today they reap the benefits of the election of education as a national priority. Today, digital technologies play a dual role in the subject of education: they provide new ways of educating and learning and are an essential component for the quality leap that the country needs, if they are used in a coordinated way, exploiting all the potential that have the to offer. In order for Brazil to reach international levels of quality education and to enter the circle of the world's most dynamic economies, exploiting all its social and economic potential, two priorities must be established in the areas of education and professional training:
• Improve the quality of education through broad access to digital content and technologies, with continuous training and adequate support for teachers and students; and
• Facilitate employability, entry into the labor market, opening up new job opportunities and the ability to undertake in the Digital Age.

Education for the future will take place throughout life (lifelong learning) and continuing education will play a central role in the lives of an increasing number of people. The inequalities that the country presents should also be addressed in terms of access to and use of digital technologies, a field in which educational policies for the digital environment play a very important role. Access to jobs, citizenship

and the ability to undertake will increasingly depend on the fact that people have an adequate set of digital skills, ranging from the digital literacy necessary for the exercise of citizenship to the acquisition of skills specific to the technological sectors more dynamic. In addition, many of the jobs and careers in the next ten years will depend on knowledge, skills in science, technology, engineering and mathematics (STEM), and virtually all professions will require literacy in ICTs. Principles of an Effective Educational Technology Policy National and international studies emphasize that for ICT use to have a positive effect on education, it is important, in implementing programs and policies, to observe and maintain four dimensions of technology use in pity of the whole whole being compromised. This approach is based on the so-called "Four in Balance" theory developed by the Kennisnet Study Center in the Netherlands. These studies also point out that an effective public policy regarding the use of ICTs in education must observe certain "lessons" or lessons learned from national and international experience :

• The policy should be clear, with a definition of short, medium and long term goals, covering all levels of government (national, state and municipal).
• The policy should be updated periodically, including strategies and targets.
• The policy should be articulated with the various actors involved, providing for and implementing collaboration among federal entities.
• Each actor responsible for implementing the policy must have a clear vision of its role and the goals to be achieved.

Managers, practitioners involved, and policymakers should also keep in mind that technology should not be employed in education in the hope of short-term student learning outcomes through standardized tests. Technology can contribute to improving learning. It can also impact other important factors, such as:

• Improvement of the efficiency of school management.
• Improved student preparation for the job market.
• Facilitates access to quality content and professionals, especially in places of low demographic density or difficult access.
• Provides better opportunities for students with physical limitations, such as vision, hearing or locomotion limitations.

However, the use of technology in the educational environment should occur gradually, negotiated and according to certain levels of maturity, so that they do not reach adverse effects, contrary to the desired objectives: for example, worsening results of traditional teaching methods, dispersion of students , increased level of conflict, or school dropout.

Diagnosis

As mentioned, Brazil has historical experience in innovation and educational technology. However, the current policy is still the 2007 reformulation of the ProInfo Program, originally prepared in 1997. Twenty years after the first version of this policy has been published, it is necessary to devise new initiatives, adapted to the current Brazilian and world reality. A diagnosis of Brazilian educational technology policy, however, can not dispense with a broader view of education in general in the country. As is well known, Brazil has made many efforts over the last 20 years to promote a broad mass education (basic and secondary), technical and higher education in Brazil. With regard to basic education, which is already universalized, the challenge now is to improve its quality. In international comparisons, the country does not occupy a position that re fl ects its economic, social or national importance. In the international evaluation of the International Student Assessment Program (PISA), promoted by the Organization for Economic Cooperation and Development (OECD), for the year 2015, Brazil occupied 63rd place in

science, 59th in reading and 66th place in mathematics, in a total of 70 countries that participated in the evaluation.
These results show, to a certain extent, the universalization effort carried out in recent years, as evidenced by the stagnation and the existence of a certain period of decreasing senses in the evaluation of the Basic Education Evaluation System - SAEB promoted by the National Institute of Studies and Educational Research Anísio Teixeira - INEP:

Connectivity has been highlighted among experts as an important vehicle for improving educational policies61. It works on four pillars of a well-formulated educational policy: (i) it enables better management, as it allows the formulation of more reliable indicators and a greater fl ow of information among managers, directors and teachers, (ii) adds new forms of continuing education (iii) it increases the access to information by the students, and (iv) allows better accompaniment of the students by the parents and responsible, facilitating and strengthening the participation of the parents in the education of their children.
Brazil currently has about 150,000 public elementary schools, many of which are small rural schools (38% of all schools) with only 8% of the total number of students. The vast majority of students (86% of the total) are in urban schools, with more than half (53% of all students) concentrated in large and urban schools. The private educational network, which has minor problems regarding the connectivity of schools, concentrates 40,500 schools, with 9 million students, representing 20% of the total number of students. As far as Internet access is concerned, 59% of public elementary schools have access to the Internet, although there is inequality between rural schools that have access (24% of all rural schools) and urban schools (85% of the total of urban schools). This access profile is largely reflective of the telecommunication business model, where the infrastructure is concentrated in densely populated areas with greater income per capita.
As for the incorporation of technology into the pedagogical routine, only 3% of public elementary schools have computers within all classrooms, and in only 19% of schools connectivity has enough speed for students to simultaneously access videos and games. In addition, 67% of teachers did not attend training courses on the use of technological resources for education, or did only courses on the use of basic tools62. Professional Training One of the aspects that stands out most in the discussion of the developments related to the incorporation of technologies in the new productive processes, such as IoT, or in the growth and development of startups is the lack of people with adequate training in the area of information technologies .
This lack unfolds in the diagnosis that there is a general lack of knowledge of the population in basic IT skills. The reversal of this trend requires not only the introduction of computer-related disciplines in basic education, but also the existence of continuous training for work.
One of the ways in which the absence of skilled labor can be remedied is the attraction of foreign professionals, a practice adopted by several countries. The country has not promoted policies in this sense, attracting skilled labor only in specific periods due to high rates of growth of the economy itself.

Of course, another alternative is the implementation of training policies for work. In the Brazilian case, it should be noted that from 2008 to 2015 the number of enrollments in secondary technical education63, including all administrative areas and the private sector, increased from 933 thousand enrollments in 2008 to 1,694,000 in 2015. Of these, in 2015 , 215 thousand corresponded to courses in the area of information and communication (informatics, communication networks and others).
It is also worth mentioning the offer of public and free technical courses at a distance. The 2015 School

Census registers more than 144 thousand enrollments in distance technical courses. It should be noted, however, that the training of mid-level technicians is only one way of vocational training, which must be matched to the needs of industry and the productive sectors65. The technological courses of higher education reached a number of enrollments that reaches 1,029 thousand in 2014, of which 133 thousand in the area of mathematical and information sciences.

>>>> Open Educational Resources

UNESCO defines Open Educational Resources (OER) as follows: "Any type of educational material that is in the public domain or openly licensed. The characteristic of these open materials means that anyone can legally and freely copy, use, adapt and share such materials. REAs can be books, curricula, lectures, handouts, exercises, tests, exams, projects, audios, videos and animations "66. A common misconception is that, if the content is made available for free, it can be considered "open content". Many contents available free on the Internet are not open, as they do not allow the user to save, modify or share them. In many cases, resources are available for a limited period of time or with access barriers, for example through the need to share personal data on online platforms. The number of Open Educational Resources in the world is increasing67. Research on the subject in Portuguese-speaking countries has been increasing a lot, 68 and there are several portals and repositories with REA in Brazilian Portuguese69. International declarations encourage governments to foster OER, such as the 2012 Paris World Declaration on Open Educational Resources70. The priority of open resources is still recognized in the current National Education Plan (goals # 5 and # 7), as well as in Resolution CNE / CES nº 1, dated 03/11/2016. REA can promote greater access to quality education, fostering new educational practices, driven by digital culture. They go beyond the educational products, closed and ready, offered by companies to the schools. They introduce the possibility of adaptation to the local context, and creative and authoring practices by teachers and students, translating more accurately the innovative environment expected for education in the digital culture of the 21st Century. They create space for new models of acquisition and distribution of educational resources fnanciados with public resources and generate conditions for new business models72.

Other technological trends pointed to the educational area are:

• Open Education. Generally confused with free education, Open Education is replicable, "remixable" and without barriers of access and interaction.
• Open and free courses. With the popularization of Moocs (Massive Open Online Courses), online, open and free courses begin to strengthen as an alternative to traditional study, especially for out-of-school students.
• Real-world skills. The job market has been demanding from the newly formed skills that have been most often acquired in informal learning situations such as problem solving, resilience, and other emotional skills, and the school is not yet ready to meet such demands.
• Personalization and new sources of evaluation. Online activity analysis tools can be used as evaluation tools and also to create learning paths according to the student profile.

View

With regard to the strategic vision for the use of technology in Brazilian education, it is worth mentioning that two reference documents point to ways in this direction. The National Education Plan (PNE) stipulates the following strategies:

• Strategy 5.3: "Select, certify and disseminate educational technologies for children's literacy (...)"
• Strategy 5.4: "Encourage the development of innovative educational technologies and pedagogical practices that ensure literacy (...)"

• Strategy 5.6: "Promote and stimulate initial and continuing teacher education for children's literacy, with knowledge of new educational technologies and innovative pedagogical practices"
• Strategy 7.12: "Encourage the development, selection, certification and dissemination of educational technologies for early childhood education, elementary education and secondary education and encourage innovative pedagogical practices"
• Strategy 7.15: "Universalize, until the fifth year of effectiveness of this PNE, access to the world wide high-speed broadband computer network and triple, by the end of the decade, the computer / student relationship in public schools Basic (...) "

In turn, the National Curricular National Base (BNCC) 74 stipulates that one of the ten general competences to be developed by all Brazilian students is to "understand, use and create digital information and communication technologies in a critical, meaningful, reflective way and ethics in the diverse social practices (including the school ones) ", aiming the communication, the access and the dissemination of information, as well as the production of knowledge and problem solving. The technology is also a strategy to reach the other competences foreseen in the BNCC, being cited several times in the document, especially in thematic units and objects of knowledge.
Thus, in view of the diagnosis outlined above and the guidelines already foreseen in PNE and BNCC, the Brazilian Strategy for Digital Transformation focused on digital education should seek to promote the broad access of students and teachers to quality teaching resources and enable practices pedagogical innovations, through the universalization of high-speed Internet access in public primary schools; ensuring lasting financing in time, in articulation with States and Municipalities; stimulating the autonomy of students and teachers in the adoption of technology for education; and systematically and systematically evaluating the implementation and impact of their policies, the use of these technologies and their contribution to Brazilian education.
Strategic Actions
• Prioritize the implementation of competences in Primary Education associated with Computational Thinking, as defined in the National Curricular Common Base.
• Formulate a new national educational technology policy in place of PROINFO, articulating the strategic dimensions of infrastructure, competence, content and digital educational resources. Expand broadband connectivity in urban and rural schools, combining connectivity solutions for optical, radio and satellite cabling, with increased access speed in schools already served by the terrestrial telecommunications network, and with the structuring of a new model of high-speed Internet financing for the public education system.
• Improve the initial and continued training of teachers in basic education, considering the technological changes and orienting, in an eminently practical way, the use of technology in the classroom.
• Encourage the production and dissemination of digital content created by Brazilian teachers and students, as well as encourage the open sharing of resources financed by the public sector, with and among educational networks, giving preference to open educational resources.
• Review traditional policies, such as the National Textbook Plan (PNLD) and the MEC Technology Guide, for a planned transition from analogue educational resources to the digital medium.
• Prioritize, in the New High School model, the reinforcement in the disciplines of the STEM group (mathematics, sciences, technologies and engineering) and the technical training tracks to work in sectors of the digital economy, taking into account the importance of stimulating girls and women to seek careers in areas related to ICTs.
• Promote greater interaction between the private sector and educational institutions (universities,

research institutes and vocational and technical training institutes) in order to incorporate the demands and needs of digital companies of the future, applying concepts such as lifelong learning and vocational education.
• Facilitate the obtaining of certificates and the recognition, along with traditional courses, of content acquired in vocational training, either through partnerships with vocational education institutions or through partnerships with companies or other entities.
Indicators

It is suggested to monitor the following indicators:
• Evaluation of Brazil in the International Student Assessment Program (PISA), promoted by the Organization for Economic Co-operation and Development (OECD).
• Number of schools with Internet access and actual bandwidth measured by appropriate devices, such as SIMET developed by NIC.br, in a possible partnership with the MEC.
• Average internet speed in Brazilian public schools.
E. International Dimension
Strengthen Brazilian leadership in global fora related to digital issues, stimulate the competitiveness and presence of Brazilian companies abroad, and promote regional integration in digital economy. The digitalization of the economy occurs globally, crossing borders and eliminating distances. It is therefore crucial to address this phenomenon from a global perspective, with international prominence in global and multi-sectoral forums, and with particular attention to cross-border issues of data, goods and services.
With the digitized economy, there are also excellent opportunities for greater regional economic integration, particularly in Latin America, with the dynamization of trade, finance, people and communications flows, which allows for lower costs, higher incomes and development gains. New business models made possible by digitalisation require proactive stance in international trade negotiations, such as the World Trade Organization (WTO), where issues such as e-commerce are being debated. Other key issues for the country to take advantage of the benefits of digitization include international data flow, location of companies and datacenters, modes of service delivery in other countries, technology standards and standards, and taxation. Economic relations in the digital world also involve issues related to the legal and regulatory environment, such as data protection and privacy, copyright and regulation of digital platforms. Increasingly, there are possibilities for expanding the presence of Brazilian companies abroad, including initiatives that range from sending technology-based startups to large centers of innovation and entrepreneurship, to participating in global digital platforms, with the intensification of the export of goods and services.
It is also essential to contribute, at the international level, to decision-making on global network-related issues such as the management of critical Internet resources. The Brazilian performance in Internet governance is a notable leader from the outset, and this role must be maintained in favor of multisectoral representation in global forums, given the complexity of the network ecosystem and the persistence of the digital divide.
1. Internet Governance

Diagnosis
Brazilian advances in the topic of Internet governance have become an international benchmark already consolidated some years ago. Among them is the Civil Internet Framework, which establishes rights and obligations in the use of the network and defines principles such as neutrality, protection of privacy,

freedom of expression and content, as well as mechanisms that promote greater legal certainty in these matters. For governance itself, the multi-sectoral model of the Internet Governance Committee in Brazil (CGI.br) has been presented internationally as a positive example since its founding in 1995, being one of the first bodies responsible for network governance in the world.

In the theme of Internet governance, Brazil has emphasized certain themes and views in the international debate:

• Complexity of the ecosystem of the network, with several actors assuming different roles;

• Multisectoral and definition of distinct and complementary roles and responsibilities for each represented sector - pillars of the WSIS framework in the Tunis Agenda 2005, reaffirmed in the WSIS + 10 process at the United Nations General Assembly in 2015;

• Persistence of the digital gap;

• Structural problems that contribute to the digital divide, such as the lack of access to technology;

• The asymmetry of representativeness between countries in international forums, given the constraints of human and financial resources for engagement on all negotiating fronts.

Today's governance system faces many challenges. Cyber security, critical resource management, jurisdiction and taxation are all examples of critical points for global network governance.

View

It is necessary to maintain Brazil's leadership in the topic of Internet governance, accepting the principles of multi-sectoralism, based on the governance principles of the World Summit on the Information Society. As explicitly stated in the Tunis Agenda "... the international management of the Internet must be multilateral, transparent and democratic, with the full participation of governments, the private sector, civil society and international organizations."

The discussions associated with Internet governance must take place in a balanced and proportional multisectorial representation environment in all discussion forums - the network is global; therefore, their problems must be addressed in their overall impact with global cooperation. Brazil must also continue to strive for adequate conditions for the full participation of the different sectors in their varied roles and responsibilities in forums, processes and governance bodies of the Internet, including the exercise of prominence by governments, where appropriate.

In the case of ICANN (Internet Corporation for Assigned Names and Numbers), decision-making on the management of critical network resources must be democratic and transparent. In addition, it is necessary to adopt a realistic approach to the subject of governance, taking care that no agent has sole control of resources alone, and striving to guarantee rights and ensure duties.

However, it is also necessary, within the framework of the United Nations, to advance in the on cybernetic weapons, such as discussions within the United Nations Group of Governmental Experts (GGE) 76 on the implementation of new mechanisms for peaceful resolution of conflicts in the cyber environment.

Strategic Actions

• Acting in international fora in order to defend the principles compatible with the World Summit on the Information Society, with an understanding of the respective roles and responsibilities of governments, intergovernmental and international organizations, as well as the private sector and civil society, both in developed and developing countries.

• Promote Internet governance issues in forums, negotiations, mechanisms and articulations that deal with this agenda, using partnerships in different areas (European Union, Mercosur, IBSA, BRICS, G20, UN, among others).

• Expand multilateral spaces for the negotiation of public Internet policies, especially in the areas of jurisdiction, protection of fundamental guarantees, cyber security and taxation.
• Acting for the implementation of new mechanisms for peaceful resolution of con fl icts in the cyber environment, such as the United Nations Group of Governmental Experts (GGE)
2. Coordination and Integration Processes in the Economy

igital
The rapid digital transformation on a global scale, with impacts on the economy, politics and society, has been the object of intense articulation in several international forums in which Brazil is engaged. The Country has been an active participant in international discussions on coordination and integration in the digital environment. In addition, with the great growth of commerce in the digital environment, especially the commerce of digital content, it becomes necessary to adapt concepts, practices, and regulations to an increasingly global economy without frontiers. In this sense, the digital economy has gained prominence in negotiations in international forums.
It is worth highlighting the activities that took place during 2017 in the following forums:
• G20: 1st Meeting of Digital Ministers, Düsseldorf - Germany, 6 and 7 April 2017. Representatives of the G20 member countries congratulated the document "G20 Digital Economy Ministerial Declaration: Shaping Digitalisation for an Interconnected World" 77 whose annexes detail public policies and implementation priorities. In the second half of 2017 Argentina took over the rotating presidency of the G20 and, in close coordination with Brazil, intends to bring focus to the region's priorities in the digital themes.
• OECD: Brazil submitted, on May 30, 2017, a letter with a formal request for access to the Organization for Economic Cooperation and Development (OECD). The Brazilian request follows the successful execution of the work program that resulted from the Cooperation Agreement signed between Brazil and the OECD in 2015. The Brazilian lawsuit is currently under review by the OECD board.
• BRICS: 3rd BRICS Communications Ministers Meeting - Hangzhou, China, July 26-28, 2017, with follow-up and implementation of the initiatives agreed by this forum at its 2nd Meeting (India, 2016), and consolidated in the document " BRICS ICT Development Agenda and Action Plan "78. In addition, during the 7th BRICS Meeting of Trade Ministers, e-commerce was one of the highlights, which led to the creation of a specific working group to discuss the topic.
• MERCOSUR: In the second half of 2017, Brazil assumed the Pro Tempore Presidency of the regional bloc, and led the process that resulted in the establishment of the "Digital Agenda Group" (GAD) as an auxiliary body dependent on the Common Market Group, with the objective of promote the development of a Digital MERCOSUR.
• ECLAC - eLAC: Between 7 and 9 August 2017, a Preparatory Meeting of the 6th Ministerial Conference on the Information Society of Latin America and the Caribbean was held in Santiago, Chile.

In April 2018, in Colombia, the Ministerial Conference will be held, which will formalize concrete actions for this process of regional integration in the digital environment, stipulated for the period 2018-2020. It is the Digital Agenda for Latin America and the Caribbean (eLAC 2020).
In addition, under the eLAC, the proposal to create a Single Digital Market in Latin America, inspired by a similar process under way in the European Union, deserves special mention. It is a new initiative that gains momentum among the processes of coordination and economic integration of our region. It can be an exceptional economic opportunity for the country, opening markets to Brazilian products with projection through digital platforms and marketplaces, added to comparative advantages in delivery

logistics in the region. Engaging the private sector in coordination and integration processes is a key factor in integrating the country into global markets.

One of the focuses of this Strategy concerns digital platforms and marketplaces, as set out in the Digital Transformation Axis of Economics, especially in the chapter on "New Business Models". Brazil accounts for 39% of the volume of B2C e-commerce throughout Latin America80. The importance of this segment of the digital platforms market for e-commerce tends to grow with the integration and value chain process in Latin America.

Strategic action

• Expand the active engagement of the Country in the negotiations of coordination and integration instances in the Digital Economy, at an international level, ensuring representation and participation in the discussions and deliberations on this topic.

3. Internationalization of Brazilian Companies in the Economy

Digital

The promotion of the export of Brazilian products and services, as well as the attraction of foreign investments to strategic sectors of the Brazilian economy, relies on the efforts of several private and public actors. In this scenario, the actions of the Brazilian Agency for the Promotion of Exports and Investments (Apex-Brasil) stand out, with a view to facilitating the access of Brazilian companies to international markets, diversifying the destinations of Brazilian exports and improving international perception about companies , Brazilian products and services. In parallel, other specific public policy initiatives may also support the internationalization process of Brazilian Small and Medium Enterprises (SMEs). Actions to promote and train SMEs, especially those in a highly competitive market segment, such as international e-commerce, are critical to its success. In addition, SMEs have an important role in generating jobs, which in the digital economy are typically more qualified.

Diagnosis

The scenario of international electronic commerce, dominated by a small universe of markets (marketplaces), is identified as covering two major segments: B2B (business to business) and B2C (business to consumer). In both segments opportunities are identified for Brazilian companies, including reduction of cost of prospecting of clients, visibility of products and multiplication of direct sales channels. At the same time, however, there are also challenges, such as the management of digital platforms, security in sales, payment and logistics, among others.

The process of internationalization of Brazilian companies via e-commerce should take place in phases, involving in the first stage the creation and management of a website on the Internet, followed by a second phase of internationalization of the digital platform.

The central role of SMEs in the economy, as well as their potential for growth with international e-commerce, is widely recognized. Several countries and regional blocs explicitly state in their digital strategies the initiatives81 to promote the global performance of SMEs in the digital environment. For a broader discussion of e-commerce in Brazil, and the role of e-commerce platforms in this context, see the chapter "New Business Models" in the Axis of Digital Transformation of the Economy.

View

In 2017, Apex-Brasil developed an initiative called the e-Xport82 Brazil Program, which aims to promote the awareness, qualification and promotion of business of Brazilian companies in the international market through e-commerce tools. The perfl of participating companies should be selected according to characteristics of the platform and the target market. The US, China and Argentina were identified as target markets in the first stage. In a second step Europe must be added. The goals include the

partnership with online markets, the training of companies and the insertion of companies in marketplaces. Other public policy actions and partnerships with associations and private entities83 can provide a broad support network for the promotion and empowerment of SMEs in the digital environment, focusing on the opportunities of international e-commerce.

Strategic actions

• Establish agreements and partnerships with international marketplaces, supporting the export of Brazilian products and services on the Internet, including by Brazilian Small and Medium Enterprises (SMEs), within the scope of the e-Xport Brasil Program of Apex Brasil.

• Promote the expansion of exports via e-commerce of goods and services, mapping opportunities and barriers, and supporting the insertion of Brazilian companies in this market segment.

• Implement partnerships with associations and entities to support small and medium-sized enterprises (SMEs), in order to foster and enable them to operate in international electronic commerce.

• Promote the interaction between companies and entities interested in expanding exports via e-commerce through events, business roundtables and lectures, among others.

• Develop quality seals for export via e-commerce (for example, by Inmetro or Apex-Brasil)

THEMATIC SHAFTS - TRANSFORMATION

DIGITAL

F. Digital Transformation of the Economy

To stimulate an increasingly digitized, dynamic, productive and competitive Brazilian economy, accompanying the world economic frontier.

1. Data-Based Economics

The transformations of the digital age bring about a new industrial revolution based on data, computing and automation. Human activities and industrial processes are improved, created, and recreated based on the volume of data on previously non-existent scales84. In the context of the so-called digital economy, data are presented as a new factor of production, such as material goods and human capital. This creates a global market in which value is created from the content generated and shared by people, sensors and machines, as well as information built from the immeasurable possibilities of crossing an immense collection of references.

The characteristics of the cyber space generate an environment, not only of mass production, but of a large information record, when added to factors such as:

• Decline in costs of collection, storage, processing and identification of meanings from data analysis;

• Public policies around the world for the gradual expansion of Internet access infrastructure and the trend towards a gradual increase in the number of users of digital technologies;

• Increasing connection not only between people, but also between numerous devices, sensors and machines to the Internet, through the so-called Internet of Things (IoT).

It is raw material that serves as input for multiple purposes, whose value is context-dependent and complementary factors related to the ability to extract information. It is interesting to note that data do not generate scarcity problems; on the contrary, their re-use maximizes their value, with the possibility of continuous reuse without loss of reliability, in a generation of added value, which characterizes them as a capital endowed with increasing returns. Thus, there is a massive production of inputs for the improvement of traditional business models, for the emergence of new products and services and for the evolution of nascent technologies such as artificial intelligence, algorithm use, machine learning, data mining, augmented reality, cloud computing and Big Data, all with high potential for transformation over social relations. Access to such inputs is based on data-driven innovation, characterized by the use

of data and analytics to improve or promote new products, processes, organizational methods and markets.

New business models and new market structures require the formulation of new policies and rules that foster the flourishing of a robust data economy and secure rights such as free competition, consumer protection and privacy.

Diagnosis

He is currently moving towards an economically and socially more and more knowledge-driven world, with a growing volume of data. By 2020, it is estimated that there will be more than 16 zetabytes (16 trillion gigabytes) of useful data, an estimated growth of 236% per year between 2013 and 202087.

Several countries diagnose the need to encourage the data-driven economy as a of the pillars of the digital economy. In addition, the five companies currently listed as the largest in the world are collecting and using data and collecting more than $ 25 billion in net income only in the first quarter of 201889.

OECD estimates show that companies that are based on data analytics increase their business productivity by 5 to 10 percent compared to those who do not. Such gains in productivity depend not only on the use of data and analysis but also on the presence of other factors, such as skills related to data analysis and management, innovative processes and industry specificities in which the company operates. Also according to the OECD, investments in intangible (knowledge-based) capital have grown proportionately in relation to investments in tangible capital, reaching 15% of US GDP in 201191.

In addition, some of the recent major mergers and acquisitions in the technology and Internet sector in recent years present great potential for broadening data access. The value chain of the data market is composed of a set of activities, among which we can highlight the collection92, the different types of treatment93 and the use in primary applications (exploitation of the data in a way linked to the activity that generated its collection, for example, mobile traffic data applied for the collection of customers from a telecommunications service provider) or in secondary applications (when the data is used for other purposes unrelated to its collection context).

In the scope of research and development in data analysis and treatment, the National Laboratory of Scientific Computation (LNCC) is the main research center in Brazil with initiatives in the sector. Equipped with supercomputing facilities, the LNCC implements big data initiatives, such as INCT-CID, in cooperation with several national and international research institutions95.

It is worth noting that there are several kinds of data, covering personal data (linked to identified or identifiable persons); (linked to the development of various business models); industrial or production (machinery operation, production control, etc.); the nature data (climatic, salient features, soil, geography, herds, plants, seeds, etc.); government data, public services (transport, supply, etc.), among others.

Thus, in assessing the establishment of public policies for the data market, it is necessary to consider, in addition to their cross-cutting effect on the various sectors of the economy, the vertical nature of each specialized niche, taking into account the specificities and needs of each sector96. International Data Transfer The global data-driven data flow, which was incipient 15 years ago, currently has an impact on GDP growth greater than some of the commercial fl ows that had existed for centuries.

Such a fl ux is magnified by the exchange of information in a digital environment, which, intrinsically, is characterized by the free circulation of data, even though beyond national boundaries. In fact, the digital data market is already born global, with its largest companies present simultaneously in several nations, which is made possible by the ubiquity of digital technologies and its lack of borders.

On the one hand, this change allows companies to seek international markets using less capital intensive business models and is already essential for a number of sectors, ranging from financial services to technology companies; on the other, brings new risks and unprecedented challenges to public policy, challenging States to cooperate and harmonize their legislation.
In this way, the international information flow is inherent in the data market and is necessary for the growth and development of a national economy based on knowledge and information. >>>>
Datacenters: Data Infrastructure A datacenter is one of the most basic infrastructures for the new digital economy. Data centers are centralized repositories, integrated into a telecommunications network, for the purpose of storing, managing and disseminating data and information.
Datacenters are linked to the development of a vibrant and competitive data economy. Its existence in a region encourages overflows such as the installation of technology development companies and services that depend on a strong IT base (software production, digital content, etc.). They are key elements for the cloud computing business in the data economy value chain.
Brazil has 2.5% of the Internet traffic in the world, 40% of the IP traffic in Latin America98 and is the Latin American country with the highest concentration of submarine cables. However, it has only 0.9% of the world's data centers99. In Brazil, for every US $ 1 billion in GDP, there are 0.022 datacenters. In countries or regions that are investing heavily in this infrastructure, such as Romania and Hong Kong, this ratio is nine times higher100.
On the other hand, a specific study of the datacenters market in TCU's recent report10112 related to the topic, indicates a high investment cost for datacenters in Brazil, which suggests that, although the Country possesses the potential to be a data hub in the continent, it faces challenges competitive in this market.

The disadvantages of excessive reliance on foreign datacenter services can be summarized in four main axes:
• Home providers and Internet service providers: since data centers provide the basis for the service, the use of foreign data centers drains the business base outside the country;
• Current users: the incidence of Brazilian legislation on data hosted abroad, although guaranteed in the Civil Internet Framework (Law 12.965 / 2014), is difficult to apply;
• Information industry: the service provided from abroad does not generate revenues for domestic companies and the technical infrastructure tends to be drained out of the country;
<<<<<<< Globalization: the foundations for the global activities of modern society and for the generation of value based on the Digital Economy fall outside the Country. Given that the datacenters themselves are often associated with the operation of PTTs Traffic policies), the promotion policies for this specific segment end up promoting the competition and growth of the entire Internet ecosystem and, in this sense, produce positive impacts along its value chain, which includes, in addition to telecommunications, content providers, Content Delivery Networks (CDNs) and Internet service providers.
From this scenario, it is identified as strategic that Brazil build mechanisms of attraction of data centers. In addition to investments, such an initiative tends to improve the quality of Internet access, due to the decrease in the physical distance between the content and the user (reduction of latency). In the same way, the consumption of content hosted in Brazil generates significant savings with the bandwidth consumption of national backbones and submarine cables (IP traffic). At the same time, increasing the number of data centers in the country means giving greater governance over content and, consequently, greater security for corporate and citizen data.

In this sense, it is important that Brazil maintains and broadens its data disclosure policy as a way to stimulate new business and solutions for society; it is noteworthy that the country was classified in 2017 by the Global Open Data Index as the 8th most open country in the world in terms of government data102.

Vision

• Data market as a strategic element for economic growth.
• Balance between the guarantee of the protection of rights and the incentive to innovation, according to guidelines also established in the Thematic Area "Confidence in the Digital Environment".
• Free flow of information and cloud computing as some of the key factors in data market innovation.
• Implementation of policies aimed at stimulating innovation and legal security in data economy, creating an environment conducive to the flourishing of this new digital market.

Strategic Actions

• Promote the approval of the policy of encouraging and attracting data centers in the country.
• Improve the National Policy on Open Government Data, following the discussion presented in the Thematic Hub "Digital Transformation: Citizenship and Government", involving all federated entities, and encourage data-based tools, systems and processes.

In this sense, it is important that Brazil maintains and broadens its data disclosure policy as a way to stimulate new business and solutions for society; it is noteworthy that the country was classified in 2017 by the Global Open Data Index as the 8th most open country in the world in terms of government data102.

View

• Data market as a strategic element for economic growth.
• Balance between the guarantee of the protection of rights and the incentive to innovation, according to guidelines also established in the Thematic Area "Confidence in the Digital Environment".
• Free flow of information and cloud computing as some of the key factors in data market innovation.
• Implementation of policies aimed at stimulating innovation and legal security in data economy, creating an environment conducive to the flourishing of this new digital market.

The Internet of Things will have a huge impact on all sectors of the economy and people's lives, generating a lot of data. A study by Telefonica estimates that the global capacity for data storage and processing will be 800 exabytes by 2020. For comparison, in 2015 it was 80 exabytes. Much of this data will come from connected devices.

IoT is the basis of the digitization process of the economy, which has transformed traditional methods of production. These methods are largely based on digital applications, the intensive use of information and communication technologies and the interconnection of devices. Incorporated into what was defined as the 4th Industrial Revolution, digitalization transformed production processes, impacting the three basic sectors of the economy: agriculture, industry and services. The connection between IT systems, subsystems, processes, objects and applications, which communicate with each other and with humans, is the key vector of this transformation.

In addition to ongoing social transformations, IoT applications and digital technologies are expected to foster productivity and competitiveness gains for nations. This is even more important for Brazil, given that in the last decades the country has been losing its ability to aggregate the value of industrial production in comparison to other developing economies. UK estimates106 show that this share went

from 12.2% to 4.4% between 1990 and 2014, while China's share, for example, rose from 15.8% to 51.3% in the same period. In addition, Brazil has been losing positions in the ranking of industrial competitiveness for emerging countries. Between 2010 and 2013, Brazil went from 33rd to 35th place. In turn, China has moved from 8th to 5th place in the same period. These data show that it is imperative that the country take actions to stimulate the development of technologies that can guarantee greater productivity and competitiveness in the basic sectors of the economy: manufacturing, agriculture and services. It is important, in this sense, to highlight the relevance of the involvement of government, business and scientific community sectors in initiatives aimed at the adoption and development of the Internet of Things (IoT) and new digital technologies; standardization of digital applications; to digital security; modernization of the legal framework; training and vocational training; and improving the business environment and infrastructure.
In light of this recognition, efforts have been made to expand the use of IoT and digital technologies in Brazil. These include:
• Creation, in 2014, of the IoT Chamber, a multi-sector forum that brings together Government, universities, research centers and companies with a view to defining governance models, actions to stimulate innovation, infrastructure and regulation for the development of the Internet of Things in Country, which will go through the elaboration of the National IoT Plan.
• Actions undertaken by MDIC and MCTIC, including public consultation of more than 300 experts, which will result in the elaboration of the National Strategy for Advanced Manufacturing.
• Public call107 launched by EMBRAPII - Brazilian Association of Research and Industrial Innovation - that aims to support actions in the area of robotics, mechatronics and advanced manufacturing.
• The establishment of a non-reimbursable development line specific to intelligent systems and advanced manufacturing by BNDES, BNDES Funtec.
• Embrapa's Strategic Plan for the 2014-2034108 cycle, which establishes the digitization of the agricultural sector as one of its priorities, emphasizing actions in the area of automation, precision agriculture, information systems and scientific computation, geotechnology and nanotechnologies.
>>>>> National Internet Plan of Things

The Ministry of Science, Technology, Innovations and Communications has been discussing the private initiative, academia and government bodies since 2014 in an effort to build a public policy on the subject. This articulation takes place within the scope of the IoT Chamber, a multi-sector body established by Decree 8,234, dated May 2, 2014.
The final product of this intense process of dialogue is the National Internet of Things Plan, whose objective is "to accelerate the implementation of the Internet of Things as an instrument for the sustainable development of Brazilian society, capable of increasing the competitiveness of the economy, strengthening national productive chains and promote the improvement of the quality of life ".
The Plan is, to a large extent, an unfolding of the activities of the IoT Chamber. Several meetings promoted by the Board over the course of 2014 and 2015 have resulted in an initial diagnosis of the IoT ecosystem in Brazil. This process, which had a strong involvement of the sectors involved, motivated the decision to draw up a national plan.
In parallel to the launch of the Public Consultation, MCTIC signed a cooperation agreement with the National Bank for Economic and Social Development (BNDES) to jointly conduct a study on Internet of Things. All the agents involved in the creation of the Plan share the aspiration that the Internet of Things has a positive, relevant and rapid impact on the economy and people's lives. To achieve this goal, the National IoT Plan will act in several dimensions, establishing general guidelines and proposing concrete

initiatives.

Impacts in the Secondary Sector: Manufacturing 4.0

Manufacturing 4.0 (or advanced manufacturing) consists of the complete digitalization of the productive processes, in which physical and digital components are associated in the same productive plant. This concept describes the organization of production processes based on technology and devices that communicate autonomously with each other along the value chain. It is a model of the 'intelligent' factory of the future, where computer-controlled systems monitor physical processes, create a virtual copy of the physical world, and make decentralized decisions based on self-organizing mechanisms109. Manufacturing digitization processes include the use of embedded sensors in virtually all component parts and manufacturing equipment, the use of cyberphysical systems, security systems and energy consumption monitoring, and the use of analytical and monitoring systems data relevant to production.

New applications of IoT will bring considerable improvements in industrial processes, such as the use of autonomous systems, which will allow the inputs to be processed with greater productivity, besides guaranteeing greater precision in the productive processes; the use of sensors, which capture data in real time, can prevent possible problems and ensure the security, energy efficiency and smooth operation of integrated systems; applications in predictive maintenance, which may anticipate the need for replacement of parts and eventual wear, among others. In addition, statistics show that the impact of IoT on the productivity of manufacturing processes can generate savings of 10% to 20% in the use of energy resources and 10% to 25% in the efficiency of the workforce10.

Some aspects are considered as prerequisites for the development of advanced manufacturing around the world, such as: standardization of systems, platforms and protocols; changes in work organization re fl ecting new business models; digital security; availability of skilled labor; and investments in Research and Development.

Statistics show that by 2025 manufacturing-related processes 4.0 can reduce equipment maintenance costs (from 10% to 40%); reduce energy consumption (from 10% to 20%) and increase the efficiency of work (from 10% to 25%).

Estimates of the German Digital Strategy point out that manufacturing 4.0 can promote a 30% increase in industrial productivity, annual efficiency gains of 3.3% and annual cost savings of 2.6%. In addition, it is expected that the sectors with the greatest potential to take advantage of the gains coming from manufacturing 4.0 are: automotive, mechanical engineering, industrial processes, electrical and electronic industry and ICTs.

In addition to establishing new forms of management and engineering that will impact the entire production chain, manufacturing 4.0 will alter the bases of industrial competition and reconfigure the competitive edge of nations, which will be based on the production of its own digital components applicable to industry and associated technologies. The adaptation of industrial production to digital manufacturing requires the establishment of policies to encourage companies to adapt to new techniques and to re-adjust their manufacturing structure111. Developed nations anticipate facing difficulties in this type of adaptation, particularly in traditional industries or in industries that are not adapted to digital applications. The German Digital Strategy, for example, predicts that only 6 out of 10 companies in your country are already fit for industry 4.0. In this sense, it is important that Brazil is prepared to face the challenge of stimulating the adaptation of all its industrial segments, including extractive, mining, transformation and construction industries, IoT applications and new digital technologies.

Several developed nations have already established actions to stimulate the digitization of manufacturing. In 2013, the United States created the first dedicated technology hub, the National Network for Manufacturing Innovation (NNMI), which is a public-private interaction platform of several national laboratories and research institutions to find solutions to the challenges of the country's industry. As part of its High Tech Strategy 2020, Germany has set the INDUSTRIE 4.0 initiative to lay the foundations for the country to achieve world leadership in providing solutions in digital manufacturing, industrial automation, embedded software and other industrial systems.
In a recent consultation conducted by MDIC and MCTIC to more than 300 specialists12, it was identified that, in order to stimulate the establishment of 4.0 manufacturing in Brazil, efforts should be devoted to the development of technologies considered strategic, including collaborative robotics, intelligence artifice, big data, Internet of things, additive manufacture, nanotechnology and new materials.
The consultation also pointed to the need for the creation of Open Labs aimed at the development of technologies of the digital industry, considering the fact that these combined technologies generate unprecedented sets of competitive manufacturing opportunities. In addition, MDIC and MCTIC established an initiative in 2015 with the participation of several public and private institutions and aimed to gather - together with hundreds of innovation experts in the industry - subsidies for an Advanced Manufacturing Policy . This initiative culminated in the publication of the report "Perspectives of Brazilian Experts on Advanced Manufacturing" 113.
Impacts in the Primary Sector: Agropecuária

Brazil is a global leader in the agricultural sector, where it stands out as the world's first or second largest producer and global exporter of seven products: orange juice, sugar, coffee, soy, corn and beef. This sector represents approximately 22% of the national GDP and has experienced an intense rate of productivity growth (in the order of 3% per year, in a sustained way) over the last decades. In addition to the country's comparative advantages, this performance is strongly based on a robust research, development and innovation environment, which favors the adoption of new technologies. The maintenance of this leadership of Brazil in the sector will depend, more and more, on the capacity to leverage the digital transformation of the economy. The impact on farming will be as much in remote sensing and mapping technologies as in the digitization of machines and implements, and in the dissemination of Internet devices and sensors of Stuff, embedded software and information and communication technologies (ICTs) in a way general in agriculture, livestock and forestry.
However, it is important to note that a greater adoption of ICT in agriculture is strongly dependent on the greater availability of trained personnel to deal with these technologies in the field. At the same time, broader coverage of broadband Internet access infrastructure in the field - primarily through mobile telephone network and satellite access - is essential for access via applications, enabling information dissemination, training, and integration into markets and databases in real time. In this context, one of the key institutions in the process of research, development, dissemination and technological training for the sector is the Brazilian Agricultural Research Corporation - Embrapa, which in the last 40 years has been the central actor in the modernization of this sector in the country .
In addition to the aforementioned Embrapa Strategic Plan for the 2014-2034 cycle, an important aspect of the company's actions is centered on the "insertion of agricultural assets in the digital market", enhancing its databases and ways of making available the company's technological assets, including recent internal developments. The company's survey points to more than 40 digital products developed in the agricultural, agrometeorology, automation, vegetation and land cover segments, experimental data, genomics and proteomics, technical-scientific information, livestock, agricultural planning and

simulation. The company also develops projects in the Robotics and Internet segments of Things, notably with application in precision agriculture, with the digitalization of sensors, machines and implements. Embrapa also conducts an entrepreneurship stimulus program called "Startups Challenge", which also seeks to engage nascent companies in the agricultural sector. A recent study conducted by ESALQ / USP114 reveals the dynamics and potential of startups in agribusiness.
It is important to highlight that a dynamic environment of digital entrepreneurship is currently developing in the agribusiness environment. In order to leverage the startups, some programs of acceleration of nascent companies such as Startup Brasil (MCTIC) and InovAtiva Brasil (MDIC) were structured within the Federal Government. Softex's survey in 2016 identified at least 75 digital startups aimed at this sector, as well as more than 150 companies providing software for agribusiness. Impacts in the Tertiary Sector: Scanning in the Service Sector The services sector represents more than two-thirds of Brazil's Gross Domestic Product (GDP) and its share of national added value has grown over time. From 2003 to 2016, the representativity of the tertiary sector increased from 65.8% to 73.3% of the value added to GDP, according to IBGE Quarterly National Accounts data.
The connection between devices and other digital technologies will also impact this important sector for the country. Several services are expected to have increasing productivity gains, such as the health services sector, the logistics sector, infrastructure and financial services. Evidence that the service sector may be heavily impacted by the digitalization of the economy is the fact that most of Brazil's technology-based innovative firms operate in the service sector.

Despite the relevance of the services sector in relation to the other sectors of the Brazilian economy, it is important to mention that one of the effects of digital technologies is the fact that the segmentation between services and other sectors tends to be gradually less relevant. In fact, the intersection between the industry and services sectors is increasing, and in some cases it is impossible to separate them clearly. Tasks and professions are increasingly becoming automated by digital technologies, which lead to sharp reductions in the costs of information and transaction search, enabling the development of innovative and highly scalable business models in the service sector.
One of the examples of this transformation provided by digital technologies in the service sector are platforms that blend social networking, online collaboration and service delivery, including collaborative consumption. In addition to these, it is important to highlight the interoperability applications of devices related to smart cities, health, retail, domiciles, offices and administrative environments, logistics, among others.
In so-called smart cities, IoT applications in urban mobility, the efficient use of security, energy and supply systems, and other solutions aimed at social and environmental sustainability in densely populated urban centers have been increasingly used. Estimates show that the global market for technology solutions to smart cities can reach $ 408 billion by 2020116 117.
In total, transport applications in smart cities can lead to impacts measured at more than $ 800 billion per year in municipalities around the world. Impacts promoted by IoT applications on air and water quality can reach US $ 700 billion per year. In addition, the effects resulting from the use of smart meters for energy efficiency and water distribution can exceed US $ 69 billion per year worldwide118.
In the health segment, connected devices and other IoT applications can optimize medical treatments and hospital management itself. Examples of the use of IoT technologies in this segment include wearable technologies, which can provide remote monitoring of patients' conditions in real time and assist in performing medical procedures, including distance; automatic and electronic filling of electronic medical records; the optimization of stocks of medicines and hospital equipment, guaranteeing the

efficient use of resources. It is anticipated that these and other IoT applications in Health will achieve economic impacts of the order of US $ 1.6 trillion worldwide by 2025119.
In addition to this, the logistics segment should also be greatly benefited by IoT applications. In fact, interoperability of IoT systems is the main focus for the logistics industry base of the future, which includes rail, air, rail and land applications. Among them, it is possible to mention the remote tracking of naval containers, airplanes, trains and freight cars; applications in interconnected navigation; the monitoring of logistics routes; and autonomous cargo vehicles. The impact on the logistics sector with IoT-based technologies is projected to reach $ 850 billion worldwide by 2025120.

In view of impact forecasts and potential applications for connected devices and other digital technologies, Brazil should base its digital strategy on actions aimed at developing competitive solutions applicable to IoT, in parallel to initiatives for professional training and wide adoption of these without neglecting the search for a normative and business environment that guarantees security for the attraction of new investments and, at the same time, the trust and the preservation of users' rights.
>>>>> Security and privacy in the world of connected devices
A fundamental requirement for the future of the Internet of Things is that its expansion is not carried out to the detriment of the security and privacy of people.
The expansion of IoT leads us into the near future in which transit, power grid, health facilities and other vital areas of a society will be networked. In this scenario, cyberattacks and data leaks will have huge impacts. It is important that public power and private initiative invest heavily in cybersecurity, viewing it as an absolute priority. There is still the enormous challenge of ensuring the privacy of individuals in a hyperconnected society. Part of the sheer volume of data collected and handled through connected devices is personal data, and business models based on their monetization are increasingly common. The legitimate commercial use of personal data presupposes respect for users' rights. This topic is covered in depth in the chapter "Confidence in the Digital Environment". >>>>>>
View
To reach the full potential of IoT applications, associated digital devices and technologies must evolve continuously, reducing production costs and producing more robust data analysis. In order to do so, it is essential to establish training and research lines for the development of these new technologies, as well as establishing safe businesses to attract new investments. In addition, in almost all of their applications, IoT systems raise questions about how to promote greater security in labor relations, user rights and the privacy of data collected. In view of the undeniable process of digitization of the industrial and service spheres and the respective economic and social impacts of it, it is considered important:
• The development of basic technologies and broadband infrastructure that enable the establishment of technologies applicable to agriculture of digital manufacturing plants in Brazil, in addition to the extensive exploration and development of high value-added services based on digital applications. In fact, strengthening these segments is unthinkable without the development of broadband infrastructure, including 5G, design houses and sensors.

• Professional training and skills training necessary for the use of new digital technologies. In view of this, it is important that articulated actions between government, industry, academia and civil society be fostered to define new educational lines for this new professional profile.
• Coordinated action policies in the public and private sectors, with regulatory frameworks that are responsive to the rapid progress of the digital sector, equalizing the stimulus to technological investment, while providing appropriate protection to consumers and workers.

Strategic actions

The strategic actions focused on the adoption and development of IoT and digital technologies in Brazil should include:

• To approve the National IoT Plan and implement test platforms for Internet Shoppers of Things in the chain of value of each of the four verticals defined as priority: Health, Agropecuária, Indústria e Cidades Inteligentes.

• In line with the actions highlighted in the "Research, Development and Innovation" Hub, to promote the improvement of the CT & I legal framework, increase the interaction between public research centers and companies, and the articulation between national research infrastructures and research lines. promoting the development of connected devices, aiming at promoting gains in scale and greater coordination in this type of investment in the country.

• Assess impacts of new technologies in the connected devices world, in particular the implications related to robotization and industrial automation, on labor relations.

• Implement actions aimed at developing a dynamic and competitive environment in the segment of devices, sensors, machines and equipment of IoT.

• Promote a business and regulatory environment that ensures the attraction of new investments in connected devices, while ensuring the trust and preservation of users' rights.

• Encourage the adoption of IoT solutions through Government Technology Orders.

Indicators

Indicators defined under the National IoT Plan, National Strategy for Advanced Manufacturing, and the Embrapa Strategic Plan (2014-2034).

3. New Business Models

The digital environment, especially that made possible by the Internet, leads to the reduction of entry barriers, the opening of new markets and the emergence of disruptive business models. At the same time, the speed of change requires regulators and policymakers to be agile and fl exible in creating a business environment conducive to the development of the digital economy. Digital platforms There is no standard and unique definition of "digital platform": this term refers to services and features offered by the Internet as varied as search engines, social media, e-commerce platforms, online application stores, price, among others.

Generally speaking, platforms can be defined by common features121, such as:

• Ability to facilitate direct or indirect transactions between users and to extract values from these transactions;

• Ability to collect, use and process large amounts of personal and non-personal data, with the aim of optimizing the user experience;

• Ability to build networks in which each additional user enhances the experience of all other users - "network effect" 122;

• Ability to create and shape new markets into more efficient arrangements that bring benefits to all users by disrupting traditional markets;

• Ability to organize new forms of social participation based on the collection, processing, modification and editing of information; and

• Information technology dependency as a means of achieving the above capabilities.

To handle the volume of traffic generated and the huge amount of data, the companies that manage the major platforms make considerable investments in hardware, software and human resources. For example, a 2015 OECD study estimated that one of the top online sales platforms had 28 data centers

around the world, each containing between 50,000 and 80,000 servers. The large companies in this market had, in addition, data centers with more than 1 million servers in 2013.

A report produced by the European Union on the subject124 classifies the platforms into five types of business models:
1. Online markets (marketplaces), in which the intermediation of transactions between sellers and buyers of goods and services occurs;
2. Mobile Ecosystems and Application Distribution Platforms: Smartphones have become the focus of a new market for software and digital content, allowing app stores to take on the role of online markets in many cases;
3. Internet search services: The key role of a search engine is to make it easier for users to find information on the Internet. The fundamental source of these services' resources is in the advertisements on the search pages;
4. Social media and content platforms: services that allow connection, sharing, business, communication and online expression. Its main sources of income are commercials and monetization of user data aggregates; and
5. Online advertising platforms, which sell and buy ad space on web pages.
With the market possibilities and the enormous incentives for innovation in technology and business models, the platforms present themselves as potential enablers for growth, innovation, efficiency and competition, favoring investments in sectors such as digital technologies, e-commerce and services online.

The means of gauging revenues vary between direct payment by the user, advertising, collection of fees through the intermediation of transactions and donations, among others. Platforms can combine demand and supply from multiple markets simultaneously, exploit network effects within and across different markets, shaping the conditions under which these markets work. A typical example of these models are the platforms that associate information search or networked social contacts with targeted advertising, from the subsidy of users' access to the online advertising market.
Many of these business models monetize personal and non-personal aggregates of data to provide services to their users should rethink the considerations made in the Digital Confidence Thematic Hub.
Diagnosis
Marketplaces
The main function of these platforms is the intermediation of a single virtual space for transactions, with cost reduction and convergence of interests between buyers and sellers or service providers. This scenario is enhanced by the use of trust mechanisms such as issuance of certificates, ranking by users, prohibition of certain types of payment with a view to avoiding fraud, establishment of codes of conduct and good practices by the platform, among others126.
Along with gains in scale, transaction cost reduction and efficiency, some platforms have also created job and income opportunities for individuals and small and medium-sized enterprises. This includes physical delivery services such as accommodation, transportation, repairs or personal services, and digital delivery services (mainly via the Internet), ranging from data entry and graphic design work to professional services (legal and business advice) .
On the other hand, there are particularities of the online market platforms, such as their often transnational character and their susceptibility to the net effect, the advantage of the frst player and the "lock-in" effect, which can provoke regulatory and competitive challenges The remuneration of

specialized platforms in marketplaces can occur in a variety of ways, mainly through commissions charged by the brokerage service in a trusting environment and by the sale of advertising spaces127.
Mobile Ecosystems and Application Distribution Platforms The widespread adoption of mobile technologies has been accompanied by the permanent connection not only of the user but also of real-world objects such as automobiles, accessories, appliances, machines, and more. In this line, mobile devices have also developed to reach today's smartphones, more complex tools that allow not only mobile voice communication, but access to the most diverse content, services and products from anywhere and anytime. This context generates the growth of specific applications to meet users' preferences and presents a new environment for accessing digital content128.

It is noted that mobile access to digital technologies has become the dominant source of revenue for service providers, with the proportion of time spent using mobile devices rising from 12.7% in 2008 to 54.6% in 2015129 , and download estimates of about 270 billion applications in 2017130. In addition, we can see the rapid growth of applications since 2008, when the app stores were launched, with revenues of around 30 billion euros generated for developers in 2015131. It is estimated that the jobs generated by the application industry in Brazil in January 2017 reached 146,000.132
In this scenario, digital application distribution platforms for mobile devices and desktops (called app stores or app marketplaces) present themselves as key agents in that they influence access to the diversity of functions offered by the digital environment, especially considering the future scenario of diffusion of the Internet of Things and the potential of connecting a gigantic number of objects to the web.
Thus, such platforms provide conditions for developers of the most diverse applications to offer their products and services, while serving as a convergent space so that users have facilities for their preferences in one place. In this way, transaction costs are reduced, with reduced expenses with payments, collections, accountability, rules, etc. This context favors the network effect: The more applications that are available in the app store, the greater the number of users looking for apps specific to that database133 currently indexed pages.
It is a fruitful environment for the provision of new services and products, with ample space for innovation and possibilities for the development of small and medium-sized enterprises. However, this same structure also tends to unify application access on one or a few bases, which can create competitive advantages to be monitored due to possible risks of concentration of economic power in these markets.
Internet search services
This type of platform aims to facilitate the search of information by users in digital environment, considering the wide range of data produced daily on the web, with the mark of 4.51 billion pages currently indexed134. As far as revenues from this niche were concerned, there was already a growth forecast of 95.5 billion Euros in 2016, representing 53% of that year's total advertising revenues135. In the Brazilian case, it is estimated that advertising revenues in this area reached R $ 5.7 billion in 2016.136
The market for search engines on the Internet is concentrated, with a service accounting for more than 90% of searches worldwide, a percentage similar to that observed in Brazil137. The main types of search services vary from a general model, based on search for words and expressions written on the web; based on titles, size and / or characteristics of Internet gaps; maps, by means of addresses, places or coordinates for GPS; and vertical model, with specialization in certain segments of online content, such as travel, health and academic information.

Due to the progressive increase in both available information and the number of users in a digital environment, search services face the challenge of flushing and personalizing access to content, which tends to be accentuated in the face of scanning expansion diagnoses for all sectors the economy and social spheres.

In this sense, because they are important tools for accessing content in a digital environment, search engines have assumed the role of true intermediaries of access to information.
These activities are carried out with the essential use of algorithms and automated decisions, and may lead to discussions about the criteria adopted for the selection of the presented results.
Social media and content platforms This type of platform generally does not charge direct payments by its users, with the main source of advertising revenue and monetization of personal data aggregates. In 2016, the global social media market generated around 30 billion euros, with growth expected to reach 45.5 billion by 2020138.
Such applications offer interaction through virtual social networks and also confine themselves as promoters of freedom of expression by enabling social interactions among several individuals in an efficient way and without the need for face-to-face meetings.
For the same reasons, these platforms can in fl uence the behavior of individuals and even the business environment. As a consequence, these agents can even be used in political campaigns, publicity or public policies, with a need to consider the market role played by these agents and attention to the protection of rights in this scenario. Online advertising platforms Since the economy has been digitalized, advertising agents have used specialized platforms to sell advertising space online. In the digital world, all access can be used as a medium for advertising, which is enhanced by the customization of services and products allowed by the web, as treated in the subsection "Data Economy".
The platforms in question enable the reduction of waste of general advertising resources, with greater efficacy in content monetization and allow the generation of considerable revenues even by niches with small groups of consumers. This scenario determines the rapid growth of these platforms, including impacts on the traditional advertising market. Already in 2015, there were predictions that digital advertising revenues would represent $ 170.17 billion or 29.9% of total global revenues in this market139.
Vision

• Recognition of the role of digital platforms for innovation and economic growth in the country, given its diversity of access to content, services and products, reduction of transaction costs and market access by small and medium-sized enterprises.
• Analysis and monitoring of the role of some players in the platform ecosystem, due to their role as intermediaries of access to information, which has advantages in terms of personalization of services, but risks to rights such as freedom of expression and access to information. • Assessment of the risk of concentration of economic power in the digital platform market, which requires updating and evaluation by regulatory and antitrust authorities.
• Encouragement of the development of national companies operating in the digital platforms markets, seeking to increase legal certainty and the appropriation of exploitation profits from these markets.
Strategic Actions
• Map the regulatory framework on the digital environment with a view to updating it, in order to encourage investments and innovation, prevent abuse of market power and enable the informational

autonomy of consumers, taking into account the specificities of online markets.
• Encourage respect for fundamental rights by digital platforms, including the operation of algorithms for automated decision making.
• Encourage digital technology companies to adopt high standards of transparency in relation to the criteria and assumptions embedded in their algorithms, in order to maximize access to user information, respecting technical limits and industrial secrecy.
• Improve the competitive conditions between online platforms and intermediaries that offer innovative services to online consumers, identifying mechanisms that can mitigate network and lock-in effects resulting from the scale of digital platforms.

E-Commerce Platforms

One of the main drivers of the digital economy is e-commerce facilitated and driven by digital platforms that enable the transaction of goods and services.

Diagnosis

E-commerce platform revenue worldwide has expanded rapidly. It is estimated that total traditional retail sales in 2016 were about $ 22 trillion, and the total value of e-commerce sales reached $ 1.9 trillion, up 23% over 2016.140

In the 2016 report of the B2C E-Commerce Index, published annually by the United Nations Conference on Trade and Development (UNCTAD) 141, Brazil ranked 51st, compared to 47th in the previous year. The index considers the percentage of Internet users in a given country, the number of secure servers, the diffusion of the credit card between the population and the Postal Confidence Index of the World Postal Union.

The country ranks 10th in terms of e-commerce market size142. Transactions via e-commerce reached R $ 44.4 billion in 2016, with nominal growth of 7.4% in relation to the previous year. The value of the average purchase ticket - the value of each single purchase - reached R $ 418.00, an increase of 8% over 2015143, driven by sales of categories of higher value-added products.

The number of Brazilian online consumers in 2016 increased 22% compared to 2015, reaching 48 million. Of these, 21.2 million spent $ 2.4 billion on international websites, with an average ticket of $ 35.69 per purchase144. As for the purchase method, 21.5% of online transactions were made via mobile devices. In terms of financial volume, more than 50% of the value is spent on home appliances, electronics and cell phones.

In this scenario, the size of the domestic market, the high degree of sophistication of electronic payment services, the existence of modern digital e-commerce platforms prepared for scale demands, and the existence of sophisticated logistics services in large centers. In Brazil and abroad, common issues persist in the practice of electronic commerce, such as transaction security, protection of purchase, sale and service contracts, and dispute settlement mechanisms, with the protection of consumer rights, without prejudice to free enterprise and competition for undertakings.

National e-commerce platforms are focused on the domestic market. Despite the large size of the Brazilian market, which attracts the attention of international players, the participation of national companies in the international arena is still limited due to the lack of focus in global markets. The participation of Brazilian companies in international e-commerce is still far below their potential, a situation clearly reflected in the trade balance data in the sector: while the value of purchases of Brazilians abroad reaches R $ 2.4 billion / year, Brazil sells only R $ 1 billion per year.

However, selling to the international market can have positive effects, such as increasing the number of customers (reducing risks and increasing the merchant's financial independence), reducing the effects of seasonal purchases, encouraging the improvement of products or services offered, and the reduction of the costs of the merchandise or service.
There are cases in which international e-commerce platforms prevent Brazilian companies from using them for sales abroad, while allowing foreign companies to use them for sales in Brazil. This lack of reciprocity shows that there is a need to assess the regulatory environment with attention to international platforms.
View
The following points should be improved for the development of Electronic Commerce:
• Strengthening of the international performance of Brazilian e-commerce platforms, in line with the e-Xport Brazil Program initiative, as detailed in the International Dimension axis
• Training of managers of small and medium-sized enterprises (SMEs) for the digital world.
• Facilitating access to credit by companies, in particular smaller ones aimed at e-commerce.
• Simplification and digitization of physical and legal systems.
• Creation of an internationalization culture in companies through the digital environment.
• Offering training and information to the online exporter.
Strategic Actions

• Promote actions such as the creation of logistical programs and services and access to specific financing funds, with a view to encouraging Small and Medium Enterprises (SMEs) focused on e-commerce.
• Promote the integration of collection processes and ancillary operations in parallel with the procedures of export shipment via e-commerce, automated online and ofine, including as many logistic processes as the tributaries.
• Encourage the adoption of alternative resolution mechanisms and friendly solution of con fl icts in e-commerce.
• Include provisions regarding the international performance of e-commerce platforms in the new multilateral and bilateral trade agreements being negotiated by Brazil.
• Support the implementation of mechanisms that increase the security of online purchases.
• Support development initiatives and the use of digital means of payment.
Indicators
• B2C E-commerce Index, published annually by the United Nations Conference on Trade and Development (UNCTAD).
• Indicators of the Easy Export Program (Post Office)
• Increase in sales of SMEs that already export (SISCOMEX)
• Increase in the number of exporting SMEs (SISCOMEX)
Platforms of Creative Economy
The creative economy was the sector that received the first and most significant impact of digital platforms. Of all the value chains involved in digital transformation, the music and audiovisual chains were the first to face rapid and radical changes in the way music and audiovisual come to the public. If, until a few years ago, the distribution went mainly through the sale of physical copies of works, involving aspects related to the making of copies, storage, distribution and allocation of sales space in physical stores, today the elements of this process are in advanced phase of replacement by the technologies of streaming, with the spread of the smartphones and the access to broadband. The control of national

musicians and artists over the use of their works has become increasingly diffused and weakened. The impacts are considerable throughout the economic sector related to the creative economy, with new challenges for the regulation of the music and audiovisual sector.

Diagnosis

In the new environment marked by digitalisation and digital commerce, digital transformation has a major impact on the production, distribution and consumption of cultural goods and services, with changes in existing business models, the emergence of new businesses and the modification of production chains. with the emergence of new players.

Music

Brazil is currently the eleventh largest music market in the world146, and a source of creativity of great renown in international music. The transition to streaming technology, however, has shown a decrease in income generated by the use of musical works. The reduction of royalties to artists on the new platforms, compared to the averages prevailing until recently, is one of the most visible impacts of technological advances and the new way of enjoying music.147

This stems mainly from the phenomenon known as value gap, in which the increase in music consumption does not lead to a proportional increase in the revenues produced. Between 2014 and 2015, the number of songs accessed increased by 132%, while the revenue generated by copyright holders grew by only 11%.

According to the International Federation of the Phonographic Industry (IFPI) "Global Music Report 2017", today there are more than 100 million users of paid subscription music streaming services. While the sale of physical formats continues to fall, with a 7.6% reduction in 2016 compared to 2015, revenues generated by digital increased by 17.7%, reaching US $ 7.8 billion and the revenues generated by streaming increased more than 60%. For the first time, revenues from digital services exceeded 50% of the total revenue of the music industry.

According to the same report, in Brazil, the recorded music market fell by 2.6% in 2016, compared to 2015, affected mainly by the drop in sales of music CDs and DVDs. On the other hand, digital sales increased by 23%, with the streaming segment increasing by 52.4%. Following the worldwide trend, the revenues derived from digital reached 49% of the total.

As far as copyright protection is concerned, there are records that artists and composers around the world are receiving low payments from digital platforms, especially those using streaming technology. The issue of transparency and ease of access and understanding of the rules used by the platforms is raised, which generates the need for intermediaries to negotiate and understand payment rules150.

Although the Brazilian government has recently regulated some aspects of the legislation applicable to uses by platforms151, the transnational character of these services imposes a discussion of the topic at the international level. To this end, Brazil, together with other Latin American countries, presented a document for discussion at the World Intellectual Property Organization (WIPO) in 2016, which seeks to discuss this and other aspects related to the use of musical works in the digital environment.152

Audio-visual

According to a study prepared by the National Cinema Agency (ANCINE), the participation of the audiovisual sector in the Brazilian economy increased by 66% between 2007 and 2013 (from 0.38% to 0.54% of GDP), reaching R $ 24, 5 billion in 2014. Of note is the Paga TV segment, which, boosted by the regulatory effects of Law No. 12,485 / 2011, increased its share of the value added by the audiovisual sector by 21.4% between 2007 and 2014153.

Content transmission services in the VOD services 154 may be divided into 1) those offered on the subscriber TV networks in the programming mode; and 2) services known as over the top (OTT), based on platforms that use the broadband structure to provide services to the end consumer.
The proportion of people who access video on demand via OTT platforms at least once a day has grown from 30% to more than 50% among broadband users between 2010 and 2015. The average weekly In Brazil, penetration of these services would be estimated in 49% of Internet users, similar to the US and higher than in countries like Canada and Mexico.155
Traditional pay-TV operators strive to extend their services by creating alternatives to OTT services by adding value and access to online content at no additional cost to subscribers of the respective channels. But at the same time, traditional pay-TV programmers have also started to independently exploit their own OTT services, constituting themselves as streaming platforms.
A joint study by ANCINE and Agência Nacional de Telecomunicações (ANATEL) in March 2016156 found that streaming platforms offer services aimed at a niche market, limiting themselves to offering content that competes effectively with the premium packages of series and episodes of programmers, at lower prices. In addition, these services rely on quality broadband, which has not yet reached the whole country.

Nevertheless, the disruptive impact of audiovisual streaming platforms can not be denied. The worldwide audiovisual market is one of the most regulated in its various aspects, encompassing content, financing, promotion and exhibition. Regulation does not yet reach the new digital business models: a regulatory notice157 of December 2016 from ANCINE indicated that the current legislation for audiovisual activity does not apply to streaming platforms. In this way, the attention of the State - as in other countries - is relevant, in order to ensure a balanced competitive and regulatory environment, which strengthens the growth of the sector, while inducing the transformations resulting from it not to lose in view of values such as freedom of expression, the promotion of Brazilian culture and the protection of children and adolescents.
View
Music
• International action to create an environment conducive to the formulation of international rules capable of providing greater transparency regarding the use of music in streaming services and digital platforms.
• Modernization of copyright protection mechanisms on digital platforms.
Audio-visual
• Evaluate the need for sector regulation for the video on-demand (VOD) market, covering the disciplining of financing conditions and the exhibition of Brazilian audiovisual works on the new platforms.
Strategic Actions
• Expand the diversity in the offer of audiovisual content to Brazilian consumers.
• Promote the competitive balance between the economic agents that work in the various segments of the provision of audiovisual and music services in the digital environment.
• Work with international organizations to promote multilateral rules on the transparency and remuneration of copyright holders on digital platforms.

Indicators
• Music: Annual data collection for streaming (ECAD - ABPD / IFPI).
• Audiovisual: ANCINE / Condecine data.
Digital Entrepreneurship
Diagnosis

The changes brought about by the digital age have significantly altered the way wealth is generated in economies. The UN158 investment report reveals that, between 2010 and 2015, technology-based companies' assets grew by 11%, while that of traditional firms grew by 1%. In the same way, it can be observed that the gap between companies able to develop new technologies and traditional companies has increased profoundly. In this context, it is reasonable to infer that the value-adding capacity of economies seems to be increasingly linked to the competence to develop intangible capital-intensive goods and services, mainly from digital technologies.
Another transformation brought about by the digital economy concerns changes in employment and work relations. The tendency of segregation of activities into automated tasks and the need for greater aggregation of value to human activities lead to a scenario where the worker of the future should be responsible for managing risks, strategy and operations of their activities. The "employer-employee" vertical line of command tends to be replaced by a range of horizontal relationships in which more and more people will be more autonomous in work and value production. In this scenario, noteworthy are the nascent companies of technology base, which act in the provision of services of high added value, usually denominated technological startups. These are more agile economic organizations, which take ownership more rapidly of new ways of working and producing, responsible for the insertion of dynamism and innovation in the various economic segments. Startups have flourished and competed in the most different branches of activity, overcoming barriers to entry even in oligopolized sectors. All this is an indication that the advance of digital technologies has promoted new ways of producing and relating economically, valuing self-employment and entrepreneurship, indicating the need for changes in the culture of employees and entrepreneurs.
Contrary to the trends observed in other sectors of the national economy, the Brazilian information technology industry has been growing in recent years. According to some statistical bases, the Brazilian GDP decreased by 3.8% between 2014 and 2015159, while the national "tech" industry grew 20% 160. In Latin America, venture capital investments grow at a significant pace, corresponding to US $ 594 million in 2015, an increase of 53% over that of 2012. Even with the economic stagnation observed in 2015, accelerators , networks of investment. There are successful national initiatives to support entrepreneurship. Some successful experiences that have been developed by federal government agencies, such as the Brazilian Inovative Program169, the Startup Brazil Program, the National Support Program for Business Incubators and Technology Parks - PNI170, can be pointed out in an exemplary way. and the Startup Industry Connection Program171.
Such programs generally serve innovative businesses from all sectors (eg ICT, industry, services and agribusiness) and from anywhere in Brazil, helping start-up entrepreneurs turn promising technologies into fast-growing enterprises and integrate them into the value chain of large companies.
>>>> The Digital Games

The gaming market handled $ 1.27 billion in 2016 in Brazil, putting the country in 12th place in the world. However, the majority of Brazilian producers - 74.40% - have annual revenues of up to R $ 240,000; 21.60%, between R $ 240 thousand and R $ 2.4 million, and the remaining 4%, between R $ 2.4

million and R $ 16 million. The added billings represent a very small share of revenue from the global gaming market. The Brazilian gaming industry is composed of young and small companies, which are largely born internationalized. It is estimated that the sector has doubled in size since the Census in 2014, when 133 companies were mapped. Most entrepreneurs create games for mobile platforms (80%) and web (63%), with entertainment games predominating (97%). Half of the companies also dedicate themselves to professional games. The distribution is carried out by application platforms (67%), digital download (39%), own sites (38%) and social networks (35%). Financing is done through own resources (64%), via incubators (26%) and through non-reimbursable resources (18%), with emphasis on the role of the environment and the company / university relationship.

Data on the global gaming industry show that Brazil participates significantly in the economic circuit, without necessarily creating virtuous cycles of supply and demand within the national territory. The Brazilian gaming industry is still at an early stage of development and needs to consolidate, with expansion of the sector and greater profssionalization of businesses and entrepreneurs. >>>>>

However, the country presents some important obstacles to the full flourishing of internationally-based digital entrepreneurship, among which we can highlight: (i) scarcity of programmers and skilled labor, with a deficit of 92,000 professionals172; (ii) lack of stimulus to enterprising culture among students; (iii) long time and bureaucratic complexity to open and close companies; (iv) labor legislation that does not allow the remuneration structures normally used by international startups; and (v) high financial, time and human resources costs to pay taxes.

An input of central importance to nascent companies is human capital, since it is not possible to develop intangible capital intensive products without a workforce with appropriate skills. In the short term, one of the solutions to this problem may be the simplification and facilitation of procedures for the recruitment of foreign professionals, resulting from the new Migration Law173. In the medium term, the expansion of the training of technology-based professionals and multidisciplinary education should seek to meet the needs of the market, as already explained in the Education and Training axis.

One of the main challenges to the promotion of digital entrepreneurship is the increase in the offer of venture capital, an essential pillar to leverage the growth of startups. In order to do so, it is also necessary to stimulate the offer of financing in the initial stages of technology-based companies, known as early stages, including the so-called "death valley", in order to provide easy and secure access to subsidies and subsidies aimed at digital entrepreneurship and risk investment. As an example, it is possible to mention the co-investment fund launched in November 2017 by the BNDES, where funds from angel investors will be complemented by funds from the fund, which will allow the expansion of resources for investment in startups.

Another major challenge facing startups is globalized competition. The internet has massified the entry of services provided by foreign companies as well as accelerated the emergence of competitors for new products launched. Thus, actions aimed at the internationalization of Brazilian startups are also necessary for the full development of digital entrepreneurship in the country. As an example, it is possible to mention the government program StartOut Brazil that aims at the international insertion of Brazilian startups. In that sense, it is essential to encourage companies to have a global mindset from the outset. Conditions should be created so that startups can be competitive internationally, including a review of the obligations to which these companies are subject, notably those which imply cost increases.

Government support can also be an important catalyst for the entrepreneurial environment. As they mature, government programs require greater coordination and articulation among themselves, in

order to optimize the allocation of resources and the management of public instruments capable of facilitating the various stages of the life cycle and the funding of a startup. This same effort seeks to better identify and continually improve the respective roles of the public sector, private agents, academic institutions, and civil society, which jointly respond to the flourishing of the national startup ecosystem.

The difficulty of contracting startups by governments is a finding that is repeated in several countries. The more rigid rules for hiring with the Public Administration, such as demonstration of previous experience and evidence of financial sustainability, sometimes contrast with the way startups operate. There is potential in the businesses offered by these companies, which can present innovative solutions to address issues of public interest. Australia, the United States, India, the United Kingdom, and other countries have considered this issue, exploring ways to facilitate and facilitate the contracting of the state with these emerging companies.174

It seems appropriate for Brazil to undertake similar assessments. An innovative public policy proposal to seize opportunities created by the digital economy is the provision of public services based on solutions from startups with low implementation costs. Solutions created from open government databases can be good public policy alternatives focused on improving public services to citizens.

>>>> Fintechs - Digital technologies fnanceiras

In 2016, the Central Bank of Brazil (BCB) created an Interdepartmental Working Group with the objective of monitoring digital technological innovations and their impacts on the financial and payment systems. One of the digital technologies tracked is distributed registration or "blockchain" (also known as "Distributed Ledger Technology" - DLT). In 2017, public consultations were held on these issues. The regulatory options adopted will define the future of the development of new digital technologies applied to the financial sector. Regulation is becoming increasingly innovative, providing room for innovative solutions, while at the same time preserving legal certainty in the markets.

The benefits of fntechs can be to provide a more resilient financial infrastructure, faster and more effective financial settlement, as well as new ways of coding, sharing and analyzing financial data. For the financial sector, the benefits would be shorter and faster transaction chains, greater capital effciency, and greater operational resilience. For consumers, they would have greater choice, better targeted services, more competitive prices.

For society as a whole, fntechs could offer a more inclusive financial system, disaggregating banking activities into their main functions, promoting better risk sharing and capital allocation. Fntechs can also perform a better credit selection, improve risk assessment, credit allocation and the efficiency of capital employed in financial activity >>>>>

Vision

There are initiatives that can be expanded or strengthened to make the country an environment more friendly to digital entrepreneurship. Such initiatives include incentives for business modeling and ideation, entrepreneurial training, use of physical coworking spaces, and low-cost networking for startups,

acceleration and incubation programs, fundraising and insertion into the ecosystem, as well as initiatives for initial investment, mentoring and connection to the market.

In order to facilitate start-up financing, it is necessary to work on the reformulation of legal and tax mechanisms in order to reduce costs and investment risks associated with bureaucratic procedures and legal certainty. It is also necessary to facilitate more complex forms of capital composition, expanding the mechanisms available for investment in startups.

Another aspect of great importance for entrepreneurship is the development of a entrepreneurial culture that facilitates the business life cycle. Thus, it is necessary to strengthen actions aiming at the change of the culture to environments that tolerate the error; the modernization of corporate forms; the simplification of the rules for opening and closing a business; reducing bureaucracy to increase competitiveness; the simplification of licensing; and the structuring of a regulatory environment that does not impede innovative business models.
It is necessary to aim for a higher Brazilian position in the international indices of entrepreneurship, especially in digital entrepreneurship, in order to insert the country into the global investment chain.

G. Digital Transformation: Citizenship and Government

Make government more dynamic, closer to the population and more efficient to solve problems and facilitate the life of the citizen.
The Brazilian State plays a fundamental role in the digital transformation of the economy and society, especially as an agent of its own digital transformation. The digitization of public services and the government as a whole is important to increase not only the level of efficiency of government activity, in terms of costs or rationalization, but also the effectiveness in relation to increasing social participation or citizen satisfaction , mainly aimed at improving the provision of services to the population. There are areas in which the State plays a major role, such as education and health, within the framework of the Federative Pact.
Because it is the entity that organizes and re fl ects society as a whole, the State is the focus of great aspirations and expectations, which are increasing due to the speed of current social, economic and technological transformations. Faced with these rapid changes, the state can not remain indifferent. Digital technologies play a double role in relation to the state: while they enhance efficiency gains and new and better services, they threaten the State's capacity for social coordination if it does not follow the social demands that are addressed to it.
There are at least three broad guidelines for public policies in the area of citizenship and digital government. Digital technology should be used to i) increase transparency and social control of state activities, ii) broaden social participation in the formulation of public policies, and iii) provide more and better digital public services.
In formulating and implementing structured actions in these three broad lines, it is expected that the government can meet expectations regarding its performance, preserving and strengthening its role as a coordinating agent of society and the transformations that it must undergo.
Thus, it is important to deepen the efforts already underway to use ICTs intensively, in order to redesign state structures, their processes and procedures, and to increase the relationship with other social actors, in order to make public institutions more agile and in tune with the needs and desires of society. Transparency and data provision should be ensured, better digital channels for interaction and collaboration between State and society should be established, more modern and speedy models for the provision of public services, closer to the citizen and providing more comfort, convenience and convenience.
The application of ICT in the public sector must incorporate a new paradigm. The introduction of technologies for the punctual improvement of processes and services is no longer enough: it is necessary to structure a digital ecosystem that simplifies and facilitates interactions between the State and other social actors. The central foundation of the Digital Government is the generation of public value for society through the use of information and communication technologies. In other words, it is a

question of applying the transforming potential of ICTs to generate benefits to society, such as:
• goods or services best suited to citizens' needs;
• simplification of access to services provided to society;

• provision of public services that meet the citizens' wishes for justice, equity, efficacy and effectiveness; distribution of public benefits in an efficient and fair manner;
• generation of value from open government data.
The State must be conceived as an entity inserted in the digital environment, in which public policies are designed as digital solutions. It is necessary to move away from the mere consumption of technologies for immersion in the digital environment as a way to manage, provide services and improve the exercise of citizenship. The leap from "e-government" to the Digital Government should be made.
Diagnosis
In 2016, Brazil ranked 51st among 193 countries in the United Nations Electronic Government Development Index (UNE-Gov) 175. In relation to 2010, the country has climbed ten positions, indicating that there have been changes in the policies for digitization, despite the need for advances: Brazil scores behind other American countries such as the United States (12th place), Canada (14th), Uruguay), Argentina (41st) and Chile (42nd).
The expectation of expanding online government services is growing. According to data from Cetic. There are 107.9 million Internet users in Brazil, of which 61% (approximately 65.8 million people) sought government information or conduct public services online in 2016. The main areas of public services sought were work and pensions (28 (24%), personal documents (21%), health (16%), police and security (10%) and transport (10%). These data demonstrate that government demand for digital services is quite significant.
However, although the number of Brazilians accessing the Internet has increased substantially in recent years, the proportion of users who make effective use of online government services remains constant. This indicates that it is necessary to expand the supply, efficiency and effectiveness of these services so that citizens can request, follow up and complete demands without the need to travel to government agencies or service stations. This perspective corroborates the aspects mentioned in the Infrastructure Axis related to the expansion of population access to telecommunication networks and devices. The main advantages of digitizing the processes and services provided by the government may include:
• Meeting growing social demand: citizens are increasingly accustomed to the experience and agility of social networks and privately provided digital services in various industries. The population, especially the younger groups, has become less tolerant of flas and long "paperwork" procedures.
• Economics: Online transactions tend to be much more economical for the state and for the citizen, both as a natural person and as a legal entity. The economy is not only in time and money, but also in labor, business processes and even rental costs for personal service areas and storage of paper documents.
• Integration and convergence: digital interactions allow greater centralization of services and, therefore, less government fragmentation in relations with citizens. The convergence of services in less numerous and more efficient contacts brings greater comfort and agility to the citizen.
• Security and privacy: Digital government services bring greater confidence in the protection of personal data.
• Transparency and social control: digital processes allow a more transparent and meticulous follow-up of the service. They also enable response channels, satisfaction analysis, and better metrics for management.

• Quality of services: digitization enables standardization of service and is a relevant factor for government trust

An important incentive for the digitization of public services refers to the financial dimension. The cost of online service is usually substantially lower compared to face-to-face service, representing enormous savings to public power. According to the international benchmark (see section 12 below), the cost of online service can reach 2.73% of the cost of face-to-face service. Estimate of the Ministry of Planning, Development and Management points out that the face-to-face service has an average cost of R $ 43.68, while online service can reach R $ 1.20: that is, a savings of more than 97% in resources by transaction.

According to this estimate, the continuous digitalization of citizen service can represent an economy for the Brazilian government in the order of R $ 663 million per year, and R $ 5.6 billion per year for society as a whole, reaching a total economy of R $ 6.3 billion per year. A study by the Government of the State of Minas Gerais evaluated the transactional costs of three state service channels: online (www.mg.gov.br); (Lig Minas 155) and self-service terminals of the service center (Integrated Service Unit - UAI). While the cost per transaction for online service is R $ 0.07, the telephone is R $ 5.72 and the self-service via UAI is R $ 0.35. It is evidence that digital transformation brings savings to the state, as well as benefits to society.

In order to appropriate these benefits at the federal level, the government has implemented several initiatives to achieve greater efficiency and intelligence in public services, both within the administration of public agencies and in services provided to citizens. The most recent of these is the Digital Governance Strategy (EGD) 177, instituted by Decree No. 8,638 in January 2016.

The main objective of the Digital Governance Strategy is to bureaucratize, modernize, strengthen and simplify the relationship between the State and society using digital technologies. Its principles include openness and transparency, prioritization of public services available in digital media, sharing of service capacity, focus on citizen needs, security and privacy, simplicity, participation and social control, government with platform and innovation. The strategy has three axes of action: i) access to information, ii) provision of services and iii) social participation.

The synthetic diagram of EGD is presented in Figure 13 below. The economy of the future is an economy heavily based on the treatment and use of data. And a very relevant part of these data are those held or stored by the government.

In this sense the Ministry of Planning has been structuring three initiatives to improve the use of data held by the government. These are the Federal Government's Data Analysis Platform (GovData), the ConectaGov Interoperability Platform and the Citizen Digital Recognition Platform (Predic).

The GovData (www.planejamento.gov.br/govdata) is a technological platform for analysis, curation, discovery, mining and integration of government data, containing the main bases of the Government in a unique place. It is made up of tools that enable data to be cross-referenced and analysis of strategic information for decision-making, with the identification of frauds or failures in public policies. It also aims to reduce costs and simplify access to government data in an integrated way.

ConectaGov consists of a government data interoperability bus that aims to facilitate the integration and reuse of data for the provision of services to citizens. An example of service moUm very important vehicle of this policy is the Brazilian Open Data Portal (data.gov.br). This policy aims at improving the management and efficiency of public spending, cross-checking, early detection of fraud and improving data analysis and intelligence within the government, as well as enabling new business models from open data of government. Governments at different levels in Brazil still seem to see on the Internet only

one channel for the publication of legislation, standards, contracts, and accountability and transparency data.
However, in order to create economic value based on government data, it is necessary to change the paradigm of how government sees the role of the Internet in relation to itself: not only as a powerful instrument of transparency, participation and social control, but above all as a means to provide better services, even if such services are not provided directly or exclusively by digital technologies. To this end, the data provided by the government must be complete, accessible, machine readable and integrated into permanent dissemination routines, in the most primary format possible. In other words, there must be a public commitment by the government entity to create value from data managed by the public authority.
The Digital Citizenship Platform of the Federal Government aims to broaden and simplify the access of Brazilian citizens to digital public services. As a public policy, it was formalized on December 19, 2016, through Decree No. 8.936. This Decree directs and establishes deadlines for the implementation of the electronic request for public services and the provision of digital public services to citizens, companies and other public entities.
The proposal of the Digital Citizenship Platform of the Federal Government establishes means for an integrated action of the State regarding the availability of information, electronic request and monitoring of public services and direct offer of digital public services. For this, it has as expressed:
i. provide citizens, legal entities and other public entities with the request and monitoring of public services without the need for face-to-face service;
ii. implement and disseminate the use of digital public services to citizens, legal entities and other public entities, including through mobile devices;
iii. provide access to information and direct provision of public services in a single and centralized platform;
iv. simplify requests, provision and monitoring of public services, focusing on the user experience of the service;
v. give transparency to implementation and allow the monitoring and monitoring of public services; and
saw. promote integrated and systemic action among the agencies and entities involved in the provision of public services.
For the fns to which it is proposed, the Digital Citizenship Platform of the Federal Government is composed of five main components:
i. Federal Government Service Portal182;
ii. digital access mechanism of the service user;
iii. tool for requesting and monitoring services;
iv. service evaluation tool by the service user; and
v. performance monitoring panel.
>>>>>> Health and Digitization

In the context of national digital strategies, e-Health strategies have become a priority, given the significant impact and broad benefits gained in several countries. Due to the relevance of the topic, the International Telecommunication Union and the World Health Organization jointly edited the ITU-WHO National eHealth Strategy Toolkit183.
More broadly, "e-Health" represents the context of the practice of health care facilitated and improved by the use of modern Information and Communication Technologies (ICTs) , considering the applications of these technologies in the organization, management and agility of patient care processes,

information sharing, assurance of greater quality and safety of clinical decisions, patient follow-up, public health policies, understanding determinants of citizen well-being, in the detection and control of epidemics, among many other possibilities.
E-Health has been changing the way it organizes and offers health services around the world, and Brazil is no exception. Health activities are closely linked to information and communication and depend on knowledge and technology to enable innovative, effective, effective and efficient mechanisms that broaden the reach and increase the quality, the resolubility and the humanization of the various aspects of health care. It is fundamental to use principles and strategies that allow the integration and interoperability of systems for recording occurrences and diseases related to the health of the citizen throughout life, promoting an effective increase in quality, resolution and humanization in the various aspects of health care. Cheers.
E-Health technologies contribute to streamlining healthcare processes, qualifying health teams, and making the information flow more effective and efficient for decision-making in health, including both clinical decision-making, health surveillance and regulation, and health promotion. management decisions and public policies. ICTs are important mechanisms capable of contributing to the results, costs and fulfillment of health related objectives.
Efficient use of eHealth should include the qualification of human resources, services and information and communication systems, specific technologies, clinical information and interoperability standards, governance, legislation and funding. There is also a need for a broad, high-quality broadband infrastructure to connect healthcare facilities throughout the country, as well as quality mobile broadband infrastructure and applications for mobile devices that enable fast communication between patients, professionals and citizens.
Several initiatives related to e-Health have already been developed in Brazil over the last two decades, some with very positive results. However, only recently has an e-Health Strategy for Brazil been consolidated184, based on the guidelines and principles and experiences of SUS itself and in line with the Digital Governance Strategy.
Vision

In view of the diagnoses presented, E-Digital sets the following objectives for the topic of citizenship and digital government for the next five years:
• Digital Governance
◊ Establishment of digital governance policies with full integration between federal government, states and municipalities.
◊ Establish a system of governance with transversal and continuous processes, with methodological uniformity, aiming at the transformation of the Brazilian State.
• Digital Public Services
◊ Consolidation of the Digital Citizenship Platform185
◊ All services accessible through a centralized channel.
◊ All federal public services providing at least service request or online scheduling.
◊ Evaluation of the provision of services.
◊ Fully operational public service monitoring panel.
◊ Unique authentication system (BrasilCidadão) available to individuals and corporations, aggregating the main levels of security in a tool and in use by most digital services.
◊ Integration of services from the various spheres of government (federal, state and municipal) with a view to unifying citizens' problems186.

• Scanning of Documents and Administrative Processes
◊ Electronic Process System implemented in all the organs and entities of the Federal Public Administration, composing the National Electronic Process - PEN.
◊ Electronic process systems integrated with the BrasilCidadão authentication solution.
• Access to Information

◊ Access to Information Law (Law no. 12,527 / 2011) timely complied with.
◊ Implementation of the Federal Government's Open Data Policy (Decree 8.777 / 16), in cooperation with other organs and entities of the public administration, consolidating the culture of transparency, social control and accountability, research and entrepreneurship, through the provision of sustained public data and reliable, in open formats, free use, with easy access through the Brazilian Open Data Portal (http: // data. gov.br/).
◊ Existence of a public data ecosystem in order to simplify the provision of services to society and improve the management and efficiency of expenditure. This ecosystem should promote data cross-referencing, enhancement of data analysis and intelligence within government, and use of government data as an important asset in the digital economy, stimulating entrepreneurship and new business models that generate value in the digital chain and benefit the citizens.
◊ Participation of all agencies and entities of the Federal Public Administration in the Open Data Policy, according to the commitments presented in the respective Open Data Plans, aligning data supply with the demands of the company's use.
◊ Existence of a digital platform for social participation, as a privileged space for social participation in Brazil, and a dialogue between federal public administration and civil society, with the objective of promoting interaction, dissemination of contents related to public policies of the federal government, for through the broad access of users to communication and interaction tools, discussion forums, chat rooms, videos, maps, participation trails with various consultation mechanisms, among others.
• Integration
◊ Implementation of government data interoperability initiatives and consequent connection between the main government systems, via Conectagov technology solution.
◊ Total exemption of certificates and documents for digital public services already included in government databases.
◊ Expansion of intelligence and cross-referencing of databases, with greater efficacy in detecting and combating fraud

◊ Harmonization and reorganization of citizen data in the main databases, with efficient identification, centralization of data updating in a single channel, and alignment with current legislation.
◊ Improvement of the infrastructure of Federal Public Administration networks and databases through synergy and integration of ICT contracting.
◊ Encourage federal public administration bodies and entities, as well as states and municipalities, to implement and monitor digital governance policies concerning their respective areas, linking initiatives, eliminating bottlenecks and rework, and harmonizing practices and tools.
• Security and Infrastructure
◊ Cloud data storage with respect to security standards.
Segura Safe electronic signature, available to citizens and companies, in their relationship with the Public Power.
Strategic Actions

• Provide at least two thousand different government services in the Federal Government Service Portal.
• Update the Digital Governance Strategy, simplifying its monitoring and evaluation by government institutions and citizens.
• Encourage federal public administration bodies and entities, as well as states and municipalities, to adopt programs for the implementation and monitoring of digital governance policies.
• Implement the waiver of certificates and documents for digital public services that are already listed in the government databases, according to Decree 9,094 / 17.
• Implement a unique citizen authentication system, aggregating key security levels into a single tool.
• Promote the Electronic Process System in all agencies and entities of the Federal Public Administration, composing the National Electronic Process - PEN.
• Consolidate the Open Data Policy of the Federal Government, strengthening the culture of transparency, social control and innovation, and promoting an ecosystem that stimulates new business models for the provision of services.
• Enhance the Federal Public Administration's database and network infrastructure by promoting the migration of the storage model to cloud data, and enhancing database intelligence and cross-database.
• Integrate the existing registers into the Government, through the Predic technological tool - Digital Citizens' Recognition Platform, in order to improve data quality and allow the unambiguous identification of the citizen and the provision of a common, complete and interoperable reference with the main bases of government data.

• Consolidation of the Digital Government Platforms of the Federal Government, like the GovData, Conectagov, Predic and Brasil Cidadão;
• Maintain and improve a digital platform for social participation, as a privileged space for dialogue between the federal public administration and civil society.
Indicators
Some indicators already consolidated in Digital Government are suggested:
• Digital Government Index - EGDI187, of the United Nations. It is intended to adopt the global component as a parameter and special focus in the e-services component.
Strategic Actions
• Provide at least two thousand different government services in the Federal Government Service Portal.
• Update the Digital Governance Strategy, simplifying its monitoring and evaluation by government institutions and citizens.
• Encourage federal public administration bodies and entities, as well as states and municipalities, to adopt programs for the implementation and monitoring of digital governance policies.
• Implement the waiver of certificates and documents for digital public services that are already listed in the government databases, according to Decree 9,094 / 17.
• Implement a unique citizen authentication system, aggregating key security levels into a single tool.
• Promote the Electronic Process System in all agencies and entities of the Federal Public Administration, composing the National Electronic Process - PEN.
• Consolidate the Open Data Policy of the Federal Government, strengthening the culture of transparency, social control and innovation, and promoting an ecosystem that stimulates new business models for the provision of services.
• Enhance the Federal Public Administration's database and network infrastructure by promoting the

migration of the storage model to cloud data, and enhancing database intelligence and cross-database.
• Integrate the existing registers into the Government, through the Predic technological tool - Digital Citizens' Recognition Platform, in order to improve data quality and allow the unambiguous identification of the citizen and the provision of a common, complete and interoperable reference with the main bases of government data.
• Consolidation of the Digital Government Platforms of the Federal Government, like the GovData, Conectagov, Predic and Brasil Cidadão;
• Maintain and improve a digital platform for social participation, as a privileged space for dialogue between the federal public administration and civil society.
Indicators

MEMBERS OF THE WORKING GROUP CREATED BY PORTFOLIO No. 842/2017
MINISTRY OF SCIENCE, TECHNOLOGY, INNOVATIONS AND COMMUNICATIONS

Maximiliano Salvadori Martinhão
Miriam Wimmer
Daniel Brandão Cavalcanti
Artur Coimbra de Oliveira
MINISTRY OF INDUSTRY, FOREIGN TRADE AND SERVICES
About Me
José Henrique Videira Menezes
MINISTRY OF PLANNING, DEVELOPMENT AND MANAGEMENT
Wagner Silva de Araújo
Elise Sueli Pereira Gonçalves
MINISTRY OF FOREIGN AFFAIRS
José Antonio Marcondes de Carvalho
Benedicto Fonseca Filho
MINISTRY OF JUSTICE AND PUBLIC SAFETY
Frederico Fernandes Moesch
Dim Michelle Ferreira Rodrigues
MINISTRY OF CULTURE
Rodolfo T. Tamanaha
Nitai Bezerra da Silva
DEFENSE MINISTRY
Durval Sanches da Silva
Alex Queiroz Pereira
INSTITUTIONAL SECURITY CABINET
José Garcia da Luz
Alcimar Sanches Rangel
NATIONAL TELECOMMUNICATIONS AGENCY
Nilo Pasquali
Karla do Valle Abrahão Cavalcanti

EDITING AND SYSTEMSIZATION QUIPE
Alexandre Lauri Henriksen

Cristiane Vianna Rauen
Daniel Brandão Cavalcanti
Luana Lund Borges de Carvalho
Marcos Toscano Siebra Brito
Miriam Wimmer
Investments
Samuel Barichello Conceição
Department of ICT Sector Policies and Programs
Secretariat of Informatics Policy
Ministry of Science, Technology, Innovation and Communications.