BRAZIL

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Introduction

One of the goals of the RITS Centre for Research, Study and Education (NUPEF) is to help formulate public policy proposals on leveraging information and communications technologies (ICTs) for human development in Brazil. RITS is active in lobbying the federal government on these policies, and has been active in the international scenario as well, as a Southern participant of the World Summit on the Information Society (WSIS), including the Working Group on Internet Governance (WGIG), and, more recently, the Internet Governance Forum (IGF).

This report is an initial effort to highlight several issues involved in the complex Brazilian context. It contains a quick historical overview of recent processes (from the 1990s until today) which led to the current situation in telecommunications, media and internet-related policies. A summarised review of governmental initiatives related to digital inclusion is then offered. The report then tries to establish the current shortcomings in the development of a national ICT policy focused on human development. Finally, it proposes priority objectives for an ICT policy framework.

Country situation

Recent history of infrastructure

Privatisation of the Telebrás system

Brazil has a fairly advanced (but poorly distributed) ICT infrastructure, largely a result of the telecommunications privatisation process begun in 1998. Until privatisation, the sector's authority was centred in the Ministry of Communications,[3] the controlling agency of Telebrás (a state "holding company" for all the telecommunications companies – telephony and data transmission) and of the State Postal Company (EBCT).

In the last years of the Telebrás monopoly, the "holding company" became known not for its formal mission (extending public telecommunications services to all Brazilians), but for its practical activity: repressing demand.

One of the significant changes in the regulatory framework was the creation in October 1997 of the National Telecommunications Agency (ANATEL),[4] the federal telecommunications regulatory body modelled on the Federal Communications Commission (FCC) of the US.

The deterioration of services, especially telephony services, combined with the practical impossibility of improving services through legal action by consumers – there was only one company providing services, and it doubled up as the regulator – favoured pro-privatisation arguments in a context of an immense demand.[5]

ANATEL was established with the mission of enabling a new model for Brazilian telecommunications, starting with the privatisation of the Telebrás system. With privatisation, the main role of ANATEL became that of regulation, concession and supervision of telecommunications services in the country.

The privatisation process took place under the government of Fernando Henrique Cardoso (1995-2003), as part of the neoliberal policy in which the touchstone was the withdrawal of the state from any productive activity that might interest national or international investors. The total estimated value of the privatisation of the sector was USD 19.5 billion. However, payments were made in the local currency, the *real*. Most of these payments were made after a major devaluation of the *real* in relation to the dollar – a gift from the federal government to the companies that were granted licences.

The original declared objective of privatisation was to ensure competition in all markets, but the policy seriously failed on this point. In practice, large consortia acquired Telebrás' existing fixed telephony structures in each of the three regions of coverage and became monopolies in those regions.

The possibility of having to face competition in regional markets (reserved for a limited time), as well as the universal service obligations of the concession contracts, made the dominant companies invest heavily in digital technology and in the construction of their own backbones. While fixed telephony was effectively increased, the goals of universal service embedded in the licence conditions, particularly regarding poor areas, were not reached.

Privatised cellular telephony began with much more competition (cellular telephony companies competing side by side in each region) and services were extended in such a way that Brazil today has 100 million cellular telephones in operation (55% penetration in the total population). However, concession contracts for cellular telephony do not contain universal service clauses – another serious error in the privatisation policy. Today more than 2,400 Brazilian municipalities (43% of the total) have no local cellular telephone service (there are no cellular network radio base stations in these municipalities). This disparity particularly affects the poorer regions in the country (North-East and North), but exists in all Brazilian states. For example, 29% of municipalities in Rio Grande do Sul, one of the most economically advanced states in the country, do not have the service.

Neither did the privatisation policy take into account the global consolidation of telephony operators, together with the rapid rate of technological convergence. There are four major cellular telephone operators in Brazil, and two of them may merge as a result of agreements between their global owners.[6]

Data transmission infrastructure

The development of the Brazilian fibre optic infrastructure began in 1993, with a link between Rio de Janeiro and São Paulo. The Embratel network exceeded 20,000 km of inter-urban fibre circuits by the end

1 <www.nupef.org.br>.

2 With contributions from NUPEF researcher Sonia Aguiar.

3 <www.mc.gov.br>.

4 <www.anatel.gov.br>.

5 In a certain way, this was a repeat of the situation that occurred when telephony was in the hands of foreign operators or small private companies – only on a much larger scale. Some of the arguments that were used for nationalisation from 1962 onwards were now used for the re-privatisation of services.

6 Vivo is owned by Telefónica de España, and Oi by Telemar. Mexican capital controls Claro and the main operator of the country's backbones and satellite services, Embratel. TIM is controlled by Telecom Italia.

of 1998. Today, there are fibre optic networks in the main cities, operated by various private companies, and even by local governments (Niterói, Porto Alegre), as well as fibre circuits between these cities.

All telephone companies build their own fibre networks, and the new regulations allow companies from other sectors, such as electricity providers, to make use of their own infrastructure and build fibre networks too. An example is Eletronet's fibre network, with 16,000 km interconnecting the main cities of eighteen Brazilian states, mounted on electricity transmission pylons. When Eletronet hit financial difficulties, the federal government considered nationalising the company, and using its fibre network to service government needs and possibly for digital inclusion projects. However, this did not happen.

Brazil has various international fibre connections with the US and Europe (and also with Uruguay and Argentina), all operated by companies controlled by foreign capital. The privatisation of telecommunications in Brazil often emphasises a single objective: to get rid of productive, profitable state-owned companies to the detriment of other considerations. As a consequence, the privatisation of Embratel resulted in the sale to foreigners of the main satellite service provider in the country. Even communications services directly related to national security (government data traffic, including that of the armed forces) currently use commercial satellite connections operated by foreign companies. The entire Amazon protection network (known as SIVAM) is interconnected via these commercial circuits. Today, Brazil (in contrast to countries of a similar size, such as Russia and India) does not have a single communications satellite operated by its own department of defence.

Despite having a sophisticated infrastructure with various data transmission backbones and internet exchange/peering points in the main cities, the distribution of PoPs (points-of-presence or points of high-speed direct connection to a backbone) is extremely precarious. Municipalities that have no local cellular telephone service in general also have no local internet access services. The distribution of broadband access (via ADSL, cable TV or digital radio network) reaches a small percentage of urban areas. Even in the two main cities of the country (São Paulo and Rio de Janeiro) there are entire districts – including middle-class districts – with no access to this service.

According to prevailing legislation, recommended by the Brazilian Internet Management Committee (CGI)[7] and regulated by ANATEL, a cable TV licensee or telephone operator that offers ADSL may connect its users to the internet, but access authentication must be done by an internet service provider (ISP). This is a result of legislation adopted in the country that separates the physical and logistical infrastructure (data transmission methods) from the service layers, and prevents monopolies from developing.

In practice, however, with the consolidation of companies and the convergence of technology, this rule has been systematically broken by cable TV operators and companies. Telefônica claims to operate ADSL services in over 900 municipalities in São Paulo, *and* is the owner of the service and content provider Internet Terra Networks; the cable TV quasi-monopoly Net Serviços, belonging to Organizações Globo and Telmex, offers internet services and content via its subsidiary Globo.com. It is not mandatory to take out a contract for connection and services from the same company, but it is obvious that these companies have many advantages when it comes to attracting users towards a single contract that encompasses all services (connection, email, access to information, etc.). This process has led to a consolidation in the provision of services and content, with the rapid disappearance of small-scale service providers.

Brazilian Digital TV System (SBTVD)

Digital TV has been legislated by Decree 4901/03. The objective is to contribute to digital inclusion. However, in the current context it should only be thought of as a complementary, though important, means for digital inclusion: the cost of a set-top box, as well as the subscription to an access network, are major limiting factors for most of the population.

The SBTVD incorporates open standard middleware, developed in Brazil, known as GINGA. This is used in set-top boxes. In June 2006, Brazil officially opted for the Japanese ISDB-T standard[8] – an option viewed by sectors of civil society as being inclined to favour the existing large TV companies, in particular the dominant company (Organizações Globo). Another criticism made by these sectors is that the decision-making process was not pluralistic, and the allocation of the radio frequency spectrum favours concentration of broadcasting in the hands of the current multimedia oligopoly.

However, specialists working in SBTVD development consider this to have been the best choice. The Japanese standard is the only one ready for transmission to portable receivers (such as car receivers) and mobile receivers (such as cellular telephones).

From the time of the establishment of digital TV, broadcasters will have ten years to adapt. During this time, programmes may be transmitted simultaneously via digital and analogue signals. After ten years, however, the concession for the analogue channel will be suspended, and transmission will become exclusively digital.

ICTs for human development – government policies and digital inclusion initiatives

Fund for the Universalisation of Telecommunications Services

After taking three years to be passed by Congress, Law 9998 was approved in August 2000, establishing the Fund for the Universalisation of Telecommunications Services (FUST), regulated by Decree 3624 of October of the same year (Senado Federal, 2000). In summary, the fund is made up of 1% of the gross operating revenue of fixed-line telephone operators (equivalent to approximately USD 400 million annually). Collection began in 2001, and by the beginning of 2007 the FUST had accumulated approximately USD 2.8 billion.

The initial proposal for the use of FUST resources, developed in 2001, stipulated that 45% should be used to connect public schools, 35% to connect health units, and 20% for other purposes. However, regulatory difficulties, and the fact that the contributions are held by the Federal Treasury, have hindered the proper use of the funds up to now.

Even if used, FUST is hostage to regulations that prioritise the acquisition of connectivity services from the telecommunications operators who actually contribute towards the fund.

The GESAC programme

The Electronic Government – Citizens' Support Service (GESAC) Programme was created under the Cardoso government to maintain individual points of access to e-government services via the internet (connected by satellite). Under the Lula[9] government, the programme moved on to connecting schools, telecentres and security services. Today, GESAC has approximately 3,200 PoPs (VSAT stations with re-

7 <www.cgi.br>.

8 See: *Decreto 5.820*, 29 June 2006. Available from: <www.indecs.org.br/index.php?option=com_content&task=view&id=85&Itemid=46>.

9 President Luiz Inácio Lula da Silva.

ception bandwidth of up to 2 mbps), active in approximately 37% of Brazilian municipalities in all states. Approximately 400 PoPs connect Ministry of Defence services.

GESAC's choice of locations for the installation of PoPs must comply with the following criteria: localities with a low Municipal Human Development Index (MHDI); localities where telecommunications networks do not offer internet access; and communities that have already developed cultural community activities that are supported (or could be supported) by ICTs. However, the MHDI criterion was not applied in a systematic manner.

Public primary and secondary schools – including those in indigenous villages and rural settlements – make up 72% of the 3,240 PoPs installed as of September 2006. This totals 2,355 schools, of which 1,800 were selected by the Ministry of Education on the condition that they already had a computer laboratory with at least five computers in a local network, but without internet access. The other 555 schools were selected by the Ministry of Communications, the Ministry of Social Development[10] and the Fight Against Hunger and state education secretariats. However, the criteria for choosing PoPs in education were also partly spoilt by political patronage.

Twelve indigenous communities received PoPs from the programme in September 2006. Only two *quilombola* communities (made up of African descendents from the period of slavery) were beneficiaries: one in São Paulo, and the other in Rio Grande do Norte. Rural and fishing communities were major GESAC beneficiaries, thanks to the organisation of rural workers (e.g. through unions) and small agricultural producers, on the one hand, and on the other, the Maré project of the Special Secretariat of Aquiculture and Fisheries (SEAP).

GESAC has been used for voice over internet protocol (VoIP) telephony in an attempt to provide telecommunications services to poorer areas, which the fixed telephone companies should serve as part of their licensing conditions. At the beginning of November 2006, the programme announced that voice transmission via the internet using PoP terminals increased from 2,131 to 66,865 minutes between December 2005 and October 2006, which is more than a thirty-fold increase. However, the service is still limited (at least officially) to a little less than 500 PoPs.

From the perspective of democratisation of broadband access, GESAC has serious limitations. Firstly, it is a relatively expensive broadband technology. Secondly, connections via satellite are more expensive than surface connections and will not be able to beat fibre optic technology, unless there is an enormous leap in on-board energy and digital radio transmission technology. Technically, the fibre technology is "future-proof" – the transmission capacity of already-installed fibre depends only on updating the transceivers at their endpoints. Technological leaps have been promising, multiplying many times over the transmission capacity of recent years (from gigabits per second to terabits per second in a single fibre).

Access to equipment

One computer per student? Brazilian public schools have approximately 33 million children in primary schools and 10 million in secondary schools, in a total of about 160,000 schools. On this scale, it is surprising that the government is considering approving projects such as the One Laptop Per Child (OLPC) project. Without considering all the support costs, as well as those related to increasing the capacity of the network and its adaptation (the project involves connecting computers to the internet), and supposing that the Negroponte[11] "gadget" costs at least USD 100, the gross cost for Brazil would be over USD 3.3 billion. It is clear that this would be an impossible and impractical expense: there are no available budget lines for this, and the same amount of money would make it possible to carry out alternative digital inclusion projects in schools with much wider reach and impact. It is also clear that it does not make sense to implement the programme for only 3-4% of Brazilian children. It is an expensive game for a country that is far from attaining the required digital inclusion levels.

Computers For All:[12] This is a programme of the Presidency of the Republic, together with the Ministry of Development,[13] the Ministry of Science and Technology[14] and the federal data processing company, Serpro. Those who will benefit are low-income families above the poverty line. It consists of subsidising lines of credit for the purchase of computers with a minimum specification, at a value of up to BRL 1,400 (USD 650). Repayments may be made in 24 instalments of BRL 70 (USD 33) each. For computers of up to BRL 2,500 (USD 1,160), there are some tax exemptions. Up to May 2006, the Ministry of Science and Technology registered 23 manufacturing companies interested in selling equipment within the programme. Since its launch, a single company has marketed 77,000 machines as part of the project.

Computer refurbishment: This is a project of the federal government (Ministries of Planning, Education and Labour) that seeks to establish refurbishment centres for second-hand computers donated by public and private entities. The computers will be refurbished by low-income youths who will be trained to do the work. They will then be distributed to telecentres, schools and libraries. The project was inspired by a similar initiative by the Canadian government, which today refurbishes over 100,000 computers a year in 50 centres, supplying 25% of the computer needs in the country's public education network. The first centre in Brazil is a pilot centre, in operation in Porto Alegre since April 2006.

Telecentres and kiosks

Citizens' kiosks:[15] This involves a Ministry of National Integration project to establish access points for e-government services. It started as an experiment in municipal public libraries in poor communities around the country's capital in 2003. By October 2006 the project had already extended to various low Human Development Index (HDI) municipalities of the states of Goiás, Minas Gerais, Mato Grosso do Sul and Mato Grosso.

Digital Station Programme:[16] This is an initiative of the Banco do Brasil Foundation (Fundação Banco do Brasil), with the support of local partners. It seeks to bring computers closer to the lives of students, housewives and workers, "saving time and money, creating new perspectives and improving the quality of life of the population."[17] Since 2004, 166 units have been established throughout Brazil, approximately 90% of them in the north-eastern and central-western states. These have a capacity to serve 500 to 1,000 persons a month.

10 <www.mds.gov.br>.

11 Nicholas Negroponte is founder and chairman of the One Laptop Per Child non-profit association.

12 <www.computadorparatodos.gov.br>.

13 <www.desenvolvimento.gov.br>.

14 <www.mct.gov.br>.

15 <www.integracao.gov.br>.

16 <www.fundacaobancodobrasil.org.br/estacaodigital>.

17 See: *Portal Inclusão Digital*. <www.inclusaodigital.gov.br>.

Information and Business Telecentres:[18] This is a programme of the Ministries of Industry and Trade and Social Development. It involves establishing telecentres focused on the digital inclusion of the small entrepreneur, with the aim of expanding business and work opportunities that will lead to economic growth and employment. The telecentres are established in business associations, mayor's offices and non-governmental organisations (NGOs). Besides facilitating hardware donations to the telecentres, the programme offers content oriented towards entrepreneurs by means of a web portal. However, telecentre hosts must sort out the installation of equipment, as well as the management and administration of the telecentre on their own. The network has 1,616 units installed across all Brazilian states.

Banco do Brasil Telecentres:[19] This is a digital inclusion programme that is part of the corporate social responsibility policy of the Banco do Brasil. The initiative resulted from the modernisation of the bank's technological network. Old equipment was donated to poor communities so that community telecentres could be established. The programme looks to train the telecentre monitors and develop partnerships to support the telecentres. The Banco do Brasil says over 1,600 telecentres and computer rooms have been established (consisting of 17,000 computers and attracting four million users).

Digital Inclusion Telecentres: This is a project that integrates the Petrobras Zero Hunger Programme, developed in partnership with the National Information Technology Institute (ITI) and RITS. To date, the project has established 50 units in low HDI areas. Approximately 1,000 people a day use the telecentres. Among the more than 15,000 persons registered to participate in the project, women are in the majority (55.48%), and 70% of users are under 30 years of age.

Chief of Staff's Office – Casa Brasil:[20] The National Coordination of the Casa Brasil programme was established by presidential decree on 11 March 2005.The programme looks to establish cultural centres in poor communities with facilities for internet use and multimedia production (audio and video). It is being developed with the participation of various ministries, secretariats and federal government companies. In August 2006, 44 units were in operation, serving an average of 50,000 people, and another 89 units were in the implementation phase in low HDI communities in the larger cities of the five regions of Brazil.

Culture Points:[21] This is a project of the Living Culture Programme of the Ministry of Culture, the objective of which is to support local cultural initiatives, called Culture Points, through funding of up to BRL 185,000 (USD 88,500). It has resources for training local agents in the production and exchange of digital multimedia (video, audio, digital photography) with the use of free and open source software (FOSS). The Culture Points are connected to the internet via satellite (GESAC). As of June 2006, 485 Culture Points had been set up by the programme, and another 80 are awaiting approval.

Serpro Citizens Space:[22] This is a digital inclusion programme by Serpro, which aims to support the installation of community telecentres and promote the digital inclusion of communities neighbouring the company's regional offices. The programme also supports the Open School Programme, in partnership with the Ministry of Education.

Technological Vocational Centres (CVTs):[23] This is a project by the Ministry of Science and Technology. CVTs are oriented towards the technological empowerment of the population. They offer training, a location for scientific experimentation, contextual enquiry, and the provision of specialised services, taking into account the vocation of the local region and encouraging the improvement of processes. The project began in 2003 and by the end of 2006 153 CVTs had been created.

Maré Fisheries Telecentres:[24] This is a programme by the Special Secretariat of Aquiculture and Fisheries of the Presidency of the Republic (SEAP). It looks to establish telecentres in fishing communities. The objectives are to offer access to computer resources and the internet; strengthen participative citizenship; and build capacity. By the end of 2006, five telecentres had been established, and another fifteen are under implementation. The Banco do Brasil supplied the computers, and the GESAC programme is providing satellite connections.

Ministry of Communications Telecentres: In another initiative, the federal government decided at the end of 2006 to provide a telecentre to each municipality – a total of 5,400 telecentres. The Ministry of Communications, in partnership with the Ministry of Social Development, carried out a tender process to acquire 54,000 computers (10 per telecentre) and 5,400 servers (one for each telecentre). The purchase also includes printers and UPSs (voltage regulators), as well as televisions, projectors and DVD players for each telecentre.

Community Telecentres in São Paulo: Covering an area of 1,522 km^2, the city of São Paulo is the largest in the country and has almost 11 million inhabitants. The inauguration of the first of the 130 community telecentres in the city's poor areas took place on 18 June 2001, the result of a joint initiative between the city mayor's office, RITS, and local organisations. Using a thin-client architecture (each telecentre has a server and 20 workstations) running GNU/Linux, all of the telecentres represent a major localised national digital inclusion initiative. The majority of them use FOSS exclusively. By the end of the term of Mayor Marta Suplicy in 2004, the telecentres were serving approximately half a million people, and continued to function under the new municipal administration from 2005.

Public schools

Brazil has approximately 160,000 public schools, 16,570 of which are secondary schools. Of the primary schools, 89,000 are in rural areas and 25,000 have no electricity. Table 1 shows the current number of schools with at least one computer, irrespective of its connectivity status. In the short term, the federal government plans to distribute approximately 76,000 computers[25] by mid 2007 to secondary schools – an average of 10 computers per school. This will significantly scale up access in secondary education.

If percentages are low (only 15.64% of public schools have computers), the connectivity situation is much worse: fewer than 6% of public schools have a permanent internet connection, and most of them use GESAC. A study suggests that schools near to the PoPs of the National Network for Education and Research (RNP), which has a high-speed network present in all of the country's major cities,[26] may

18 <www.telecentros.desenvolvimento.gov.br>.

19 <www.bb.com.br/appbb/portal/bb/id/index.jsp>.

20 <www.brasil.gov.br/casabrasil>.

21 <www.cultura.gov.br/programas_e_acoes>.

22 <www.serpro.gov.br/cidadao>.

23 <www.mct.gov.br/index.php/content/view/11471.html>.

24 <tuna.seap.gov.br/seap/telecentro>.

25 In many instances, refurbished computers are used.

26 RNP connects 250 university and research centres.

Table 1: Computers in schools				
Schools	**Total**	**%**	**With at least one computer**	**%**
Primary	143,000	89.6	16,792	11.74
Secondary	16,570	10.4	8,172	49.32
Total	159,570	100.0	24,964	15.64
Source: **Ministry of Education (January 2007)**				

be connected to it via wi-fi (or something similar) at a much lower cost than that of satellite. Schools outside of the large centres will have to wait for the roll-out of the backbones, or rely on connectivity via satellite.

The Ministry of Education expects to equip 12,000 rural schools by 2008 and another 45,000 rural schools by 2011. Only 1.2% of schools have computer laboratories in rural areas.

Community networks

As is the case in various other countries, Brazilian cities are seeking alternatives to solutions offered by the market, so that network resources can be optimised and internet access democratised. Despite the fact that successful projects have been implemented in only a few cities to date, there is much interest on the part of many mayoral offices, and especially local civic entities, in seeking alternatives. Frequently cited examples are the cities of Piraí (in the state of Rio de Janeiro) and Sud Mennucci (in the state of São Paulo), which created their own municipal networks in partnership with the community. These had two central aims: to optimise network resources for the use of the public administration, and to extend the internet to poor communities (through telecentres), schools and public health centres.

Another project still in the pilot phase is the community network of the riverside communities of the Tapajós and Arapiuns Rivers. An initiative of the Health and Happiness Project (PSA) and RITS, the project intends to connect more than 140 communities (each with 50 to 150 families) over a stretch of more than 150 km, using a combination of fibre optic, wireless and satellite connections. Currently, it serves five communities with two GESAC satellite connections and a long-range wi-fi network.

Participation

Government interventions in ICTs for human development in Brazil reveal a common thread: it is rare for civil society to be invited to participate in the formulation of public digital inclusion policies.

On the other hand, despite the federal government having created sectoral committees to handle a common national strategy, this has not been developed, and what is seen is a long list of parallel initiatives by ministries and state enterprises.

Cases in which there has been an opportunity for the effective participation of civic entities (such as the São Paulo Mayor's Office telecentre project, among others) have resulted in successful projects – which should motivate further partnerships between government and civil society. This is not happening, and the signs with regard to the Lula government's second term of office are not encouraging: budgetary allocations that directly relate to digital inclusion programmes were reduced between 2006 and 2007.

Civil society has sought to actively participate in policy proposals. One of the most relevant forums is that of the National Digital Inclusion Workshop, held annually since 2002. The 5th Workshop, held in Porto Alegre, produced a document – The Declaration of Porto Alegre – listing the main points of a national ICT policy for human development (RITS, 2006).

Conclusions

We start with the observation that Brazil is a big country, both geographically (8.5 million square km) and demographically (180 million inhabitants). We also start with the obvious hypothesis that public policy expenditures in leveraging ICTs for human development are not costs, but *essential investments*. We do not need to discuss how important ICT access is for economic and social (and also cultural) development, significantly contributing towards leaps in local development possibilities and participation in the whole national economy.

We also recall that there are many initiatives, originating from governments, NGOs, the private sector, and even from academia, that serve as examples of good practice for a comprehensive strategy. The following may be cited, among others: telecentres in the most needy communities; subsidised connectivity via satellite (GESAC) for schools, public services and telecentres; exemplary municipal digital initiatives (Sud Mennucci, Piraí and others); electrification programmes for rural schools;[27] consolidation of an extensive and advanced national education and research network (RNP); the implementation of a government policy that prioritises open standards and FOSS; e-government actions at federal and state level, including online services, standardisation and system interoperability (e-PING architecture); and a national internet governance system that is transparent and considered worldwide as a point of reference for efficiency and quality.

However, even though various national initiatives in the ICT field are among the best in the world, we are still lacking a unifying strategy that will deepen and democratise the benefits of new technologies. Some points that show the urgent need for a government strategy:

- More than 2,400 municipalities are being ignored by private telecommunications and internet service companies. These municipalities only have fixed telephone services (because universal service obligations demanded it). In these municipalities, with more than 22 million people, and representing over 44% of our 5,562 municipalities, there is no local cellular service, nor local access to the internet. These municipalities are precisely those that most require economic and social support. They are in all states, but especially in the north and north-east, and are condemned by telecommunications operators to eternal disconnection.
- Zero, or very unstable connectivity in nearly all of our rural areas. Whoever lacks the economic resources for a satellite connection is also condemned to eternal disconnection. Satellite connectivity is expensive, and not "future-proof". We know that it is limited and, in the way that it is distributed (point to point), very expensive in relation to the bandwidth offered. At the same time the quality of service is susceptible to bad weather (especially in the Ku band).
- Thousands of districts in larger cities, where there is no broadband service, have also been abandoned by the operators for market reasons. In these districts, like in all other municipalities and in our poorest districts in Brazil, it is essential to establish community internet access centres, as there is no way to connect a local digital inclusion project except via satellite.

27 Using photovoltaic panels.

These districts (or satellite cities) are present in all Brazilian cities, including those that are the most advanced in terms of internet services, like Rio de Janeiro, Brasília and São Paulo.

- Brazil has over 33 million primary school children, and approximately 10 million in secondary schools, in about 160,000 public schools across the country. In nearly all of these schools, there is no internet access (or even the equipment to enable access when it does exist). It is ridiculous, especially for a country with over USD 3 billion accumulated in a universal access fund, to have connectivity in less than 6% of its public schools. At the other extreme, in South Korea over 65% of six-year-old children are on the internet, and practically all public schools have broadband connections.
- Approximately 53% of our families live on less than two minimum wages per month. Over 30% of our families are not in a position to acquire a computer, unless it is at a nominal price, or 100% subsidised. But, even so, the additional expenses (in access costs and power consumption) for a family owning a computer that will inevitably be connected to the internet means that the device can create more problems than solutions for the poorest households.

Topics for a comprehensive strategy

We cannot content ourselves with the limitations of underdeveloped countries. While we have different levels of resources available to us compared to developed countries, our ability to do much better is indisputable. However, our strategic planning, at least in the area of ICTs, appears to be that of an impoverished country; especially when we see instances when the government operates in a closed manner, without dialogue with civil society, and is affected by internal disagreements.

The situation is aggravated by the fact that we have conflicting legal and institutional structures that hinder or impede the investment of public resources into concrete actions – frequently leading to the impossibility of trying to implement public policies without public resources. To give just one example: the FUST is in practice hamstrung by the General Telecommunications Law and other regulations.

A comprehensive and unifying strategy for leveraging ICTs for human development throughout the country must work with a set of central objectives determined by wide consensus. Below, I describe what I consider to be the priority objectives for this strategy.

- *Guarantee that, in each municipality, there is a national high-speed fibre optic PoP, or a direct extension of a PoP, adequate to ensure quality connectivity for the use of multimedia in all areas of the municipality.*

Municipal networks, developed by local initiatives and with the support of a unified national strategy, could offer connectivity to all areas or institutions in the municipality (urban districts, rural areas, health centres, hospitals, schools, telecentres, public libraries, government administration centres, etc.). They could also provide connectivity to individual users and legal entities. In this way, local community networks would be combined with a national high-speed network guaranteeing the best benefit/cost for each user, and uniform connection quality throughout the country.

To do this a national implementation programme that optimises the distribution of PoPs is essential. In many municipalities today there is still no justification for a fibre extension with high-speed equipment. However, this technical project would define PoPs that are appropriately located, from which nearby municipalities will be covered by one or more high-speed digital radio link (200 mbps can be achieved in each link in current commercial digital radio standards) or even local fibre branches at initially lower speeds.

It is crucial to guarantee enough bandwidth for the use of various internet services, including the effective use of multimedia, in all municipalities, and not to simply adopt a standard today that will be obsolete tomorrow. A national "future-proof" programme is essential, and not only a "national broadband plan" whose range, efficacy and longevity are in doubt.

- *Prioritise support on the ground (at municipal level) for comprehensive digital inclusion initiatives that integrate separate initiatives and local needs in a common network, optimising connectivity costs and improving the quality of service of access.*

The national strategy will support the development of *digital municipalities* – comprehensive community networks connecting public services, schools, telecentres and health centres, in urban and rural areas. The networks will also be available for private use. These initiatives, benefiting from thousands of similar, already well-known experiences in the country and in the world, not only reduce connectivity and communication costs, but greatly improve the quality of service.

Owing to the major asymmetry in the distribution of connectivity resources in the country, special priority must be guaranteed in the national strategy to the more than 2,400 municipalities that currently have no access to a local backbone PoP.

Ideally, the strategic result of this plan would see the high-speed municipal networks forming the backbone of the country's internet infrastructure.

- *Guarantee at least shared access (via local community telecentre initiatives supported by a national policy) in all lower-resourced urban areas. Seek ways of extending the reach of community networks to the rural population.*

If this objective is achieved it could mean the installation of approximately 10,000 community telecentres, in partnership with local governments and communities. It should be noted that Bolivia's current digital inclusion plan stipulates the establishment of 2,000 telecentres for a population of around 11 million. If this scale was repeated in Brazil, we would be talking about more than 30,000 telecentres. This document reveals many government community telecentre initiatives – all of them operating in parallel, without a common strategy.

- *Avoid, with appropriate legislation, telecommunications cartels that satisfy only the market.*

Telecommunications cartels are today fighting for the market of those who are already connected and able to pay relatively high monthly fees (much more expensive than in Europe or the US) in order to have access to broadband connections.

In this scenario, all other users will be condemned by the market to eternal disconnection, and the country condemned to the accelerated deepening of the "digital divide". There should be a guarantee that local or regional entrepreneurs offer connectivity proposals that support public roll-out policies (such as a municipal network).

- *Guarantee that in the shortest time possible, all public schools will be well (and permanently!) connected to the internet.*

This was one of the central priorities for FUST resources. But the policy ended up not being implemented. It is not enough to define a national plan of democratising high-speed access and the installation of community networks. It is also necessary to guarantee that Brazilian public schools will have access to the internet.

Our distance from countries such as South Korea is massive, and is rapidly increasing – but it is also increasing in relation to less developed countries.

- *Guarantee connectivity to all public health, security and municipal administration services.*

This was another of the central priorities for FUST resources that ended up being abandoned. As in the case of the schools, these services cannot expect the ideal network to arrive on their doorstep. Means of connecting them (even if only in a limited way) have to be found, until a more efficient alternative arrives.

- *Ensure the use of open systems and standards, in order to reduce the dependency on proprietary systems and software or software with interoperability problems.*

Brazil is already globally recognised as one of the countries to have made a widespread attempt to adopt FOSS and open standards in the public federal sphere. The reasons for this policy are valid for all spheres of government, and a national ICT policy could not ignore this priority. However, the initiative still requires more careful coordination, and there are still federal e-government services operating with proprietary systems in cases where a FOSS alternative clearly exists, of the same or better quality.

- *Expand e-government systems and services to all instances of public administration, taking into account the "digital divide", interoperability criteria, open standards, transparency and efficiency.*

The federal government and some states (as well as some municipalities) have been recognised as examples of this policy. It is important that this practice, combined with the effective universalisation of internet access, be expanded with quality and efficiency.

- *Establish a national empowerment strategy so that, on all levels, individuals and institutions with access can use it efficiently.*

One of the mistakes frequently made in social and educational ICT programmes in the country is to start (and often end) a project with the acquisition and donation of equipment. Apart from access to connectivity and equipment, it is essential that there be a dissemination of skills to make better use of this access.

- *Promote changes to FUST laws and regulations in the short term, and create a multi-stakeholder governance mechanism for the fund.*

It is indisputable that Brazil, even taking its size into account, has already accumulated an exceptional amount of financial resources to promote and leverage ICTs for human development. However, legal support and a government attitude that relegates the relevance of digital inclusion to second place have hindered the use of these resources. It is essential that the decision-making process for the use of the fund be pluralistic, transparent and democratic. It is also fundamental that priority in the use of these resources be guaranteed to innovative projects originating from communities, or with community participation. The national ICT strategy must, finally, combine optimal use of fund resources with other resource sources. ■

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