Brazil, State of São Paulo

CENTER OF EXCELLENCE FOR TECHNOLOGY AND INNOVATION IN FAVOR OF PERSONS WITH DISABILITIES (CETI-D)

CONCEPT PAPER AND SCHEMATIC PROPOSAL FOR THE ESTABLISHMENT AND OPERATION OF CETI-D

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PART 1

I. DISABILITY DEFINITIONS

A. From a medical to a social model

I.1 The "medical model of disability" – the model most widely understood and interpreted today – considers disability "a physical, mental, or psychological condition that limits a person's activities," linked to various medical conditions and viewed as a problem residing within the affected individual. Considering this model of disability, along with statistics reported in both developed and developing countries, the World Bank in its 2007 report "Measuring Disability Prevalence" estimated the number of PwD (PwD) to be between 10-12% of the global population.

I.2 While the medical model is the construct for disabilities that we are historically most accustomed to using, over time the international community has largely come to recognize that the medical model is not a sufficiently effective or empowering conceptual framework for promoting the full inclusion of PwD in society, as pointed out in an earlier World Bank report entitled "Making Inclusion Operational: Legal and Institutional Resources for World Bank Staff on the Inclusion of Disability Issues in Investment Projects". As a result the paradigm of disabilities is expanding to include both the medical model as well as the more recently defined "social model of disability."

I.3 Unlike the medical model of disability, the social model of disability views disability as "arising from the interaction of a person's functional status with the physical, cultural, and policy environments," an approach which closely follows the work done by the UN Washington Group on Disability Statistics (more information is available at: http://www.cdc.gov/nchs/citygroup.htm).

I.4 According to the social model, disability is the outcome of the interaction of a person with his or her environment and thus is neither person- nor environment-specific. Within the social model, then, a disability results when a person attempts to communicate, yet does not understand or speak the national or local language. Similarly, a disability results when someone who has never before operated a phone or computer attempts to use one – with no success. In both cases, a disability has occurred, because the person was not able to interact with his or her environment.

I.5 Compared to the medical model of disability, the social model of disability inevitably encompasses more of the global population in more situations and under more circumstances. And it is based on the energetic and compelling leadership of the Washington Group on Disability Statistics and the World Bank's Disability and Development team, along with the United Nations' Declaration on the Rights of PwD in December 2006 that the disabilities paradigm – and the way we view accessibility - has begun to shift.

B. Definition adopted by the Convention on the Rights of PwD

I.6 The definition of Disability in the CRPD can be found in Paragraph (e) of the preamble of the Convention: *"Recognizing that disability is an evolving concept and that disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others"*.

I.7 Article 1 further specifies that: *"PwD include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others"*.

I.8 These definitions constitute the legal foundation of Accessibility Rights:

- It confirms the abandonment of the traditional "medical" definition of disability which focused exclusively on a person's impairment;
- It clearly establishes the "social" definition of disability which results from the interaction between persons with impairments and attitudinal and environmental barriers, a notion that emerged in the later part of the 20th century;
- It affirms that the full and effective participation of disabled persons in society can only occur if those barriers are removed;
- Accessibility Rights, including to Information and Communication Technology, are established to ensure that PwD enjoy a "full and effective participation in society on an equal basis with others" and become an integral part of Human Rights.

C. Extended views of ability and disability

I.9 While disabled persons represent a significant under-leveraged human asset in most countries, the extension of life expectancy and resulting general aging of the population in several major economies (North America, Europe, China, and

Japan) creates similar conditions for a much larger portion of the population. As demonstrated by data cited in section 3.E of this report, an absolute majority of ICT users in fact benefit from universally designed products and services and accessibility features. Enabling both disabled and aging persons with substantial expertise and capabilities in fields as diverse as sciences, law, culture or business and economics to be fully productive is thus becoming an economic imperative in addition to being a human right obligation.

I.10 From an employment standpoint, corporations in highly competitive sectors are in fact proactively seeking disabled persons for the following reasons:

- Untapped expertise with above average motivations to contribute;
- Positive and proactive contributions of disabled persons to managing diversity within an organization;
- Specific abilities of disabled persons to make the company more successful with market segments which they understand better than anyone else (customers with impairments for example);
- Work ethics and greater loyalty than average, lowering turnover and minimizing recruitment and training costs long term.

I.11 Several organizations exist in different countries for employers practicing proactive recruitment policies for one or several of the reasons listed above. In the United States, the US Business Leadership Network helps to formulate and promote new perspectives on ability and disability which have contributed to a progressive change in attitude among large corporations.

I.12 At the other hand of the spectrum are persons without physical, sensorial or cognitive impairments but illiterate or lacking basic skills and living in extreme poverty. An extended notion of disability would include those segments of most disenfranchised population and may be taken into account in assessing the return on investment in accessible products and services. Solutions for blind and reading challenged persons for example bring direct benefits to illiterate persons.

D. Implications for CETI-D

I.13 In light of these trends and developments, it is recommended that CETI-D:

- Embrace and promote the "social" definition of disability "which results from the interaction between persons with impairments and attitudinal and environmental barriers"

- Set its mission as eliminating those barriers, whichever they are, in cooperation with all relevant networks of stakeholders from both the public and private sectors
- Promote the role of disabled persons in society at all levels of responsibilities with role models, awareness raising and educational programs toward key influencers including employers
- Set new metrics in support of progressive inclusion strategies measuring their human rights, social and economic benefits

II. DISABILITY DEMOGRAPHICS

A. Brazilian data

II.1 The results of the Brazilian Census 2000 show that of a total population of 170 million people, approximately 24.6 million people, or 14.5% of Brazil's total population has some kind of disability (See, Table 1 below). A series of press releases issued by the Brazilian Institute of Geography and Statistics (IBGE) on 20 December 2002 and 27 June 2003, described certain features of the results. The disability rate was higher in small-sized municipalities of up to 20 thousand people (16.3%) than it was in the largest municipalities (13%). Not only were municipality size differences identified, but ethnic differences were also found in the population. The disability rates for Indigenous Black populations were 17.1% and 17.5%, respectively, whereas the disability rates for White and Asian populations were below 14%. Overall, the rate of PwD as reported by the IBGE increased with age, from 4.3% in 14-year-old children to 54% of the total number of people older than 65.

II.2 Among PwD, visual disabilities predominate. About 67.6% of the population had visual disabilities, 11.5% had intellectual disabilities, 6% had physical disabilities, 32% had mobility disabilities, and 23.3% had hearing disabilities. Because the 2000 census did not use a category for multiple disabilities, the figure for all disability population groups totals more than 100 percent. Rates of mental disabilities, physical disabilities, and hearing disabilities were higher among men than among women. The predominance of visual disabilities has caused some concern over the methodology, accuracy of the results, and implications for policymaking and programs.

Table 1. Brazil. Resident population, by kind of disability, according to age group

Kind of Disability Age Group (in years)	Some or great permanent difficulty to see	Some or great permanent difficulty to hear	Physical difficulty	Permanent intellectual	Mobility
0 – 9	486,822	205,366	84,272	364,018	296,064
10-19	1,429,999	389,222	121,975	447,594	302,695
20-29	1,486,735	424,687	162,249	436,368	421,973
30-39	1,797,991	542,998	186,918	428,380	667,690
40-49	3,400,260	732,641	194,079	384,203	1,061,631
50-59	3,107,375	862,036	196,030	311,061	1,398,191
60-69	2,409,434	984,037	194,962	250,310	1,555,756
70-79	1,676,560	950,957	164,697	192,499	1,364,744
80 or more	849,665	643,154	110,880	130,503	871,040
Total	**16,644,842**	**5,735,099**	**1,416,060**	**2,844,937**	**7,939,784**

SOURCE: Brazil Census 2000

B. Data collection methodologies

II.3 Based on some of the most recent Washington Group (WG) on Disability Statistics work, which involved cognitive testing of a set of "new" disability questions, Brazil is poised to incorporate the WG set of new disability questions in their November 2010 Census instrumentation. While it is not necessarily expected that the percentage of PwD in Brazil will exceed the Census 2000 figure of 14.5 percent, there is some expectation of change in the percentage of some groups of people with various disabilities (e.g., visual). This could, then, likely result in some change in Brazilian government policy interventions, apportionment of resources, and focus of programs. And, of course, it could also have some impact on the focus of the CETI-D's work. This is discussed later in this section.

C. Specific needs and specific abilities

II.4 PwD are able participants in Brazilian society. Census 2000 data reveals their level of participation in two key life areas: education and employment.

1. Education

II.5 IBGE's 2000 census findings reveal that for PwD ages 0 to 9 years, attendance in daycare or school exceeded that of their nondisabled peers 69% versus 62%. For the 10 -19 years age group, the trend is reversed; attendance for people without disabilities is 83% versus 62% for PwD.

Table 2. Brazil. Resident Population, with or without disabilities, by attendance in daycare or school

Age group (in years)	At least one of the investigated disabilities (total)	At least one of the investigated disabilities (attending daycare or school)		None of the investigated disabilities (total)	None of the investigated disabilities (attending daycare or school)	
0-9	1,078,293	643,668	69%	31,467,988	15,084,199	62%
10-19	2,248,818	1,673,901	**64%**	32,721,539	32,388,224	**83%**
20-29	2,439,404	420,791	**29%**	27,280,216	5,205,129	**15%**
30-39	2,949,613	189,378	**6%**	22,133,782	1,486,866	**7%**
40-49	4,493,153	144,085	**3%**	14,635,917	524,164	**4%**
50 or more	11,390,975	131,018	**1%**	15,487,504	221,528	**1%**
Total	24,600,256	3,202,640	**13%**	143,726,947	49,710,111	**35%**

SOURCE: Brazil Census 2000

II.6 In Brazil, according to IBGE's analysis, there was nearly universal school attendance for persons aged 7 to 14 (94.5%), but for people with at least one disability, the rate was lower (88.6%), and dropped to 74.9% for children with severe disabilities. The lowest school attendance rate was observed among

persons with a permanent physical disability (61.0%). Data on elementary education reflected a major difference: the rate of PwD completing eighth grade, thus achieving the nationally mandated level of education, was only 10%.

II.7 The overall literacy rate of people without disabilities in Brazil was 87%; for PwD the rate was 72% (Table 3 below). Except for the 5-9 year old population subgroups, PwD' rates of literacy were lower than their nondisabled peers in every age group.

Table 3. Brazil. People aged 5 years or more, with or without disabilities, by literacy level, by age group

Age group (in years)	At least one of the investigated disabilities (total)	At least one of the investigated disabilities (literate)		None of the investigated disabilities (total)	None of the investigated disabilities (literate)	
5-9	707,763	361,551	51%	15,675,685	8,511,147	51%
10-19	2,248,818	1,907,697	85%	32,721,538	31,290,418	95%
20-29	2,439,404	2,057,356	84%	27,280,216	25,643,907	94%
30-39	2,949,613	2,417,957	82%	22,133,762	20,236,545	91%
40-49	4,493,153	3,576,885	80%	14,635,917	13,042,348	89%
50 or more	11,390,975	7,102,125	62%	15,487,504	12,137,672	78%
Total	24,229,726	17,423,580	71%	127,934,644	110,862,038	87%

SOURCE: Brazil Census 2000

II.8 In terms of years of educational attainment, PwD level of achievement was less that of the population as a whole (Table 4 below). Out of the total persons over the age of 15 who had three years of education or fewer, 32.9% had some disability.

Table 4. Brazil. People 15 years or older, with or without disabilities, according to years of education groups

Years of education Groups (in years)	People 15 years or older, with or without disabilities (total)	At least one of the investigated disabilities		None of the investigated disabilities	
No schooling or <1yr	13,904,626	5,735,758	41%	8,034,098	58%
1-3	19,316,634	5,207,569	27%	13,958,191	73%
4-7	37,570,144	6,281,238	17%	30,983,376	83%
8-10	20,789,737	2,221,696	11%	18,404,450	89%
11-14	20,957,396	2,097,197	10%	18,702,645	90%
15 or more	5,911,119	603,218	10%	5,266,097	90%
Not determined	1,107,018	292,249	26%	807,290	74%
Total	119,556,675	22,438,924	19%	96,156,148	81%

SOURCE: Brazil Census 2000

2. Employment

II.9 According to the census, of the 66.6 million people aged 10 or over who constituted the working population of the country, 9 million were PwD (Table 5, below). The census found that the overall employment rate of PwD was lower than that among people without disabilities. The rate of employment for people without disabilities was just under 50% while the rate for PwD was about 10% lower. People with mental disabilities had the lowest rate of employment with only 19.3%. People with other types of disabilities had somewhat better rates of involvement in the employment market: physical or mobility disabilities (24.8%), hearing disabilities (34.0%), and visual disabilities (40.8%). Of the 9 million PwD employed at the time of the 2000 census, 5.6 million were men and 3.5 million were women. Thus, almost 52% of men with disabilities had work while 27.3% of women with disabilities were employed.

Table 5. People 10 years or older, with or without disabilities, by occupation condition, according to age groups (numbers in 000s)

Age Groups (in years)	Total number of people with occupation	At least one of the investigated disabilities (with occupation)	None of the investigated disabilities (with occupation)	Total number of people without occupation	At least one of the investigated disabilities (without occupation)	None of the investigated disabilities (without occupation)
10-19	7,118	407	6,648	28,184	1,841	26,073
20-29	18,645	1,263	17,227	11,345	1,175	10,053
30-39	17,470	1,712	15,623	7,820	1,237	6,510
40-49	12,818	2,592	10,134	6,455	1,901	4,502
50-59	6,527	1,930	4,552	5,987	2,243	3,701
60-69	2,379	864	1,498	5,813	2,605	3,170
70-79	581	265	312	3,979	2,224	1,733
80 +	91	49	42	1,696	1,208	480

SOURCE: Brazil Census 2000

II.10 Not only were there fewer PwD employed, they were also more likely than the population as a whole to earn less than the minimum wage. While 29.5% of PwD reported earning less than the minimum wage, the figure was only 22.4% for people without disability.

D. Comparison of international and Brazilian data

II.11 According to United Nations data, approximately 50 million people, about 10% of the population in Latin American and the Caribbean (LAC), have a disability. Although different countries in LAC have different definitions, during the past decade, the concept of disability has evolved from a focus on impairments or

medical conditions to a focus on exclusion. This conceptual shift acknowledges that persons with physical or mental disabilities face barriers that impede their equal and full participation in society.

II.12 Despite the lack of consensus on a definition and the variety of methods of data collection across the region, it is clear that disability is an important cause and consequence of poverty and exclusion. Recent census data show that Brazil, Chile, Ecuador, Nicaragua and Panama have disability prevalence rates higher than 10% (14.5%, 12.9% 12.1%, 10.3% and 11.3% respectively). According to the World Bank, around 82% of PwD in LAC live in poverty, and they are more vulnerable to exclusion from the economic, social, and political life, because of stigmatization and lack of access. In all Latin-American countries, the employment rates for PwD are lower than for those without and a high percentage work informally, or are underemployed. On average, 70% of PwD in the region are either unemployed or outside of the workforce. In Mexico, for instance, the general employment rate is 50%, while the rate for PwD is approximately 27%, and 22.6% of those who are working receive less than a minimum wage. Similarly, in Brazil, 30% of PwD receive less than a minimum wage, and in Chile only one third of PwD who are employed have full time work. In Bolivia, almost 40% of PwD are self-employed or work informally, and in Honduras 73% are self-employed or work for no pay.

E. Beneficiaries of accessible and assistive technologies beyond the disabled persons population

II.13 Whereas removing ICT barriers to access for PwD is a necessary condition for better education opportunities and employability, it is important to acknowledge the immense benefits of greater accessibility and assistive solutions for the entire population. One well known example in urban environments is the effort made to adjust sidewalks at street intersections in order to ensure their full accessibility to wheel chairs. When implemented, it is also used by numerous other persons to pull grocery carts, wheeled luggage or baby strollers.

II.14 Similarly, all accessibility features developed for ICT products and services benefit a much larger population than disabled persons, thus contributing to a significant increase in productivity of a country. Women, children, the elderly, people in poverty, illiterate persons, people who live in rural areas, as well as PwD can also benefit from ATs and ICTs through the introduction of universally designed hardware, software, and digital interfaces in products and goods used in government-sponsored programs. Providing marginalized populations access to affordable and accessible technologies, along with the training and support

services, will benefit many other groups of marginalized individuals as well as their families and communities.

II.15 For example, by providing text captioning of videos, webcasts or newscasts for people who are hard-of-hearing or deaf, more members of the audience who are literate are able to benefit from the information being transmitted. By providing audio-captioning of videos, webcasts or newscasts for people who are blind or who have visual deficits, more members of the audience.

II.16 A milestone research was conducted and made public in 2003 by Microsoft. The company, seeking to quantify how many of its users benefited from accessibility features at is was developing Windows Vista, commissioned Forrester Research, Inc., to conduct a comprehensive, two-part study (Phase I and Phase II) to measure the current and potential market of accessible technology in the United States and understand how accessible technology is being used.

II.17 Phase II examined the use of computers and accessible technology among those who were identified in Phase I as being likely or very likely to benefit from accessible technology. It involved a follow-up survey with computer users who currently use accessible technology and with computer users who were identified in Phase I as being likely or very likely to benefit from the use of accessible technology due to experiencing mild or severe visual, dexterity, hearing, cognitive, and speech difficulties and impairments. The survey was conducted by phone and mail in fall 2003 and was completed by 3,428 computer users. It included in-depth questions about the use of computers and the awareness and use of accessible technology.

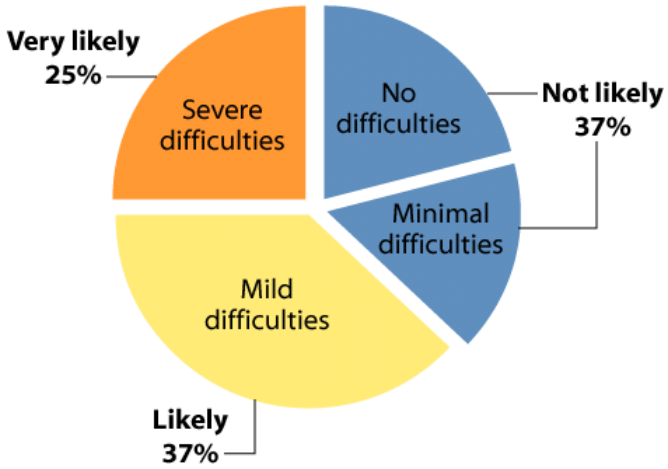
II.18 Key results were:

- 57% of computer users are likely or very likely to benefit from the use of accessible technology.
- 44% of computer users use some form of accessible technology.
- Users seek solutions to make their computers easier to use, not for solutions based on their health or disability.
- Making accessibility options easier to discover and use results in computers that are easier, more convenient, and more comfortable for computer users.

II.19 The figure below correlates the degree of severity of difficulties with the three groups of likelihood to benefit from the use of accessible technology—not likely, likely, and very likely:

- Individuals who did not have difficulties or impairments, or who have only minimal difficulties are not likely to benefit from the use of accessible technology.
- Individuals who have mild or severe difficulties or impairments are likely or very likely to benefit from the use of accessible technology.

Incidence of Difficulties and Likelihood to Benefit from the Use of Accessible Technology



Base: US adults age 18 and older

Source: Source: Study commissioned by Microsoft, conducted by Forrester Research, Inc., 2003

F. Policy alternatives

II.20 Disability involves the interaction of a person's functional status with their physical, cultural, and policy environments. If the environment in Brazil is designed for the full range of human functioning and incorporates appropriate accommodations and support mechanisms, then people with functional limitations would not be "disabled" in the sense that they would be able to fully participate in society. Interventions designed to improve participation are not only targeted at the individual level, for example medical rehabilitation aimed at a specific impairment, but also at the societal level, for example the introduction

of universal design to make ICT infrastructure more accessible, inclusive education systems, and community awareness programs to combat stigma.

II.21 As mentioned earlier, the Washington Group (WG) developed a short set of questions for use in censuses and surveys according to the Fundamental Principles of Official Statistics and which is consistent with the ICF. Question testing has shown that they produce internationally comparable data. It is intended that the use of these questions in the 2010 Brazilian Census will identify the majority of persons in the population who are at greater risk than the general population of experiencing limited or restricted participation in society. The questions cover six functional domains or basic actions: seeing, hearing, walking, cognition, self care, and communication.

II.22 Studies in countries that have used the WG approach show an improvement over the use of more traditional impairment-based census questions on disability – such as those used in the Brazilian 2000 Census. Using the WG questions it is possible to construct several different measures, or levels, that reflect the multidimensionality of the disability experience. For purposes of social participation and the equalization of opportunities, the functional status – and how that impacts someone's life – is of interest and not necessarily the cause (medical or otherwise).

II.23 The implications for Brazil and for CETI-D's work portfolio, related to the flexibility in this approach to disability, may be profound. If service provision is based on the disability prevalence then clearly this would impact on policy, particularly in Brazil where essential resources and capital are scarce. However, one can ask "What are the implications of developing a national policy that provides AT or ICT services for 2.7 % of the population if 13.4 % require some service?" In the alternative, would it not be more appropriate and efficient to construct a long-term CETI-D research agenda for AT and/or ICT technology targeted to the specific population that requires them? In Brazil, while 14.5 % of the Census 2000 population (Table 1) 67.6% had some visual impairment. More refined data are expected after Brazil's 2010 Census, which will use the Washington Group questions, which focus on functional limitations and at different levels. Targeting specific sub-populations would be more cost-effective, and would provide for the equitable and efficient delivery of services. With the knowledge that many children with disabilities in Brazil do not attend school because of vision problems correctable by glasses, policy could be directed to target this specific sub-population, to provide necessary services and to rectify inequalities. A relatively minor and easily correctable functional problem that would have significant debilitating personal consequences could be avoided.

G. Implications for CETI – D

II.24 The analysis of these data warrant the following recommendations for CETI-D's work:

- Adopt Washington Group methodologies for the purpose of conducting surveys and analyzing data in support of the development of policies and programs;
- Analyze results of the 2010 Brazil Census for the State of Sao Paulo to determine population sub groups and select initiatives with the highest impact from a human factors and return on investment standpoint;
- Work with department of education to determine which inclusion strategies and corresponding ICT solutions may yield greater equality of opportunities for students with disabilities especially for those 10 to 19 years of age;
- Expand analysis of benefits of assistive and accessible technologies to other groups of population to assess return on investment and market opportunities for private sector partners.

III. TECHNOLOGY TRENDS

III.1 This section offers an analysis of the principal ICT usage trends worldwide and in Brazil, in order to identify areas of priority which CETI-D can address to mainstream the accessibility of ICT products and services in cooperation with government programs and the private sector. Indeed, removing or reducing successful accessibility barriers currently present in mainstream ICT applications and services can indeed equalize opportunities for a very large number of disabled persons at minimum cost. Assistive technologies trends are also analyzed with the intent to identify those specific areas for which CETI – D could have the most impact building a viable ecosystem and investing in specific areas of R&D.

A. Evolution of installed bases of ICTs worldwide

III.2 As of May 2010, there were in the world:

- 1.2 billion personal computers;
- 1.8 billion Internet users (incl. shared / mobile access);
- 1.4 billion telephone land lines;
- 2+ billion TV sets;
- 2.4 billion radios.
- 4.6 billion cell phones, including over 2 billion text messaging users

III.3 These numbers demonstrate the ubiquitous impact of ICTs on all aspects of life and the rapid progression of ICT applications in all domains over the past two decades. Whether in developing or developed countries, chances are that most citizens are potential users of cell phones, televisions, radios, computers to a certain extent and of digital interfaces in multiple products and services. Mainstreaming the accessibility of ICT products and services and promoting ICT based assistive technologies are therefore priorities for all governments implementing the Convention on the Rights of PwD.

B. Projections and likely major paradigm shifts

III.4 Projections from around the world indicate the following major ICT trends and paradigm shifts:

- The continued expansion and functionalities of mobile phones including Internet access facilitated by universal coverage and the expansion of 3G networks, and the increasing usage and decreasing price of "smart phones" and other high end mobile devices;
- Major push by governments and service providers to make broadband available to the largest population possible. In emerging economies such as Brazil, emphasis is on infrastructure while in developed economies, emphasis is on promoting adoption by disenfranchised populations;
- Greater availability of broadband will cause cloud based computing to expand dramatically, opening many new opportunities for cloud based services including for assistive technologies;
- Shift from analog to digital TV;
- Continuous decline in the cost of personal computers and continued positive impact on usage of government programs for schools;
- Predominance of shared access via LAN houses and telecenters for Internet access in developing economies for an extended period of time, in Brazil in particular;
- Growth of Open Source solutions;
- Share of services will continue to grow among IT expenditures in mature IT markets such as Brazil;
- E-Government will continue to be an important area of investments for governments

C. Brazilian trends

III.5 Brazil is one of the world's leading IT markets and the largest IT market in Latin America, representing more than 45% of the total investments for the sector in the region. According to Business Monitor International (BMI), it is projected to grow at a compound annual growth rate of 11% over the 2008-2013 periods. The total value of spending on IT products and services should pass US$30bn in 2011 and US$37bn by 2013. Brazil is a mature ICT market, with expenditure distributed between hardware, software and services in similar proportions than for large developed economies IT markets. PC penetration rate in Brazil,

however, is less than 25% but the federal government has implemented programs to equip all elementary schools with computers. The number of mobile phones users reached 176.8 million in February 2010 and the market continues to show strong growth. By comparison, the number of landlines is approximately of 41.2 million.

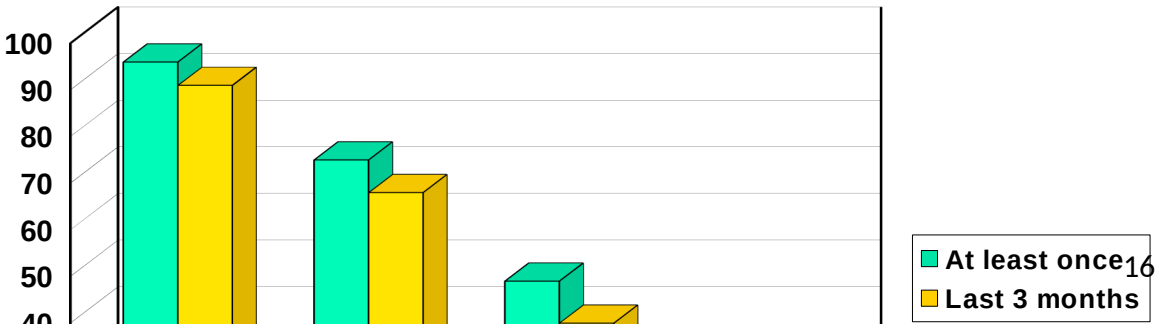
III.6 Brazil is fifth worldwide in Internet adoption with 72 million Internet users (36% of the population), and fifth in number of Internet hosts with a total of 16 million. There are 138 television stations and over 1500 radio stations in operation. Brazil is thus a media rich and connected nation which underlines the criticality of accessible ICTs for PwD.

III.7 Broadband, however, is still in its infancy with only 10 million connections, a 5.1% penetration rate, leaving enormous potential for growth propelled by microwave based infrastructure in remote areas.

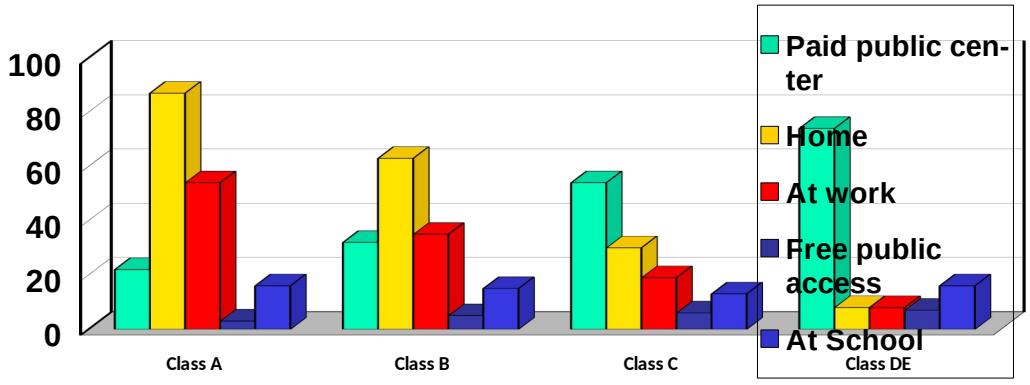
III.8 One of the most important aspects of Brazil's ICT usage pattern from an accessibility standpoint and CETI – D priorities, is the rapid evolution of Internet usage. Statistics below were selected from the "Survey on the Use of Information and Communication Technologies in Brazil" conducted by the Brazilian Internet Steering Committee, www.cgi.br and the Brazilian Network Information Center, realized in cooperation with the Observatory for the Information Society in Latin America and the Caribbean (OSILAC) and with the United Nations Economic Commission for Latin America and the Caribbean (CEPAL). For that survey, 17,000 households were interviewed in urban zones covering the five regions in the country at the end of 2007 with a probabilistic sample design based on the National Households Sample Survey (PNAD) of the Brazilian Geography and Statistics Institute (IBGE).

III.9 The survey results showed Brazil's steady Internet usage growth: with the largest number of users in Latin America and 34% of its population using the Internet. Socio-economic categories A & B are reaching high levels of usage equivalent or greater than in North America (73%) or Europe (60%). Disabled persons belonging to categories A & B will likely experience accessibility issues and solutions following the same paradigm than in the US or Europe, i.e. individual tools installed on a dedicated personal computer at home or at the office.

Usage of Internet by socio economic category



III.10 At the other end of the socio-economic spectrum, however, survey results demonstrated that shared access took the lead in absolute number of Internet connections in Brazil in 2007, driven by classes C & DE users, mostly via the use of shared access in "LAN Houses" or telecenters. This explains how Brazil's usage of the Internet is significantly higher (36%) than the penetration of broadband connections (5.1%) and of personal computers (25%).



III.11 Unlike the situation of the user of a dedicated personal computer at home or at the office, a user in a shared access situation cannot benefit from assistive technologies embedded in his or her equipment. These statistics have therefore direct implications for CETI – D strategy, with the following additional considerations:

- Disabled persons are likely to be proportionally in greater number in categories D & E than in the total population, reflecting a global correlation between disability and low economic status

- LAN Houses and community centers are becoming the de facto channel for ICT proficiency for the majority of Brazilians, followed by schools and work places

- As a channel, LAN houses also represent a potential opportunity to promote assistive tools and training programs for disabled persons

III.12 In addition to those trends, the expansion of the installed base of smart phones will progressively cause an increasing number of Internet users to use wireless services but should international patterns be observed in Brazil, a large share of those connections will be for business communications and services. For the short and medium term, LAN Houses will remain the largest source of Internet traffic in Brazil and the most widespread point of broadband connection for the majority of Brazilians.

D. Assistive Technologies

III.13 ICT based assistive technologies include a very diverse and complex group of equipment, software and services bringing accessibility solutions to PwD. It is a very fragmented industry worldwide and relies on a number of different channels for distribution, customer support and training. There are many definitions of Assistive Technology ranging from formal technical definitions maintained by organizations such as the WHO, to informal definitions generated by users themselves. The term "assistive technology" is closely related to "enabling technology", that is technology that enables access to information, communication or the environment. For the purpose of the strategy to be developed for CETI –D, it is desirable to adopt a broad definition including technologies that enable access to other forms of technology, whether they be computers, phones, digital TV or home or office control systems or assistive technologies enabling and supporting Independent Living, personal mobility, working and communication.

III.14 Regarding ICT based assistive technologies, one may distinguish:

- Palliative assistive technologies (ATs) aimed at compensating the lack of accessibility of mainstream ICT products and services to accommodate a person's access needs. Examples of such ATs would be magnifying software or contrast tuning add-on software when not included in an operating system. Such assistive technologies would not be needed with universally designed products, software or services. A significant number of assistive products and services can be considered as "palliative

aftermarket products" which only exist because of the lack of universal design of mainstream products.

- Innovations driven by new ICT platforms such as embedded geo-positioning functionalities in a smart phone, enabling special applications servicing disabled persons such as path finding, proximity accessible services guides or emergency response functions. In such case, an innovative technology platform enables new assistive services for PwD which would not be possible otherwise. Those represent a large opportunity for cooperation between public and private sector, for CETI – D led consortia with the participation of service providers and product vendors.

- Condition specific assistive technologies going beyond the scope of universally designed products and making it possible with a careful integration of products to develop solutions for persons with severe disabilities, for example using blue tooth technology and voice recognition to control house appliances from a single remote console or smart mobile phone; or embedding sensor technology in wheel chairs and a person's physical environment to enhance their maneuverability and safety. Those solutions tend to be developed by specialized enterprises and may include a significant amount of integration and support services.

III.15 Whereas a multitude of products and services fall in those broad categories of "Assistive Technologies," one common denominator is the almost universal need to deliver those with some level of customized solution, and a significant amount of user training and support. It is therefore important to consider the availability of such services without which no assistive technology eco-system is viable for vendors and users alike.

III.16 Several countries have attempted to jump start their assistive technology eco-system through public channels:

- Education, including mainstream schools and universities, vocational colleges, and specific education institutions

- Rehabilitation centers

- Employment and professional training centers

- Publicly funded community or disabled persons support centers

III.17 One of the difficulties for assistive technologies deployment, which IT industry service organizations are well aware of, is to make available a critical mass of competencies in various geographic areas for highly specific types of disabilities and in a variety of socio-economic contexts. While a fragmented approach cannot adequately serve the needs of PwD, consolidating expertise resources can be an important building block of an assistive technologies eco-system. As is mentioned in section 9.B.iii, inter-agency support centers yield positive results in the United States and other countries.

III.18 Overall, it is safe to say that a multitude of assistive technology products exist today, produced by a highly fragmented industry, but with very limited distribution and customer service capabilities. As discussed with representatives of the AT industry at the March 2010 meeting, organized to explore the objectives of CETI – D, it is not the lack of assistive technology products which is the main issue but rather the AT industry's:

- Highly fragmented structure and high costs
- Inability to reach customers
- Inability to service them
- Inability to develop interoperable solutions
- Lack of effective collaboration with mainstream suppliers of technology

III.19 Confirming the above analysis, the following timeline produced by Technosite, a nonprofit organization dedicated to promoting assistive technologies summarizes the current and future focus of assistive technologies R&D moving away from palliative solutions to interoperable APIs to cloud based computing:

Present:	Installation of ATs from different vendors (niche) in mainstream technologies (PCs, ATMs, etc.)
	Integration of ATs in operating systems or browsers (built-in / embedded accessibility)
Short term:	Usage of the same API for facilitating interaction of ATs with a specific system. Accessibility API independent of platform updates
Medium term:	Interoperability of ATs in different systems by a Universal Accessibility API. Specific examples: Microsoft's UIA, JAVA's accessibility API, GNOME

	accessibility API, IAcessible2, W3C-WAI's ARIA, MacIntosh Accessibility framework
Long term:	Ubiquitous access to AT software as a service. Cloud of ATs

E. Implications for CETI-D

III.20 The examination of these data leads to point at the following opportunities CETI-D faces to promote different technologies and applications:

- Seek to equalize opportunities of access for PwD by monitoring core ICT usage trends in Brazil;
- Engage private sector organizations to ensure that mainstream media and Internet are accessible and that specific services are developed for PwD, IE mobile phones service providers, broadcasters, ISPs, LAN Houses and telecenters government programs;
- Promote an effective Assistive Technologies eco-system by building critical mass via government procurement, standardization and consolidation of expertise and training via inter-agency coordination including science and technology, education, social services, health, housing and transportation services or the State of Sao Paulo;
- Leverage Brazil's unique IT strengths by focusing R&D efforts on mobile phone applications and cloud based assistive technologies allowing disabled persons to access ATs free of charge and independently of the computer or point of access they use, including from any LAN House or telecenter;
- Identify areas of R&D opportunities for advanced condition specific ATs in partnership with the private sector and universities

IV. KNOWLEDGE ECONOMY APPROACH TO SOCIAL INCLUSION

A. Conceptual framework

IV.1 Today's global economy is in transition towards a "Knowledge Economy" (KE), that is, an interconnected, *globalized* economy where knowledge resources such as *know-how*, expertise and intellectual property are more critical than other economic resources such as land, natural resources, or even manpower. In today's Knowledge Society, knowledge becomes a source of competitiveness, where value lies in new ideas, services and relationships, using technology as an instrument, not as an end in itself. Formally, the KE is defined as *the added, non-monetary value that society accrues from increased access to information, data and knowledge, as a by-product of the new global communication and data processing technologies*.

IV.2 Capturing and representing the value of such knowledge and introducing it as a factor in decision-making, is what the knowledge economy is about. By the application of the objectives, principles, methods and instruments of the KE, such added value is realized through a concerted effort to capture, analyze, disseminate and evaluate knowledge (cultural, indigenous, scientific, institutional, etc), converting the intangible nature of knowledge into a resource with market and societal value. Asia's experience has shown that successful incursion into the KE will be based on simultaneous and combined investment in five pillars: (i) strong intellectual property rights systems; (ii) education; (iii) innovation; (iv) information and communication technologies (ICT); and (v) perhaps more importantly for developing countries: social inclusion. This last element is what will make the difference between "growth" and "development".

IV.3 The acceleration and pervasive usage of ICT applications in all aspects of contemporary society make ensuring their accessibility for people living with disabilities indispensable. The acceleration of innovation tends to create a growing accessibility gap in all ICT areas. While new ICT based assistive technologies bring unprecedented opportunities for persons living with disabilities, innovators lack proper funding and industry remains very fragmented. A more comprehensive approach is an imperative when we look at the implications of the Convention on the Rights of persons wih Disabilities. The new accessibility imperative is thus better suited to be accomplished within a framework that takes seamlessly into consideration, investments in innovation, ICTs, the full participation of people with disabilities into our modern society,

their peculiar knowledge stemming from a suite of unique skills as a product of their heightened senses.

IV.4 This is the reason why a large consensus on international cooperation in matters of accessibility is occurring among innovators, representatives of the largest ICT markets, NGOs focused on social inclusions and educators in quest of the sought-after techniques allowing persons with disabilities fully benefitting of the present educational programs and systems. This consensus would be better achieved if countries would take the lead in tackling the challenges of persons with disabilities, within the larger framework of the Knowledge Economy.

B. KE Instruments

IV.5 The KE concept has application in the realm of international development at two levels: macro and micro.

IV.6 At the MACRO – country level—the KE is a planning tool aimed at giving the country comparative advantage over others by investing in sectors where growth can be based on the capture and dissemination of knowledge: unique indigenous knowledge that can become a valuable asset; new knowledge that can be developed internally; or knowledge developed elsewhere that can be adapted to the unique conditions of the country.

IV.7 At the MICRO – individual organization or enterprise level— where this concept bears interest for the CETI-D, the KE is a strategic growth choice used to achieve greater effectiveness, efficiency or reach where growth is impeded by a "knowledge challenge": existing knowledge that is yet untapped; gaps in required knowledge; or the need to adapt knowledge developed elsewhere to the specifics of the organization or enterprise.

IV.8 In order to maximize the potential of comparative advantages as well as to make the most of knowledge capital, **simultaneous** investment is needed in five interrelated fields:

- Innovation;
- Education;
- Social inclusion;
- Information and communication technologies (ICT); and
- Enabling policies

IV.9 It is the simultaneity in the intervention that differentiates the KE from other more conventional interventions, such as for example, investment in science and technology alone. By itself, such single-sector investment may generate valid and important products, but its potential can be curtailed due to absence of a concerted effort to make those products into long-lasting significant social impacts. Here is where the KE makes its conceptual contribution: by describing a package of simultaneous investments, connected to each other, all pursuing a single common strategic objective.

C. Global significance of CETI-D Knowledge Economy approach

IV.10 Thanks to advances in assistive technologies (ATs) and information and communication technologies (ICTs), there is a greater flow of information. Increasingly, knowledge is becoming a key factor in economic growth, in social development, in political empowerment and in cultural enrichment. In today's economy, knowledge becomes a source of competitiveness, where value lies in new ideas, services and relationships, using technology as an instrument, not as an end in itself.

IV.11 Regrettably, while it had been expected that more people would have access to information and knowledge as a result of advances in ATs and ICTs, for some segments of the world population the knowledge divide persists. Approximately 650 million people live with some type of disability, and with current trends in population, medical advances and an increasingly graying population, this number will only grow. PwD tend to be acutely vulnerable to exclusion. PwD are disproportionately poor and poor people are disproportionately disabled. Furthermore, there are an estimated 150 million children in the world with disabilities; about four-fifths of them in developing countries, as well as more millions live with disabled parents or relatives. Over 80% of PwD live in isolated rural areas in developing countries. Some 62 million children of primary school age have a disability; 186 million children with disabilities have not completed primary school, and fewer than 2% of children with disabilities in developing countries are in school. No society can ignore such a massive number of people and leave them to their own destiny. In addition to these circumstances, PwD also feel that they have very little to say in plans and programs that are supposedly provided for their welfare, for the improvement of their conditions. Any vision of empowering PwD must include the provision of access to information and knowledge, because that is the best way to empower people – to enable them to become productive citizens and to lead a life of dignity of their own. In this regard, the experience that CETI-D will undertake carries a global significance.

D. Application to the search for improved quality of life and accessibility for PwD.

IV.12 It has been widely demonstrated that the field of technology is a fertile ground for the economic and social inclusion of people with mobility disabilities or physical limitations. In principle, technology increases the possibilities for more participation of PwD in education, labor markets, and society at large. For instance, jobs in the technology sector do not depend on physical strength, but instead on intellectual knowledge and experience, meaning that someone with a physical disability can perform the tasks at the same level as a non-disabled person.

IV.13 PwD and their communities can derive enormous benefits from access to, and use of, assistive technologies (ATs) and information communication technologies (ICTs). ATs and ICTS can have a twofold impact on PwD. On the one hand, these technologies offer unprecedented potential for supporting innovative means of access and interaction to key aspects of life such as information, social exchanges, economic activity, education, and health. On the other hand, since access to these technologies is as relevant as physical accessibility, inaccessible AT and ICT solutions can worsen the relative disadvantage of PwD.

IV.14 CETI-D would be built on three basic tenants:

- PwD have specific needs – transportation, communications, medical attention, public services, among others – of whose provision the whole society is responsible, not only the State;
- PwD have the potential to develop specific capabilities and specialized knowledge which must be developed through scientific research;
- Through social inclusion, PwD could make significant contributions to today's Knowledge Society and related Knowledge Economy.

E. Potential Benefits

IV.15 CETI-D would support the Government of Sao Paulo's strategic agenda in the defense of the Rights of PwD forward into the realm of knowledge-based micro-economies; globalized services; state-of-the art technology and other means that would allow the State of Sao Paulo to promote the social inclusion of PwD as active and valuable members of society.

IV.16 CETI-D's simultaneous investments in research, technology, education, social inclusion and enabling policies – the main instruments of the Knowledge Economy—have direct application to the quest for greater and more productive

inclusion of PwD in society. Implications for CETI-D's work are at the national-level (macro) and at the individual-level (micro).

IV.17 At the macro-level, in order to bring PwD into inclusive knowledge societies, there are certain conditions that must be met, namely, the enabling of national policies and strategies. Capacity must be built so that people can undertake the activities that foster inclusion. This includes infrastructure development. If, for example, there is no ICT connectivity there is no access to content. In addition, even if there is ICT connectivity, there is also a need to develop capacity for generating local content in the language that people can understand. ICTs must be developed from the very beginning to be inclusive; otherwise, the cost of modifying the ICTs is going to be enormously prohibitive. Investments into research and development around ICT standards of services must be made available, otherwise it is not possible to guarantee and enable access to all.

IV.18 At the micro-level, because disabilities involve functional limitations, it is often difficult or impossible for PwD to interact with their communities and societies without assistive technologies (ATs) and information communication technologies (ICTs). This technology can be highly technical and disability specific. Often, however, the provision of access for PwD to a mainstream technological innovation is more cost-effective than creating a specialized technology. For example, e-mail has revolutionized the communicative abilities of people who are deaf or hard-of-hearing at a fraction of the cost of the highly specialized communication equipment previously developed for their use; and personal computers, the Internet and e-mail have increased the social and economic access of people with impaired verbal capabilities in a similarly cost-effective way. Whether they be specially designed to meet the needs of PwD (e.g. Braille writers, prosthetic devices, wheelchairs and hearing aids) or innovative adaptations of mainstream technological innovations (e.g. e-mail, the Internet and personal computers), assistive technologies are vital to the process of providing social and environmental access to a significant cross-section of PwD.

F. Opportunities for CETI-D's strategy and results measurement metrics

IV.19 There are many opportunities for CETI-D's involvement and for groundbreaking innovation. Some opportunities will be tied to Brazil's implementation of the ICT and accessibility provisions of the Convention on the Rights of PwD (CRPD). Some opportunities will be related to Brazil's commitment to improving the quality of life of all of its citizens, and enhancing the levels of national productivity.

IV.20 For example, Brazil has committed itself to a digital inclusion effort for all segments of its population. Since 2005, the government of Brazil has invested more than $509.2 million in digital inclusion projects (See, http://www.mc.gov.br/inclusao-digital). This activity has been developed and undertaken by the ministries of Communications, Planning and Science and Technology. In 2008, the Ministry of Communications invested $134 million in projects that include the deployment of Community Telecenters in cities around the country, as well as operating system access to broadband Internet..

IV.21 The Community Telecenters program is the federal government's effort to decrease the number of Brazilians who are excluded from the world of computing. The program involves the assembly and delivery of a computer center with Internet access, which serves a group of at least 10 people. Each telecentre kit consists of 11 computers - 10 terminals and a server - a laser printer, data projector and a router for Internet access; and, some furniture, including cabinets, chairs and tables.

IV.22 From 2008 until July 2009, 6,076 telecentres were delivered to 5,469 Brazilian cities. As a result, by mid-2009, 98.29% of Brazilian municipalities were covered. From October 2009, when it began the second phase of the program, the Ministry of Communications launched new bidding rules for the purchase of an additional 15,000 kits of computer equipment, audio-visual equipment and for the installation of telecenters in all municipalities. Ultimately, the government hopes to achieve the goal of deploying 21,000 community telecentres by the end of 2010 by making 231,000 computers with free internet access available to the population at large.

IV.23 Beyond the effort to expand the Community Telecentres program, the government wants to take internet services and cellular telephony to rural regions of Brazil. In 2009, the Ministry of Communications set up the National Rural Telecommunications entity to enable rural population access to these services.

IV.24 Another area involving the promotion of public policies for digital inclusion has led the ministries of Communications and Education to develop a strategy to ensure broadband in public schools. In 2008, the government struck a deal with telecom operators to replace some of the obligations under the concession agreements with operators of fixed telephony services. Originally, contracts signed in 2005 forced companies to install telephone service stations (PSTs) in every Brazilian city. The PSTs involved the operation of a terminal of fixed telephone, a fax line and dial-up Internet. As a result of the deal struck in 2009, companies were required to bring broadband in urban public schools.

IV.25 As a result, by June 2009, approximately 30,000 schools across the country were connected, representing more than half the total of schools in central cities. By the end of 2009, the Ministry's expectation was that 45,381 schools would be connected, representing 80% of all urban public schools. According to the government, the Broadband in Schools program will last until 2025. All urban public schools are expected to be connected by the year 2010.

IV.26 The next step is to bring broadband to rural schools. This effort was to begin in January 2010. That's because, on 24 July 2009, the Ministry of Communications published the decree establishing the National Rural Telecommunications program. The goal is to enable the rural population access to telephony and broadband data (internet) services. The ordinance provides for connection to high-speed Internet, free of charge for all rural public schools in the country. More than 80,000 rural schools are to be connected.

IV.27 CETI-D can play a role in Brazil's digital inclusion (for all) initiative in a number of ways. CETI-D could undertake work in developing low-cost and accessible ATs and ICTs that would be installed in connected telecentres. Similarly, CETI-D could work with connected schools whose teaching staff needs technology knowledge transfer training for the adoption and/or adaptation of instructional ATs and ICTS for use with individual students with disabilities. Finally, CETI-D can work with business and industry, as well as the education sector, on the intersection of issues of workforce development and training on the use of technologic innovations in the workplace and in schools.

G. Implications for CETI – D

IV.28 For CETI-D, utilizing a KE strategy would mean to:

- Pursue a given concrete objective through simultaneous investment and work in the five areas that constitute the instruments of the KE, not in one of them alone, but in all of them at the same time with highly focused purposes and doable targets.
- Leverage major KE related programs deployed by the federal government such as computers and broadband in schools and the promotion of tele-centers in order to promote CETI – D universal cloud based AT solutions
- Develop training programs for AT educators in collaboration with universities of interdisciplinary AT support courses (rehabilitation and/or specific education)

- Emulate the JAN network in Brazil in cooperation with universities and employer's associations (see section 8.B.iii)
- Leverage government efforts in favor of broadband adoption and engage study of tele-work opportunities for disabled persons in cooperation with employers associations
- Invest in the creation of dedicated web-based services for PwD to be managed by organizations of PwD linked to the State of Sao Paulo portal for disabled persons (meets CRPD's mandate)

V. ICT OPPORTUNITIES FOR ASSISTIVE TECHNOLOGIES AND REHABILITATION

V.1 Information and Communications Technologies play an increasingly important role in shaping the latest trends in Assistive Technologies (ATs) for rehabilitation. As mentioned in several chapters of this report, whereas technology can in theory bring extraordinary benefits for persons with disabilities in rehabilitation, the most difficult barrier which needs to be overcome is the lack of awareness and a weak support eco-system for ATs. This section will provide an overview of market segmentation, lowering cost options, impact of government policies and investment, and an "ecosystem" approach to AT, which may influence CETI-D choices.

A. Rehabilitative ATs for PwD, Market Segmentation

V.2 Rehabilitative ATs for persons with disabilities cover a vast array of products and services. It is estimated that over 20,000 products and types of services are currently available under this category. Main categories of ATs products and services used in rehabilitation generally used are the following:

- Hearing and Listening Aids
- Vision and Reading Aids
- Prosthetics
- Alternative and Augmentative Communications (ACCs) ATs
- Computer Accessibility ATs
- Daily tasks ATs for independent living (hygiene, bathing, clothing, cooking etc.)
- Education and Learning Aids
- Domotic and Environmental – building and appliances ATs
- Ergonomic Equipment and Seating and Positioning Aids
- Mobility and Transportation Aids

- Recreation and Leisure Aids

- Tele-monitoring and emergency communications

V.3 Those categories of ATs, from a therapeutic and rehabilitation standpoint address very distinct types of disabilities. Some of them are meant to directly compensate or help with the loss of an individual's functionality such as sensorial or mobility, while others are meant to compensate for a lack of accessibility of the environment or a mix of both. Applications such as tele-monitoring tend to be of greatest value to elderly populations, while ACCs are most critical for working persons. Literacy rates and technology awareness are also important factors: children, adults and aging persons for example have very different abilities and attitudes towards using technology.

V.4 To look at the potential needs that CETI-D may address in this field, it is therefore useful to refer to available Brazilian demographic data with the following criteria for segmentation:

- Life cycle situation: different age brackets have different needs, different abilities and attitudes towards technology solutions. Young persons, for example, are naturally more inclined to use and benefit from technology than elderly persons. Typical impairments to be expected with aging may include loss of sensorial abilities, cognitive or memory limitations.

- Type of disability: the type of disability addressed by rehabilitation products and services constitute the foundation for a sound market analysis. Statistics in Brazil as analyzed in chapter

- Situational (rural or urban, socio-economic, literacy)

V.5 As reported in the first draft of our report, the results of the Brazilian Census 2000 show that of a total population of 170 million people, approximately 24.6 million people, or 14.5% of Brazil's total population has some kind of disability (See, Table 1 above). A series of press releases issued by the Brazilian Institute of Geography and Statistics (IBGE) on 20 December 2002 and 27 June 2003, described certain features of the results. The disability rate was higher in small-sized municipalities of up to 20 thousand people (16.3%) than it was in the largest municipalities (13%). Not only were municipality size differences identified, but ethnic differences were also found in the population. The disability rates for indigenous and black populations were 17.1% and 17.5%, respectively, whereas the disability rates for White and Asian populations were

below 14%. Overall, the rate of persons with disabilities as reported by the IBGE increased with age, from 4.3% in 14-year-old children to 54% of the total number of people older than 65.

V.6 Among persons with disabilities, visual disabilities predominate. About 67.6% of the population had visual disabilities, 11.5% had intellectual disabilities, 6% had physical disabilities, 32% had mobility disabilities, and 23.3% had hearing disabilities. Because the 2000 census did not use a category for multiple disabilities, the figure for all disability population groups totals more than 100 percent. Rates of mental disabilities, physical disabilities, and hearing disabilities were higher among men than among women. The predominance of visual disabilities has caused some concern over the methodology, accuracy of the results, and implications for policymaking and programs.

V.7 In order to determine the potential market for each type of rehabilitative AT, an in depth analysis of the level of disability, based on a detailed functional approach, is required. Data collection from health administration and social security and health insurance surveys can also be used.

V.8 It appears, however, that the potential for each of the rehabilitative ATs listed above is quite considerable in Brazil which opens the door to innovative options to lower their costs. A systematic gap analysis of offerings for each category will be an essential first step to develop CETI-D' strategy, as well as an analysis of viable business models to sustain each specific segment of the AT eco-system.

V.9 A good blueprint for gap analysis can be found in the recent in-depth analysis funded by the European Union and appended to this section: OASIS – Open Architecture for Accessible Services Integration and Standardization by María García Robledo (SIEMENS), Silvio Bonfiglio (PHILIPS), Evangelos Bekiaris, Mary Panou, Eleni Chalkia, Alexandros Mourouzis, Kostas Kalogirou (CERTH/HIT), Miltos Anastasiadis (ANCO), Stefanos Venios (EWORX). While this report focuses on the European market and the specific issue of aging populations (including people who are elderly with disabilities), it does include a very detailed inventory of products and services with supporting business models as well as a gap analysis in the following segments:

- Independent living applications
- Elderly socialization
- Autonomous mobility

- Work-ability
- Service provision

FURTHER REFERENCES INCLUDED IN THE OASIS REPORT COVERING REHABILITATIVE ATS:

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[8] "ICT & Ageing: European Study on Users, Markets and Technologies". Preliminary Findings, Oct 2008. Empirica & WRC.

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[15] C.V.C. Bouten : "Assessment of daily physical activity by registration of body movement" PhD. Thesis, Eindhoven University of Technology.

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B. Options to Lower the Costs of ATs for Rehabilitation

V.10 During the network session held in Sao Paulo on March 19, 2010 on "Industrial Innovation", the topic of rehabilitative ATs was discussed by both Brazilian AT providers and international representatives of the AT industry.

V.11 There are different scenarios to source rehabilitative ATs in Brazil:

- Integrate, localize and service existing technologies which in the case of imported components or products is difficult and costly due to import taxes
- Manufacture in Brazil products under license agreement from an overseas vendor
- Manufacture in Brazil products designed in Brazil

V.12 Both from an international and Brazilian perspective, CETI – D potential functions as an incubator or science park specialized in ATs make sense. As it develops those partnerships, the research arm of CETI-D needs to explore three fundamental questions: (i) which technologies are available today for each category of impairment? (ii) where are they sourced from? and (iii) at which cost?. Priority areas would then be derived based on such systematic gap analysis.

V.13 Fostering public private partnerships in those priority areas, including by inviting existing Brazilian or international vendors to locate development teams at the CETI – D facility can be a very effective approach. Early industrial cooperation agreements can concentrate on integration and localization and distribution, then on local manufacturing as volumes increase. According to participants in the March meeting and the Assistive Technology Industry Association (ATIA), quite a few rehabilitative AT companies already have a presence in Brazil via distributors or fully owned subsidiaries. Brazil is seen by most ATIA members as an important and strategic market. ATIA confirmed its interest in assisting CETI – D in bringing its members to CETI-D activities as needed.

V.14 Additional considerations to lower the costs for rehabilitative ATs are:

- Standardization for public procurement allowing for greater production volumes and consistent training and support

- Integrating products with the most ICT commodity components and carefully selecting viable Open Source AT software
- Assess new technology platforms such as mobile phones with existing Open Source AT applications which can support alternative communications and other assistive functions at a lower cost than legacy equipment and services and engage a dialogue with wireless service providers
- Tele-care and tele-health on the rise as ATs for independent living: consistent with Brazil's leadership in Internet infrastructure and usage, CETI-D should identify which areas may be successfully developed and promoted in the context of the Brazilian market with institutions providing care services to persons with disabilities
- Integrate, localize and license and invent where needed
- Ensure that proper funding mechanisms are in place with clearly identified options for persons with disabilities to apply in order to boost production volumes and reach greater economies of scale.

C. How can Government Policies and Investment make a Difference for ATs

V.15 Whereas there are some negative aspects of the US model, especially since it is difficult to find who can fund what with some level of predictability, it is one of the most mature and diversified models in the world. Looking at the Brazilian system and how it may be leveraged is of critical importance in the context of CETI-D 's strategy.

V.16 Perhaps the best answer to the question is: "By considering examples of policies and programs which have supported the development of assistive technologies either through: (1) direct subsidies to education institutions, (2) the use of funds to promote the rehabilitation or employment of persons with disabilities, (3) the use of Medicaid programs, and (4) joint public-private partnerships for assistive technology (AT) research and development (R&D)."

1. AT and Education in the United States

V.17 In the United States there is a strong and growing interest in the value of AT to increase and enhance the independence of individuals with disabilities. The

interest in AT is strong in federal education policy that has required that AT be considered for every student who receives special education services.

V.18 Federal legislation and policy (i.e., the Individuals with Disabilities Education Act, or IDEA) indicates that AT can be provided as an integral part of a child's special education, as a related service to special education, or as a supplementary aid or service to special education. This means that AT devices and services can be directly provided to help a child benefit from his or her education, or may be supplementary to their education program. In the U.S. education system, AT is typically provided as a special education service or related service. Related services include occupational and physical therapy, and speech/language therapy.

V.19 Coordinating AT and IT Functions: There have been recent efforts to combine the AT and IT functions of schools into one comprehensive education technology office. A national initiative to develop this type of AT/IT coalition was launched in 2004 by the Consortium for School Networking, entitled, "Accessible Technologies for All Students." It was designed to, "accelerate the use of technology in schools; increase access to assistive and accessible technologies for *all* students; increase individualization of education through the greater range of technologies offered; and, lead to increased student achievement and success."

V.20 School districts that have developed ways to coordinate their AT and IT functions in educational systems tend to be more inclusive and more successful in meeting the education technology needs of students with disabilities. An example of transferring technology-related improvements into mainstream education technology practices is the National Instructional Materials Accessibility Standards (NIMAS) section of the 2004 amendments to IDEA.

V.21 In 2006 a new, more universally designed approach was mandated by the U.S. Congress. In that year, regulations for NIMAS – the National Instructional Materials Accessibility Standard – went into effect. That standard stipulates that all U.S. textbooks be available as a "digital source file" (a fully marked up XML source file based on the Daisy international standard). The power of that digital source file is in its flexibility: It can be easily transformed into many different student-ready versions, including a Braille book, a digital talking book, a large-text version, and so forth. The same content can be generated once by a publisher but can be displayed in many different ways to match the different needs of diverse students.

V.22 The effect of the NIMAS legislation is in the change in how we think about diversity that the technology promotes. The conceptual shift is evident in that Congress calls for schools to provide alternative versions for all students who

have "print disabilities." In that wording shift, "learning disabilities" to "print disabilities," lies an alteration in the response to diversity and disability. By recognizing that many learning problems are resident not just in the child but in the medium of instruction, the NIMAS legislation also recognizes that the limits of print are too costly for American education. Printed textbooks cannot adequately meet the challenge of diversity, and we will need to shift our educational practices to new technologies that – through more universal designs – are equitable and effective for all of our learners...

V.23 Measuring AT Outcomes in Education: The Consortium for Assistive Technology Outcomes Research (CATOR) was established in 2001 as a program designed to advance the field of AT outcomes measurement. CATOR's research and development is dedicated to improving measurement science for AT, reducing barriers to the use of AT outcomes measures, understanding the processes of AT adoption and discontinuance, and identifying new methods for collecting and capturing AT outcomes data. Funding has included several sources including the United States Department of Education, National Institute on Disability and Rehabilitation Research (NIDRR). The CATOR goals are being addressed by an array of contributors – associations, agencies, industry, and academic institutions – in the AT measurement and outcomes research field. CATOR activities are designed to directly benefit: Consumers (device users) - by learning to better understand how consumers use their devices so that their unmet needs can be identified and addressed through meaningful measurement; AT service providers - by developing recommendations for reliable, valid, and practical ways of measuring outcomes, as well as for systems for managing outcomes information and communicating it effectively; Decision-makers - by empowering them to base their decisions on the best available scientific evidence. Decision-makers may be consumers who want to advocate effectively for AT services, service providers wanting to improve their professional practice, service managers who need to allocate scarce resources, funders who want to competently evaluate the programs they fund, or government agencies who need to analyze policy relating to AT; and, Researchers - by joining with them to advance the AT field by pushing beyond the current boundaries of theory and methodology.

V.24 Current education initiatives: American Reinvestment and Recovery Act (ARRA) funds plus the U.S. Department of Education's core reforms are expected to transform and reinvigorate public education throughout the nation. ARRA funds from the Department are governed by four broad principles: (a) spend funds quickly to save and create jobs; (b) improve student achievement through school improvement and reform; (c) ensure transparency, reporting, and accountability;

and (d) invest one-time ARRA funds to minimize the "funding cliff" (www.ed.gov/policy/gen/leg/recovery/factsheet/idea.html).

V.25 These goals resonate with the overall priorities of the Department to advance student achievement through core reforms such as (a) making progress toward rigorous college- and career-ready standards and high-quality assessments that are valid and reliable for all students, including English language learners and students with disabilities; (b) establishing pre–K to college and career data systems that track progress and foster continuous improvement; (c) making improvements in teacher effectiveness and in the equitable distribution of qualified teachers for all students, particularly students who are most in need; and (d) providing support and effective interventions for the lowest-performing schools (see http://www.ed.gov/policy/gen/leg/recovery/implementation.html).

V.26 Guidance for spending funds for special education programs available through IDEA Part B and Preschool Grants were made available through OSEP in 2009. One use of these limited term funds IDEA ARRA funds that are allowable under IDEA ARRA and aligned with the core reform goals includes obtaining state-of-the-art assistive technology devices and providing training in their use to enhance access to the general curriculum for students with disabilities.

V.27 National Education Technology Plan 2010: On March 5, 2010 the United States Department of Education released the first public draft of the National Education Technology Plan (NETP). The 114-page document represents an intent to both infuse technology throughout the curriculum (and beyond), and to implement some major--sometimes radical--changes to education itself. The plan, titled "Transforming American Education: Learning Powered by Technology," sets forth a manifesto for change, questioning many of the basic structures of American education, enumerating the principles of change that are the foundation for the plan, and setting goals and recommendations for achieving this change.

V.28 NETP sets out goals in five broad areas: learning, assessment, teaching, infrastructure, and productivity. And it lays out 23 recommendations to help achieve those goals. One of the most important of those goals for students with disabilities may be in the category of learning. Here NETP advocates a 21st century skills approach, with an emphasis on individualized learning. Specific recommendations include creating new standards and objectives grounded in 21st century skills and designed for use with technology; creating flexible, universally accessible resources; and using technology and "advances in the learning sciences" to enhance education in science, technology, engineering, and math (STEM).

V.29 Common Core Standards 2010 (National Governors Association): In March 2010, the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO) released the first official public draft of the K-12 standards as part of the Common Core State Standards Initiative, a process being led by governors and chief state school officers in 51 states, territories, and the District of Columbia. These draft standards, developed together with teachers, school administrators and experts, seek to provide a clear and consistent framework to prepare children for college and the workforce.

V.30 The Common Core Standards articulate rigorous, grade-level expectations in the areas of English language arts and mathematics to prepare students to be college and career ready. Promoting a culture of high expectations for all students is a fundamental goal of the common core state standards. To participate with success in the general curriculum, students with disabilities, as appropriate, may be provided additional supports and services, such as: (a) Instructional supports for learning, based on the principles of Universal Design for Learning, which foster student engagement by presenting information in multiple ways and allowing for diverse avenues of action and expression; (b) Instructional accommodations —changes in materials or procedures— which do not change the standards but allow students to learn within the framework of the common core state standards; and (c) Assistive technology devices and services to ensure access to the general education curriculum and the common core state standards.

2. AT and Vocational Rehabilitation/Employment

V.31 In the United States, the federal Vocational Rehabilitation Act provides for vocational and independent living services to people with disabilities. States that choose to participate in the program received $3.1 billion in fiscal year 2010 federal money to provide services. The federal-state vocational rehabilitation (VR) system is the major third-party source of assistive technology devices and services for persons with disabilities seeking employment. The use of AT to assist in preparing individuals with disabilities for employment permeates the VR process. Assessments used to determine eligibility and rehabilitation needs may include an assessment by someone skilled in rehabilitation technology. Available VR services which may meet the definition of AT include: prosthetic and orthotic devices; eyeglasses; orientation and mobility services, which can include AT; rehabilitation technology services, which can include vehicular modifications; telecommunications; sensory devices; and other technological aids and devices. A key element of federal policy and financial program support for AT in vocational rehabilitation relates to the State Assistive technology program. In fiscal year 2010, this amounted to about $31 million.

3. State Assistive Technology Program

V.32 State AT Programs implement required activities focused on improving the provision of assistive technology to individuals with disabilities of all ages, through comprehensive, statewide programs that are consumer responsive. AT Programs make AT devices and services more available and accessible to individuals with disabilities and their families through state-level activities and state leadership activities. The State AT Programs are authorized under the Assistive Technology (AT) Act. The AT Act provides a formula grant for a State Assistive Technology (AT) Program to each of the 50 states, the District of Columbia, Puerto Rico and the four outlying areas. The most recent reauthorization of the AT Act provides resources so each state will receive $410,000 minimum for the state AT program and $50,000 minimum for protection and advocacy services.

V.33 AT Act Programs implement State level and State Leadership activities which include: (a) *State financing activities*, such as systems for the purchase, lease or other acquisition of or payment for AT devices and services or alternative financing systems, such as low-interest loan funds, interest buy-down programs, revolving loan funds, loan guarantees or insurance programs or other mechanisms providing for the purchase, lease or other acquisition of AT devices or services; (b) *Device reutilization programs* that support the exchange, repair, recycling or other reutilization of AT devices; (c) *Device loan programs* that provide short-term loans of AT so that individuals can try out devices or fill a temporary need for a device; (d) *Device demonstration programs* in which personnel familiar with AT demonstrate a variety of AT devices and services and provide information about AT vendors, providers and repair services; (e) *Training and technical assistance*, which includes developing and disseminating training materials, conducting training and providing technical assistance to enhance the AT knowledge, skills and competencies of appropriate individuals; (f) *Public awareness activities* designed to provide information on the availability, benefits, appropriateness and costs of AT devices and services, including a statewide information and referral system; and (g) *Coordination and collaboration* of activities among public and private entities responsible for policies, procedures or funding for the provision of AT devices and services.

4. One Stop Centers and AT

V.34 Congress passed the Workforce Investment Act (WIA) in 1998 to better serve job seekers and employers through a new framework that brings together multiple federal employment and training programs into a unified system of support. The

single system is anchored by comprehensive One-Stop centers in each workforce investment area in all fifty states.

V.35 Four separate federal agencies-the Departments of Labor, Health and Human Services, Education, and Housing and Urban Development fund 17 categories of programs that provide services through the One-Stop system. The Workforce Investment Act offers one of the most significant attempts to date to reexamine the way services are delivered to individuals in need of public assistance that recognizes the importance of consolidating categorical programs and streamlining service delivery to more efficiently and effectively meet the needs of target populations. Although WIA allows state and local governments the authority to design how best to implement the One-Stop system, the guiding principles of the Act require a focus on streamlined and integrated service with an emphasis on improved coordination and collaboration across agency lines.

V.36 More than 80 percent of the state One-Stop Center plans include persons with disabilities and/or representatives of public and private agencies, such as vocational rehabilitation programs, that serve persons with disabilities in the state plan development process.

V.37 Grant funds were used to purchase and install assistive and adaptive technologies in Resource Rooms to remove barriers to the use of information technology and to create greater program accessibility. The purchase of equipment was typically accompanied by training and technical assistance with frontline workforce development staff in the One-Stops to improve their understanding of using assistive technology to eliminate barriers to program accessibility.

V.38 The majority of projects developed and implemented One-Stop Accessibility Plans that have removed many information technology, physical, and other program barriers. In addition, the majority of projects worked to develop accessibility guidelines for One-Stop Center Staff, and they continue to make accessibility guidelines a focus of activity in the State Workforce Investment Board and Local Workforce Investment Board working groups on disability issues in which they participate. Moreover, several projects developed and used accessibility checklists and survey tools to evaluate current physical and program access of One-Stops and provide assistance to reduce and eliminate barriers.

5. Use of Medicare and AT

V.39 Medicare is a federal health insurance program that covers three classes of recipients: persons age 65 or older; persons receiving Social Security Disability

Insurance (SSDI) payments (including many adults with developmental disabilities who receive SSDI on the earnings record of a parent); and, persons with end stage renal disease. Medicare is divided into two parts, known as Part A and Part B.

V.40 Medicare Part B, which is known as supplemental medical insurance and requires a monthly premium, is the part of Medicare that covers certain AT under the categories of durable medical equipment, prosthetic devices and orthotic devices, and home health services.

V.41 In 2002, Medicare decided to extend coverage to text-to-speech devices, in part, because they concluded that the devices were included within their definition for "durable medical equipment," which is the over-arching category for most medical devices for home use — everything from wheel chairs to blood glucose monitors. You can bet that any reform that comes out of the focus on text-to-speech devices will have an effect on whether other medical services offered via mobile phones gain Medicare reimbursement.

V.42 The Medicare National Coverage Determinations Manual has a very specific definition for the "Speech Generating Devices" that Medicare covers: "Speech generating devices are defined as speech aids that provide an individual who has a severe speech impairment with the ability to meet his functional speaking needs," The Medicare National Coverage Determinations Manual has a very specific definition for the "Speech Generating Devices" that Medicare covers: "Speech generating devices are defined as speech aids that provide an individual who has a severe speech impairment with the ability to meet his functional speaking needs," the manual reads. Among the requirements for coverage are: "Being a dedicated speech device, used solely by the individual who has severe speech impairment; May be software that allows a laptop computer, desktop computer or personal digital assistant (PDA) to function as a speech generating device."

6. Use of Medicaid and AT

V.43 Medicaid is the third largest provider of health insurance in the United States. Medicaid is health insurance that helps many people who can't afford medical care pay for some or all of their medical bills. Not everyone who has limited income and resources is eligible for Medicaid. A person must qualify for Medicaid. Low-income is only one test for Medicaid eligibility; assets and resources are also tested against established thresholds.

V.44 The Medicaid Act identifies numerous categories of health care services for which federal funding available. These broad categories of services do not

identify the specific medical treatments, procedures, or devices that are covered by Medicaid. Rather, particular treatments, health services, or medical equipment are covered by a state Medicaid program if the treatment, service, or device fits within one or more of the broad categories of services identified in a state's Medicaid plan.

V.45 Medicaid operates under federal standards that give states considerable authority to determine whether individuals should have access to assistive technologies. The categories of service covered by Medicaid will vary greatly from state to state. This is because the majority of Medicaid service categories are optional. A state must cover all "required" categories of service, such as inpatient hospital care and home health care services for persons eligible for skilled nursing services. A state may choose which of approximately 30 "optional" categories of service to cover.

V.46 Typically, state Medicaid programs have covered AT under one or more of the following coverage categories: home health care (which includes medical supplies and equipment, commonly referred to as "durable medical equipment"), physical therapy (PT), occupational therapy (OT), speech therapy, prosthetic devices, and rehabilitative services. With the exception of home health care, all of these categories are optional for adults, meaning that some states will cover them and some will not.

V.47 Children under age 21 are covered under a special mandatory program, known as the Early and Periodic Screening, Diagnosis and Treatment (EPSDT) program. Under federal Medicaid law, a state is required through its EPSDT program to cover all of the required and optional services for Medicaid-eligible children under age 21 even if some of those optional categories are not covered for adults. The statutory language, governing EPSDT, would seem to support a very expansive view of when a child will receive AT under the EPSDT program. A service must be covered for a child if it is among the required and optional services and is "necessary to correct or ameliorate defects and physical and mental illnesses and conditions ...."

V.48 In addition to fitting within a Medicaid coverage category (required or optional), an AT device will not be approved by a state Medicaid agency unless it is medically necessary. Medical necessity is not defined by the federal Medicaid law or regulations. But, any state definition of medical necessity must be consistent with the broad purposes of the Medicaid program. The federal law states that the primary goal of Medicaid is to provide medical assistance to persons in need and to furnish them with rehabilitation and other services to help them "attain or retain the capability for independence or self-care."

V.49 The U.S. Congress has authorized waivers of certain Medicaid requirements in a variety of situations. Most waiver programs for adults age 65 and over include some coverage of home modifications (e.g., installation of grab bars and widening of doors to accommodate wheelchairs) and some AT products (e.g., personal emergency response systems) that are excluded under conventional Medicaid coverage guidelines.

V.50 Although most discussions of ATs focus on people living in the community, these technologies may also benefit people living in residential care facilities, including nursing homes. Examples range from wheelchairs and hearing aids to products that assist with cognition and "wander management" systems for people with dementia.

V.51 Freiman et.al. (2006) reviewed public funding for an array of ATs. Table 6 summarizes their conclusions about public insurance coverage of several kinds of technologies.

Table 6. USA. Summary of Public Health Plan Coverage of Assistive Technology

Assistive Technology Category	Coverage Provided by:		
	Medicare[a]	Medicaid State Plans[a,b]	Medicaid Waivers[b]
Personal mobility ATs	Yes	Yes	Some
Orthotics and prostheses	Yes	Yes	Some
Hearing, vision, and speech ATs & augmentative communication	Little	Some	Some
Cognitive ATs	No	No	Some
Transportation ATs	No	No	No
Home modifications	No	No	Some

NOTES: Medicaid state plans = benefits included in a state's approved plan, including optional benefits that states choose to provide, must be provided statewide and cannot be capped; a provision of the Deficit Reduction Act of 2005, adopted since the data for this table were collected, makes exceptions for certain home-and community-based services that previously required waivers. Medicaid waivers = benefits approved as part of an approved waiver may be capped, targeted to specific groups (e.g., individuals with brain injuries), and limited to certain geographic areas of a state; some = although some items are covered, a significant portion of the assistive technologies in this category are not covered; ADL = Activities of daily living; AT = assistive technology; VA = U.S. Department of Veterans Affairs.

[a] Coverage needs to meet medical necessity criteria.

[b] Due to state-by-state coverage variations, the information in this column roughly represents the modal coverage by the states.

7. Supplemental Security Income's Plan for Achieving Self Support (PASS)

V.52 SSI is a needs-based program funded by general tax revenues. An SSI recipient must have limited income and limited resources. The PASS allows a person with a disability to exclude income and/or resources, which would otherwise be countable under SSI, when the excluded money is to be used for some

occupational objective. By doing so, the person retains SSI, becomes eligible for more SSI, or becomes eligible for SSI as a new applicant.

V.53 The PASS enables an individual to achieve an occupational objective, i.e., self-support, through use of this excluded income and resources. For example, the PASS may enable a person to secure education or training needed to become self-supporting, to make the transition into employment, or to set up a business. As a further example, the PASS can be used to purchase items like a van or laptop computer if those items will help pave the way to an eligible individual's vocational goals.

V.54 The proposed PASS must be submitted to the Social Security Administration (SSA) in writing. Chances for approval are enhanced if great care is taken to document fully, on a government form, the person's needs and the viability of the proposal as a means of attaining self-support. Anyone, including the SSI applicant or recipient, can write a PASS.

V.55 A number of items must be contained in the written PASS, including: a designated occupational objective; specific savings/planned disbursement goals directly related to the objective; a list of items or activities requiring savings or payments and anticipated amounts; a specific period of time for achieving the objective; identification and segregation of any money or other resources being accumulated and conserved; and, a detailed business plan when self-employment is a goal.

V.56 A PASS can generally be approved for up to 48 months. A PASS may be extended beyond the 48-month limit, in intervals up to six months, as necessary to allow the person to achieve his or her goal. The allowance for any number of six-month extensions will help persons who, because of a disability, cannot complete a typical college program in four years. The extensions can also help individuals whose vocational goal requires a Master's or professional degree program.

V.57 The money set aside under a PASS can be used for anything that can be specifically tied to achieving an occupational objective. Just as there are limitless ways that people make money, there is no real limit on the types of proposals that can be approved. In recent years, there has been an increase in the uses of technology, including AT, and other creative approaches to allow persons with disabilities to achieve self-support.

8. Public-Private Partnerships

V.58 Public-private partnerships are most effective in ensuring the rights of persons with disabilities when government uses every public policy tool at their disposal

to promote both competition and accessibility in the marketplace. Public-private partnering can involve: research and development (R & D) financing, technology innovation demonstrations, or indirect government support (e.g., criteria used in public procurement). The following are examples of PPPs.

V.59 Under the aegis of the U.S. Department of Education, the National Institute on Disability and Rehabilitation Research (NIDRR) conducts comprehensive and coordinated programs of research and related activities to assist in the achievement of the full inclusion, social integration, employment and independent living of people with disabilities. From its fiscal year budget of $109 million, NIDRR supports a considerable number of R &D contract and grant projects.

V.60 For example, NIDRR's current R&D portfolio includes 22 Rehabilitation Engineering Research Centers (RERCs) to conduct programs of advanced research of an engineering or technical nature in order to develop and test new engineering solutions to problems of disability. Each center is affiliated with a rehabilitation setting, which provides an environment for cooperative research and the transfer of rehabilitation technologies into rehabilitation practice. The centers' additional responsibilities include developing systems for the exchange of technical and engineering information and improving the distribution of technological devices and equipment to individuals with disabilities. Of the current portfolio of 22 RERCs, the majority involve work in one or more areas of adaptive technology, assistive technology, or information communication technology.

V.61 As a second example, the National Center for Technology Innovation (NCTI) advances learning opportunities for individuals with disabilities by fostering technology innovation. Funded by the U.S. Office of Special Education Programs (OSEP), NCTI works with a community of government, nonprofit, and private organizations. NCTI's network of individuals and staff works on the development of ATs as well as the commercial success that will make them viable on a large scale. Specifically, NCTI helps researchers, product developers, manufacturers and publishers to create and commercialize products of value to students. To achieve its goals NCTI is designed to offer services to: analyze needs, issues, trends, and promising technology innovations; cultivate a collaborative network; promote reliable research-based solutions; and, facilitate successful commercialization approaches for the education market. NCTI is guided by an advisory board of industry and educational leaders, who combine an understanding of the unique needs of individuals with disabilities and the demands of moving ideas from the laboratory to the learning environment.

V.62 As a third example, government involvement in ensuring access to AT (and related ICT) by persons with disabilities does not always involve direct financial support. For example, criteria used in public procurement and other means by which open and accessible standards are required for interfaces, communication protocols, and file formats are extremely powerful ways to ensure access by those with disabilities through AT to education, employment, and culture. In 1998, the U.S. Congress amended the Vocational Rehabilitation Act to require Federal agencies to make their electronic and information technology accessible to people with disabilities. Inaccessible technology interferes with an individual's ability to obtain and use information quickly and easily. Section 508 was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. Under the law, agencies must give federal employees with disabilities and members of the public access to information that is comparable to the access available to others.

V.63 As a fourth example, the free and open source software (FOSS) development strategy requires that the source code, or inner commands that make up a software product, be available for all to see and improve on. The FOSS strategy presents an attractive way for both volunteer and paid programmers to contribute to projects knowing that such work will usually remain available to the general public regardless of the strategic or tactical decisions of any company or organization. From the perspective of persons with disabilities, companies and organizations can sell or give away low or no-cost FOSS-based AT, depending on what other benefits or services they include with the transaction. There are many FOSS initiatives that lend themselves well to scaling-up by government agencies and programs. The following is one example: one that includes the U.S. and other countries; and, one example that includes countries other than the U.S.

V.64 AEGIS Project. AEGIS stands for "Open Accessibility Everywhere: Groundwork, Infrastructure, Standards" and it brings together 20 companies, NGOs, and university and commercial research organizations from 10 countries. Most of the funding comes from the European Commission. Project coordination is being conducted by the Greece-based Center for Research & Technology Hellas, and the technical lead is U.S.-based Sun Microsystems. The AEGIS project works to determine whether 3rd generation access techniques provide a more accessible and embeddable approach in mainstream ICT (desktop, rich Internet and mobile applications). This approach is developed and explored with the Open Accessibility Framework (OAF) through which elements of the design,

development and deployment of accessible mainstream ICT are addressed. The OAF provides embedded and built-in accessibility solutions, as well as toolkits for developers, for installing accessibility in existing and emerging mass-market ICT-based products (including AT).

D. Developing and AT-for/Rehabilitation-Ecosystem

V.65 As noted by most participants to the Industrial innovation network and international participants to the March meeting, one of the functions that CETI-D can play is to support the development of a strong Rehabilitative AT ecosystem. Such an ecosystem should include core activities addressing the following gaps: 1/ Skills gap, 2/ Lack of awareness of solutions and funding sources, 3/Participation of disabled persons' organizations and 4/ Funding processes and viability of business models.

V.66 Developing training programs for capacity building of personnel involved in the provision of services and/or supports to persons with disabilities: Training involved use of certifications by type of technology and application in partnership with private sector distributors and training companies. Such training need is clearly identified by all ecosystem stakeholders as a key challenge.

V.67 Promoting the awareness of ATs among disabled persons in partnership with Disabled Person's Organizations (DPOs): Even with commodity ATs, it can be very difficult to reach out to persons with disabilities There are many solutions available, but no one knows that they exist. Awareness barrier. The U.S. State Tech Act program model provides an example where the field offices' infrastructure is provided by the State while organizations of persons with disabilities provide demonstration and briefing services to consumers and orient them for sourcing and funding. This solution creates a win – win situation where persons with disabilities knowledgeable on ATs help persons with similar conditions. It also provides employment opportunities to persons with disabilities involved in such programs. A similar situation exists in the United Kingdom with RNIB.

V.68 Use DPOs as a component of distribution channels: This is done successfully in several countries including the UK and US. CETI-D could develop a program to assist DPOs develop such roles. A positive thing that CETI-D could do would be to develop a network to bring vendors who have their own distributors and services with DPOs to explore how to best implement the solutions listed above.

V.69 Developing clear and actionable funding processes: Funding processes for ATs are fundamental, as well as maintaining an ongoing monitoring of the viability of business models supporting ATs.

VI. ASSISTIVE TECHNOLOGIES AND ICT ACCESSIBILITY POLICY FRAMEWORK: THE CONVENTION ON THE RIGHTS OF PWD

A. Background, implications of ratification by Brazil on Federal and State authorities

VI.1 The Convention on the Rights of PwD (CRPD) was adopted by the United Nations General Assembly on December 13, 2006. A major milestone for all persons living with disabilities around the world, it is the 8th Universal Convention on Human Rights and the first of this millennium. There are 144 countries that have signed it as of May 2010 and 87 have ratified it, making it an enforceable legal instrument since May 5, 2008 when the 20th country's ratification occurred. In a short period of time, the CRPD has become the universal frame of reference guiding governments in developing and implementing their national legislation, regulations and programs protecting the Rights of PwD.

VI.2 Technically, the CRPD is both a development and a Human Rights instrument. It can serve as a policy instrument which is cross-disability and cross-sectoral with a number of definitions and policy areas covered by its text. It is however also legally binding as a Human Rights treaty. Brazil signed both the Convention and its optional protocol on March 30, 2007, on the opening day for signature, and ratified them on August 1, 2008, among the first major countries to do so. As a result, the Federal Government and States are equally obligated by the dispositions of the CRPD and its Optional Protocol.

B. Dispositions on Accessibility and Technology

1. Accessibility a foundation of Disability Rights

VI.3 Accessibility and specifically accessibility to information and communication technologies are addressed by the Preamble of the Convention itself which includes the following initial consideration (v): *"Recognizing the importance of accessibility to the physical, social, economic and cultural environment, to health and education and to information and communication, in enabling PwD to fully enjoy all human rights and fundamental freedoms"*.

VI.4 Accessibility is also affirmed by Article 3 as one of the eight general principles of the Convention:

"The principles of the present Convention shall be:

(a) Respect for inherent dignity, individual autonomy including the freedom to make one's own choices, and independence of persons;

(b) Non-discrimination;

(c) Full and effective participation and inclusion in society;

(d) Respect for difference and acceptance of PwD as part of human diversity and humanity;

(e) Equality of opportunity;

(f) ***Accessibility****;*

(g) Equality between men and women;

(h) Respect for the evolving capacities of children with disabilities and respect for the right of children with disabilities to preserve their identities".

9. ICT Accessibility

VI.5 A very innovative component of the Convention relates to dispositions concerning Information and Communication Technologies (ICTs both from a digital accessibility and assistive technologies standpoint). Indeed, for the first time, ICT accessibility is defined as an integral part of Accessibility Rights, on par with accessibility to the physical environment and transportation: *« To enable PwD to live independently and participate fully in all aspects of life, States Parties shall take appropriate measures to ensure to PwD access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems...* » (Article 9).

VI.6 As a result of this definition of Accessibility, all the dispositions of the Convention defining the rights of PwD in specific areas of activity and which include the terms "accessible" or "accessibility" include all ICT products and ICT based applications and services, a far reaching implication for industry, governments and civil society.

VI.7 The terms "Accessibility" and "Accessible" are in fact mentioned respectively 9 and 17 times in the text of the Convention, the vast majority of those occurrences in articles covering specific provisions by application areas, which are summarized in the following Table 7 and can serve as a check list for those areas which CETI-D should monitor and address.

Table 7. Check list for areas of CETI-D monitoring

Application Areas	CRPD Article	Accessibility Mandates	Reasonable Accommodation	Promoting Assistive Technologies
E-Government	9.2.a	X		
Media and Internet	9.2.b	X		
Education	24	X	X	X
Employment	27	X	X	
Political Rights	21	X		X
Emergency services	9.1.b	X		
Culture & Leisure	30.5.c	X		
Private sector services	9.2.b	X		
Personal Mobility	20			X
Rehabilitation	26			X

VI.8 Furthering the definition of accessibility including ICTs, "Communication" is defined by the Convention as including all possible means of communications that may eliminate barriers: *"Communication" includes languages, display of text, Braille, tactile communication, large print, accessible multimedia as well as written, audio, plain-language, human-reader and augmentative and alternative modes, means and formats of communication, including accessible information and communications technologies"* (Article 2).

10. Extended notion of Information and Communications Technologies

VI.9 Communications Technologies is Article 9 on Accessibility which states: "information and communications, *including information and communications technologies and systems*". This definition implies that information and content, communication as defined above, and systems – i.e. hardware and software including human interfaces, all need to be accessible.

VI.10 Furthermore, Article 9 on Accessibility specifies:

"These measures shall include the identification and elimination of obstacles and barriers to accessibility, and shall apply to … Information, communications and other services, including electronic services and emergency services" (1.b).

"States Parties shall also take appropriate measures to…

Promote other appropriate forms of assistance and support to PwD to ensure their access to information; (2.f)

Promote access for PwD to new information and communications technologies and systems, including the Internet (2.g)

VI.11 In addition, Article 21 on "Freedom of expression and opinion**,** and access to information", specifically covers communication and contents in the context of ICTs, mass media and the Internet:

"States Parties shall take all appropriate measures to ensure that PwD can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information and ideas on an equal basis with others and through all forms of communication of their choice, as defined in article 2 of the present Convention, including by:

(a) Providing information intended for the general public to PwD in accessible formats and technologies appropriate to different kinds of disabilities in a timely manner and without additional cost;

(b) Accepting and facilitating the use of sign languages, Braille, augmentative and alternative communication, and all other accessible means, modes and formats of communication of their choice by PwD in official interactions;

(c) Urging private entities that provide services to the general public, including through the Internet, to provide information and services in accessible and usable formats for PwD;

(d) Encouraging the mass media, including providers of information through the Internet, to make their services accessible to PwD;

(e) Recognizing and promoting the use of sign languages."

11. Product development and design

VI.12 Two principles are embedded in the CRPD which have important implications for State Parties and developers of ICT products and services operating under their jurisdiction:

Incorporating accessibility considerations at an Early Stage of product development:

"Promote the design, development, production and distribution of ***accessible information and communications technologies and systems*** at an ***early stage***, so that these technologies and systems become accessible at minimum cost" (Art. 9)

Promoting and applying Universal Design:

The CRPD establishes Universal Design as a universal rule for products and services design. It includes both a definition and a mandate covering Universal Design:

- **"Universal design"** means the design of products, environments, programs and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of PwD where this is needed (Article 2, definitions);

- States Parties undertake to ensure and promote the full realization of all human rights and fundamental freedoms for all PwD without discrimination of any kind on the basis of disability. To this end, States Parties undertake… ***to promote research and development of universally designed*** goods, services, equipment and facilities, as defined in Article 2 of the present Convention, which should require the minimum possible adaptation and the least cost to meet the specific needs of a person with disabilities, to promote their availability and use, and to promote universal design in the development of standards and guidelines" (Art. 4.1.f)

12. Assistive Technologies

VI.13 The most relevant and important article of the CRPD to ascertain the meaning of Information and Assistive Technologies can be found its definition of Universal Design above. The Convention specifies that *"Universal Design shall not exclude assistive devices for particular groups of PwD where this is needed"*. This clearly establishes assistive technologies as a distinct category which should be promoted in addition to pursuing all forms of ICT accessibility (Article 4.f).

VI.14 Directly supporting the objectives of CETI-D, the CRPD also requires State Parties *"To undertake or promote research and development of, and to promote the availability and use of new technologies, including information and communications technologies, mobility aids, devices and assistive technologies, suitable for PwD, giving priority to technologies at an affordable cost"* (Article 4.g) hereby re-enforcing the notion that specific policies and programs should be developed in support of assistive technologies in addition to promoting accessible ICTs. This disposition justifies the implementation by States of public-private partnerships in support of Research and Development.

VI.15 Three articles further cover assistive technologies in specific application areas:

> Article 20 (b) on Mobility specifies that State Parties shall *".Facilitate access by PwD to quality mobility aids, devices, assistive technologies and forms of live assistance and intermediaries, including by making them available at affordable cost"*
>
> Article 26.3 on **Habilitation and rehabilitation** mandates that *"States Parties shall promote the availability, knowledge and use of assistive devices and technologies, designed for PwD, as they relate to habilitation and rehabilitation."*
>
> Article 29.a (ii) on **Participation in political and public life** seeks to *"Protect the right of PwD to vote by secret ballot in elections and public referendums without intimidation, and to stand for elections, to effectively hold office and perform all public functions at all levels of government, facilitating the use of assistive and new technologies where appropriate."*

VI.16 An important disposition regarding **intellectual property rights** reinforces those dispositions on assistive technologies for those applications requiring digital versions of published texts: *"States Parties shall take all appropriate steps, in accordance with international law, to ensure that laws protecting intellectual property rights do not constitute an unreasonable or discriminatory barrier to access by PwD to cultural materials" (Article 30 on Cultural life). In that regard, it will be important for CETI-D to monitor the results of the current negotiation engaged in the context of WIPO to create a universal framework for exemptions ensuring that published texts can e made available to blind persons.*

VI.17 Finally, Article 32 (d) on **International Cooperation** encourages State Parties to provide, *"as appropriate, technical and economic assistance, including by facilitating access to and sharing of accessible and assistive technologies, and through the transfer of technologies".* This particular article offers to CETI-D a logical springboard to exercise its leadership internationally by pioneering cross border cooperation.

13. Standardization

VI.18 One of the important areas of international cooperation is standardization. Standardization allows for interoperability, greater competition, and mass production on an international scale lowering costs for users. ICT accessibility standards have been developed by various institutions including ISO affiliated national organizations and the ITU. Regrettably, there has been virtually no participation from Latin American countries to international accessibility standardization work. *This vacuum presents an opportunity for CETI-D to lead the field of ICT accessibility and assistive technology standardization in Brazil and the whole of Latin America.*

VI.19 From a legal and policy standpoint, standardization must in fact be addressed anyway by State Parties to the Convention to the extent that services to the public are delivered via information and communications technologies such as e-government or any type of digital interface and electronic media. Article 9 – 2 specifies: "States Parties shall take…appropriate measures to develop, promulgate and monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public." A complete set of references on ICT accessibility standardization is available in a dedicated section of the G3ict-ITU e-accessibility Toolkit for Policy Makers.

14. Reasonable accommodation

VI.20 "Reasonable accommodation" is an important notion in the Convention on the Rights of PwD. Its definition is found in Article 2:

> *"Reasonable accommodation" means necessary and appropriate modification and adjustments not imposing a disproportionate or undue burden, where needed in a particular case, to ensure to PwD the enjoyment or exercise on an equal basis with others of all human rights and fundamental freedoms".*

VI.21 What constitutes "Reasonable accommodation" has been the subject of much debate and controversy in those countries which have included similar definitions in their existing legislation such as the United States or the United Kingdom. With this background in mind, the Preparatory Committee for the Convention included in its text several important dispositions affirming and detailing several areas of applicability of the notion of "Reasonable accommodation" which relate directly to ICT accessibility and assistive technologies:

VI.22 Denial of reasonable accommodation is a form of discrimination: *"Discrimination on the basis of disability" means any distinction, exclusion or restriction on the basis of disability which has the purpose or effect of impairing or nullifying the recognition, enjoyment or exercise, on an equal basis with others, of all human rights and fundamental freedoms in the political, economic, social, cultural, civil or any other field. It includes all forms of discrimination, <u>including denial of reasonable accommodation</u>"* (Article 2.3)

VI.23 As a result, Article 5 on **Equality and non-discrimination** stipulates that: *"In order to promote equality and eliminate discrimination, States Parties shall take all appropriate steps <u>to ensure that reasonable accommodation is provided</u>"*

VI.24 Specific areas of applicability underlined by the Convention include:

- Liberty and security of the person (Article 14)
- Education (Article 24)
- Work and employment (Article 27)

VI.25 Article 24 on **Education** covers a number of requirements which cover ICT and assistive technologies such as *"Facilitating the learning of Braille, alternative script, augmentative and alternative modes, means and formats of communication and orientation and mobility skills, and facilitating peer support and mentoring"* (24.3.a) or ensuring the appropriate training of teachers: *"Such training shall incorporate disability awareness and the use of appropriate augmentative and alternative modes, means and formats of communication, educational techniques and materials to support PwD"* (24.4). These detailed dispositions demonstrate the level of "reasonable accommodation" expected in Education.

VI.26 Long term, what constitutes "Reasonable accommodation" in other areas and specifically for the workplace will likely be influenced by shared good practices serving as benchmarks among employers from both the public and private sectors. The inclusion, in the aforementioned G3ict Toolkit, of case studies and good practices is intended in part to serve as references for "Reasonable accommodation" involving ICT solutions.

C. A holistic model for accessible infrastructures and services

VI.27 Whereas the Convention on the Rights of PwD incorporates a number of dispositions, definitions and guidelines regarding which pre-existed in the national legislations and policies of countries which contributed to the elaboration of its text, the general framework it sets for disability and accessibility rights is unique in its holistic approach and will irreversibly change the general approach followed by policy makers around the world.

VI.28 In effect, *the notion that barriers are the responsibility of society* changes the scope of policies and programs in support of accessible and assistive technologies. Specifically, the Preamble of the Convention (e) states: "*Recognizing* that disability is an evolving concept and that disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others…" From a practical standpoint, it means that government agencies such as CETI-D dedicated to improving the full participation of disabled persons to society need to address environmental barriers in a holistic approach and not simply focus on developing individual assistive solutions as palliatives for

inaccessible environments. With this consideration in mind, it appears that the new policy model will include a large degree of awareness raising, capacity building and direct interventions among government agencies, manufacturers, service providers and regulators to ensure that key ICT products and services are:

- Universally designed to the greatest extent possible
- Providing specific accessibility features to the greatest extent possible (closed captioning on television or relay services for telephones for example)
- Following standards for interoperability with individual assistive technologies (web accessibility rules for example)

VI.29 Developing and promoting advanced assistive technologies can only greatly benefit from such a holistic and inclusive approach so that scarce R&D funds can be allocated to projects which are not palliatives to inaccessible environments but focused on enhancing individual sensorial, motor or cognitive abilities.

D. Dispositions and policy frameworks to promote accessible and assistive technologies

VI.30 As a result of the above, and in order to proactively affect change, CETI-D will have to address different levels of policy making at international, federal and state level and involve in its programs leading private sector entities selling ICT products or providing ICT based services. Likely levels of intervention would include for example:

- International level:
  - Participation to standardization work
  - Participation to international coordination for public procurement accessibility standards
  - Participation to policy maker think tanks (i.e. G3ict)
- Federal level:
  - Interaction with the Telecom regulatory authority
  - Interaction with legislators

- Federal agencies for education, labor, rehabilitation and science and technology

- State level:
  - Accessible e-government program for all government agencies
  - Public procurement program for all government agencies
  - Consolidation of assistive products evaluation and purchasing or open sourcing with agencies involved in providing them to end users (education, rehabilitation, employment)
  - Consolidating support structure for employers and educators (example JAN in the US)

VI.31 Engaging the private sector is equally important to the extent that a number of essential services are provided electronically by corporations. The CRPD, in its article 9 specifies: "The state must insure that *private entities* that offer facilities and services to the public take into account the accessibility of those services" (Art. 9.1.b, also mentioned in Art. 21 on "Freedom of expression and opinion, and access to information"). Such involvement can be developed by:

- Integrating private sector representatives in the governance of CETI – D
- Promoting good behavior and best practices with incentives and publicity
- Working on developing voluntary accessibility charters with professional sectoral organizations
- Using regulatory instruments with consultations with professional organizations when none of the above yields results

E. Implications for CETI-D

VI.32 CRPD has the potential to be a strong foundation for CETI-D's work. CETI-D could:

- Use the CRPD as a strong foundation for CETI – D's endeavors and promote it as a blue print for action, positioning CETI – D as a global pioneer in the implementation of the CRPD ICT accessibility agenda
- Leverage the CRPD to legitimize CETI – D's role as a catalyst to foster greater accessibility of products and services across the board and its

advocacy role for public and private sector organizations providing ICT based products and services

- Implement CRPD's specific guidelines for every category of sectorial accessibility issues as a foundation from a political and legal standpoint with all stakeholders
- Position CETI – D as a leading proponent of the CRPD framework on ICT accessibility to facilitate grant awards from International Development Institutions

VII. BARRIERS TO ACCESS AND SOLUTIONS BY MAIN AREAS OF TECHNOLOGY [1]

VII.1 In this section, the main barriers to access and existing solutions are reviewed by category of information and communications technologies. Unless otherwise specified, the nomenclature used is that of the e-accessibility toolkit for policy makers developed by G3ict in cooperation with the International Telecommunications Union which will allow users of this report to identify additional sources and references easily (www.e-accessibilitytoolkit.org). For each category, a list of key stakeholders is suggested to facilitate the development of a strategic and organizational framework for CETI-D.

A. Wireless infrastructure and devices

VII.2 Mobile phones constitute the largest installed base of any ICT device today in the world and in Brazil and have become an essential tool for all social and economic activities. Mobile phones and wireless services have also been a tremendous positive factor in ending the isolation of the elderly, rural communities and persons with reduced mobility. Mobile phones and wireless services can offer outstanding accessible and assistive features but can also be inaccessible to PwD. Key barriers result from the interaction between a specific type of disability and the lack of corresponding adjustment. Main accessibility features currently available include (list adapted from the latest Mobile Manufacturer Forum nomenclature):

1. Hearing Accessibility Features

- Visual alerts to notify the user of incoming calls/messages
- Adjustable volume control
- Display of missed, received or dialed calls through call logs
- Visual or tactile indicators showing what has been pressed on the keypad, and visual display of text
- Text-based messaging options
- SMS to Avatar translation for deaf illiterate (Tunisia)
- Bone sound conduction

[1] Derived from the G3ict – ITU e-accessibility toolkit for policy makers for consistency of nomenclatures and references www.e-accessibilitytoolkit.org.

- One on one video for sign language communications

2. Vision Accessibility Features

- Tactile markers to help orient fingers on the keypad
- Audible or tactile feedback to confirm a button has been pressed
- Adjustable font sizes
- Audible cues for low battery, caller waiting or ending a call and volume level
- Adjustable brightness/contrast controls for the display
- The size of the main display
- Backlit display
- Text to Speech functionality
- Mini Daisy reader for downloadable digital books

3. Speech accessibility features

- Text Messaging/SMS
- Email
- Instant Messaging
- Multi-media Messaging
- Predictive Text
- Re-use of personalized SMS messages
- Video one on one for sign language (available on 3G services only)

4. Dexterity

- Ability to use the phone in 'hands-free' mode
- Predictive text input
- Call answered by pressing any key
- Voice recognition for dialing or accessing features within the phone
- No pinching, twisting or rotation of the wrist needed

- Candy bar design to avoid extra movements (that a phone with a folding or sliding design requires)
- Flat back on the phone to allow for operation on a table top rather than having to be held
- Optional accessories such as a Bluetooth headset or keyboard making texting and talking much easier

5. Cognition

- Menus and instructions clear and simple to understand
- Providing simple instructions when something is required from the user
- Providing enough time for people to enter the required information
- Ability to associate photos with telephone numbers
- Text to Speech

VII.3 Other features that may be useful include:

- Having a choice between audio, visual or vibrating alerts to let users know when they're receiving a call
- Keys provide audio, visual and tactile feedback when pressed
- Popular functions such as placing a call controlled by repeating pre-recorded voice commands
- Help menus designed to anticipate the information being sought
- Keypad shortcuts to make every step quick and efficient

6. Expanded assistive functionalities

VII.4 Newer generation handsets include:

- Enhanced Text to Speech, voice recognition
- Scanner capability or camera with optical character recognition and text to speech allowing for instant text and label reading including at short distances
- GPS and triangulation positioning based upon cell antennas
- Bone sound conduction for severely hearing impaired persons

- Remote services:
    - Emergency services
        - Digital libraries with downloadable books
        - E-Government services
        - GPS and triangulation proximity services
        - Blue tooth proximity services

VII.5 Key stakeholders involved in developing and promoting mobile phones accessibility and assistive features:

- Organizations of PwD
- Wireless service providers
- Telecom regulatory authorities
- Handset manufacturers
- Open source operating system providers
- Applications providers
- Emergency services
- Universities research centers
- Universal service fund

B. Radios

VII.6 With 2.4 billion radio receivers in operation worldwide, radio are the second largest communication medium after cell phones, most of them terrestrial radios with additional features such as alarm clocks or recording capabilities. Whatever the type of radio, the listener has to use a mix of hardware (displays, buttons, dials, cables, etc.) and software (menus, schedule guides, pause/rewind/record functions, etc.). This equipment can sometimes be very difficult to use for people with visual or physical disabilities. For example:

- People with visual disabilities often find it difficult or impossible to see the labels on buttons or to read the display. They may require equipment with clearly labeled buttons that can be distinguished by touch. They may

need to be able to increase the size, brightness or contrast of displayed text or have it spoken out in a synthetic voice.

- People who have poor grip or dexterity may need larger well-spaced controls that are easy to locate and operate with minimal strength and movement. They may benefit from having a remote control that can be laid on a flat surface and operated using one hand.
- People with cognitive disabilities need equipment that is easy to unpack and set up and easy to learn and use.
- For internet or mobile radio, PwD will need the applications or websites to be compatible with the assistive hardware and software they use to operate their PC or mobile device.

VII.7 In the United States, Digital Radio for the deaf was launched by National Public Radio. It allows deaf persons to read the news or emergency notifications as they are spoken on a screen located on top of the radio receiver.

VII.8 Considerable improvements can be brought to radio receivers and electronic consumer products by applying Universal Design principles to their design. A number of user surveys show that accessibility of radios, while very widespread, can be vastly improved.

VII.9 Key stakeholders involved in developing and promoting radio accessibility and assistive features and services:

- Disabled Persons Organizations
- Broadcasters
- Radio receivers importers and manufacturers
- Broadcasting regulatory authority
- Emergency services

C. Video and Television

VII.10 With 1.5 billion television sets installed worldwide, and several viewers per set, television is a ubiquitous medium around the world and in Brazil. PwD can be affected in many different ways by barriers to usage.

VII.11 Most equipment and remote consoles are difficult to use for persons with low dexterity or cognitive impairments.

VII.12 Persons who are hard of hearing or deaf cannot benefit from programming if sign language or captioning is not provided. Lack of such services constitutes a very significant barrier for a large segment of the population. It can be particularly difficult to overcome if no standard exists for the reception and displaying of close captioning services.

VII.13 Persons who are blind can only watch television by listening. They can very much benefit from video description services now promoted in several countries.

VII.14 Key stakeholders involved in developing and promoting television accessibility and assistive features and services:

- Disabled Persons Organizations
- Broadcasters
- Television sets importers and manufacturers
- Broadcasting regulatory authority
- Emergency services

D. Landline phones and services

VII.15 Land lines phones refer to traditional phones connected via a physical connection to the phone network. Accessibility features can be offered for the handset itself, addressing visual, hearing, dexterity or cognitive disabilities, or via dedicated services such as TTY terminals and relay services for the deaf.

1. Accessibility features most desired by PwD

- Clear audio
- Large print capability
- Text messaging
- Connection to hearing aids
- Audio amplification
- Pip on figure 5
- Large figure keys with good contrast
- Good quality video, suitable for sign language, lip reading and person recognition. Interoperable between IP and 3G networks.
- Real time text together with voice
- Total conversation ability (voice, text, video)

- Flashing light on incoming call
- Vibration on incoming call
- Text relay service
- Video relay for sign language
- Captioned telephony relay service
- Automatic voice to text (and sign) conversion (as soon as possible)
- Own phone number in the national number plan leading through a relay service
- SMS on fixed phones.

2. Available accessibility features

- For direct operation of the phone:
    - Large button phones
    - High contrast large number keys
    - Voice controlled calling
    - Stored number calling on specific memory keys with opportunity to have pictures of the destination on the keys
    - Extra loud ringing tone
    - Pip on key 5 for key navigation
    - Flash on incoming calls
    - Select high quality audio codec (available on IP and ISDN phones)
    - Programmable dialer with possibility to have pictures on the buttons
    - Self voicing function that allows use of all features and functions without vision
    - Ability to operate all touch screen functions with gesture (coupled with voice)
    - Ability to use full phone without vision or gesture (directly or via connected device)
    - Ability to control phone with AT (modem) commands
    - Ability to connect a Braille reader
    - Ability to install or activate a screen reader
    - Standardized external interfaces so that it is possible to connect standardized attachments and assistive devices
- For enhanced communication and perception:
    - Strong audio amplification

- Inductive loop coupling from the handset to hearing aids
- Handset designed for bone conducted audio perception
- Short Message Service compatibility
- Speakerphone function
- Real-time text input and display
- Video transmission, reception and display feature. (e.g. for sign language, lip reading, showing things or persons, general recognition)

3. Accessibility features available externally through attachments

- To control calls:
  - Programmable dialer with possibility to have pictures on the buttons
  - Flashing devices connected via wire or wirelessly for visual alerting on incoming calls
  - Wireless vibration alert devices for tactile alerting on incoming calls
  - Mechanical handset lifter
  - Assistive devices using AT (modem) commands to control phone
  - Braille display
- Assistive peripherals attached to the phone
  - Headset
  - Hearing aid coupling (inductive) when held to ear
  - External handset amplifier
  - Neck loop and neck loop amplifier for inductive coupling to hearing aids
  - Alphanumeric keyboard
  - Braille display
  - Text phone addition
  - External video camera

4. Relay Services

VII.16 Relay services are usually human operated services via voice, text, or video, offering live translations during phone conversations for persons who are deaf. Relay services are usually supported financially by public or community funds since their operation is labor intensive and requires much more human resources than regular person to person calls. Main types of relay services are:

- Video relay services, translating between sign language in video and speech in a voice phone.
- Text relay services, translating between real-time text in the text part of a phone and speech in a voice phone, usually for people with speech impairments, people who are hard of hearing, people who are deaf or deaf-blind.
- Speech-to-Speech relay services, supporting speech calls for people with speech impairments or cognitive disabilities.
- Captioned speech relay services (Captioned Telephony), adding real-time text captions to a voice call, for people who are hard of hearing or deaf.

VII.17 The relay and emergency services need to operate on a limited number of connection types or protocols. Thus it is important to coordinate the specifications of access to relay services, to emergency services, and for terminals used by PwD so that maximum interoperability in all available media is achieved for call combinations.

5. Text phones, Video phones, Total conversation phones and Voice phones

VII.18 There are a number of different types of landline phones that support different media combinations (voice, video, text).

VII.19 Some examples of phones with specific accessibility features are:

- Text phones for the analog phone network
- Real-time text terminals for Internet and other IP network connection
- Videophones for Internet and IP network environments
- Total Conversation phones
- Voice phones

VII.20 Key stakeholders involved in developing and promoting land line phones accessibility and assistive features and services:

- Disabled Persons Organizations
- Telcos
- Telephone handsets importers and manufacturers
- Telecom regulatory authority

- Emergency services
- Universal Service Fund

6. Web sites

VII.21 Access to web sites has become a vital element of most activities in society. As such, their accessibility is becoming a critical component of the full participation of disabled persons to society. Considerable effort has been made at an international level by the Worldwide Web Consortium Web Accessibility Initiative (W3C – WAI) to define accessibility standards and provide free guidelines, authoring tools and capacity building sources. Yet, most web sites do not follow those standards, creating significant barriers for PwD either by not taking into account basic perceptions and interaction processes for various profiles of individuals or by not offering interoperable interfaces with assistive technology such as screen readers or alternative input devices based on keyboard only interaction. In order to fully describe the scope of the work done by the W3C – WAI it is useful to consider the list of conditions taken into account by its accessibility standards:

- visual disabilities
    - blindness
    - low vision
    - color blindness
- hearing impairments
    - deafness
    - hard of hearing
- physical disabilities
    - motor disabilities
- speech disabilities
    - speech disabilities
- cognitive and neurological disabilities
    - dyslexia and dyscalculia
    - attention deficit disorder
    - intellectual disabilities

- memory impairments
- mental health disabilities
- seizure disorders

- multiple disabilities

- aging-related conditions

VII.22 There is really no incremental cost attached to following the W3C-WAI accessibility guidelines to develop a web site and there are actually quite a few benefits in terms of enhanced usage and traffic. Retrofitting an inaccessible web site, however, is a very complex and expensive proposition. W3C – WAI web site: http://www.w3.org/WAI

VII.23 Key stakeholders involved in developing and promoting web accessibility:

- E-government web sites
- Largest e-commerce and public information web sites managed by the private sector
- Universities
- W3C – WAI Brazil correspondent
- Information Technology professionals associations
- Web developers
- IT companies involved in web technology
- Wireless service providers

7. Personal computers

VII.24 Accessibility of personal computers encompasses three elements:

- **Accessibility features or settings,** that are built into software programs and allow adjustment and customization of product settings to meet vision, hearing, mobility, language, and learning needs. For example, in Windows, changing the font size and color, and changing mouse pointer options are accessibility settings. Leading operating systems and application software include accessibility features and settings that make personal computers easier to see, hear, and use.

- **Assistive technology add-ons** (specialty hardware and software products) that are carefully chosen specifically to accommodate an individual's disability or multiple disabilities. Examples include a screen magnification program or a screen reader for a computer user who has low vision, braille output devices, a virtual keyboard with a pointer or an ergonomic keyboard for a computer user with wrist pain.

- **Compatibility between assistive technology products**, the operating system, hardware components and software applications. This is critical for assistive technology products to function properly.

VII.25 Common computer-based solutions for education workplace and home applications address visual, auditory, motor and cognitive disabilities. An important trend is the development of open source assistive software, a direction particularly important in the context of Brazil given the Federal Government policy favoring such solutions.

VII.26 Main categories of solutions include (lists are not exhaustive):

VII.27 For Visual Disabilities:

- Severe visual disabilities, including complete blindness
    - Screen reader software, with either voice or braille output or a combination of the two.
    - Free Solutions: Fire Vox, System Access To Go, NVDA
- Low vision
    - Possible use of screen readers, screen magnification, high-contrast settings, in-browser/program font enlarging.
    - Free Solutions: CLC STAR, iZoom Web, System Access To Go
- Forms of color blindness/color vision deficiencies (red-green being the most common --5% of males--)
    - Need for information to not be conveyed solely by color differences.
    - Free Solutions: Users of Windows or Mac may alter contrast. For the web, CLC STAR may be useful

VII.28 For Auditory Disabilities:

- On the web or with video content, synchronized captioning of audio and video
- Text transcripts for audio-only presentations/podcasts.
- Text messaging systems
- TTY devices and software for text communication via telephone

VII.29 For Motor Disabilities:

- Mobility and motor control disabilities caused by injury (nerve, nerve stress, or loss of limbs)
- Switches, pointing devices, such as head-mounted or eye-controlled pointers, or trackballs that do not require fine limb movement
- Mobility and motor control disabilities caused by disease or genetic conditions
- Issue: tremors and loss of ability to control hand movement
- Track balls, switches, tremor-compensating mice, etc.
- Voice recognition software to perform input, including scrolling, clicking, and moving the mouse.
- Free Solution: Click-n-Type

VII.30 For Cognitive Disabilities **(**Largest category of disability affecting the most Personal Computer users):

- Conditions ranging from reading and linguistic disabilities to attention deficits to problem-solving and memory conditions to various forms of learning disabilities
- Solutions: `
    - Programs that offer word prediction when writing and that can read aloud and highlight text are useful for mild to moderate cognitive disabilities.
    - Visual markup, word lookup, and electronic bookmarking facilities offered by high end programs such as Freedom Scientific WYNN and TextHELP Read and Write Gold
- Free Solutions: CLiCk, Speak, WordTalk, LetMeType, Power Talk

VII.31 Making personal computers accessible often needs careful adjustments of settings for a particular individual. This makes the availability of training and user support very important to PwD, especially those with significant disabilities. Key steps in any assistive technology implementation include:

- Identification of need
- Evaluation and testing solutions
- User training
- Environment accommodation (family, school, workplace)
- Continuous assessment

VII.32 One of the most important success factors for the deployment of accessible and assistive features of personal computers is the Assistive Technology ecosystem which includes the following stakeholders:

- Organizations of PwD
- Public agencies involved in promoting assistive technologies for the education, labor and rehabilitation sectors
- Major providers of operating systems, application software
- Hardware manufacturers
- Computer distributors, integrators, IT training companies
- Software developers
- Assistive technology vendors
- Schools and universities
- Community centers and Internet cafés

8. Software

VII.33 Software accessibility is a critical component of most ICT applications. Accessibility features cover available alternative input and output, tracking of movement and objects, and access to navigation and contents. A number of rules developed for web accessibility overlap with rules for accessible software. It is also important that software be interoperable with assistive technologies such as screen readers and alternative input/output devices.

VII.34 From a system architecture standpoint, accessibility rules apply to operating system software, development tools or application software in different ways.

VII.35 Whereas operating system software for personal computers such as Windows includes a number of accessibility options for users, application software and development tools typically leverage the operating system accessibility features. Several companies providing tools for developers have made their user interfaces accessible to disabled developers. Enterprise wide software providers, on the other hand, have historically created their own user interface and commands. Those enterprise wide applications cover industrial automation and control, inventory systems, security systems, human resources databases etc. and tend to create significantly more accessibility issues for PwD than generic office automation software used in the context of personal computers operating systems. This issue presents serious difficulties for the employment of PwD.

VII.36 Key stakeholders involved in developing and promoting software accessibility:

- Disabled persons organizations
- Software vendors
- Associations of employers involved in employment of disabled persons
- Professional associations of software developers
- Public sector procurement agents
- System integrators
- Universities
- E-government services

9. Electronic kiosks and self services

VII.37 Electronic kiosks are ever expanding to serve multiple routine but essential functions in modern economies such as:

- ATMs (Automated Teller Machines)
- Information kiosks
- Ticket vending machines
- Electronic voting machines
- Information displays (e.g. flight information)

- Point of sale customer card payment systems
- Card door entry systems

VII.38 Whereas their use brings significant convenience to users and productivity gains to corporations, transportation and public services, electronic kiosks can create insurmountable barriers for PwD. Those include physical barriers if the kiosk is not accessible to a person in a wheel chair or the kiosk requires a level of dexterity incompatible with common disabilities; sensorial barriers if no secure audio output is available to blind users via an earphone plug, or if a sound acknowledgement cannot be heard by a deaf person. Kiosks may also use complex user interface which cannot be understood by persons with cognitive disabilities.

VII.39 As kiosks applications have expanded, so have challenges by Disabled Persons Organizations: important modifications have thus been made to bank ATMs, airport check-in kiosks or voting machines. Accessibility rules for kiosks are now better established and are progressively adopted by major vendors and integrators.

VII.40 Key stakeholders involved in developing and promoting electronic kiosks accessibility:

- Disabled Persons Organizations
- Electronic kiosks vendors and integrators
- Transportation authorities and operators
- Travel and hospitality industries
- Government agencies responsible for accessible voting procedures
- Banking industry
- E-Government services

10. Broadband services

VII.41 Broadband allows people with disabilities to live independent lives at a location of their choice by delivering multiple services and types of interactive applications which would not be possible otherwise:

- Telecommuting or running a business out of one's home

- Tele-rehabilitation services, and providing health and vocational support to PwD where they live
- Access to on-line education, digital libraries and cultural activities
- Persons who are deaf or hard of hearing can use broadband based video relay services with video phones to communicate with the operator via sign language.
- For people with autism, on-line technologies have also allowed the development of an independent autistic community. Connecting online with peers also allows people who have autism to break their isolation.
- Emergency services: in the near future, E-911, the North American telecommunications system that automatically associates a physical address with the calling party's telephone number, and routes the call to the most appropriate Public Safety Answering Point, will have real time interoperable voice, video, and text capabilities, allowing equal access to emergency services for people with hearing, cognitive and speech disabilities.

VII.42 Concerning Barriers to access to broadband for PwD, a recent FCC report ("A Giant Leap & A Big Deal: Delivering on the Promise of Equal Access to Broadband for People with Disabilities" - OBI Working Paper Series – April 2010 by Elizabeth Lyle) describes current barriers to adoption of broadband by PwD as follows:

> "Based on data from its October-November 2009 survey, the FCC estimates that 42% of Americans with disabilities have broadband at home, considerably below the national average of 65%. Some 39% of non-adopters have a disability, much higher than the 24% of the overall survey respondents who have a disability. People with disabilities face the same major barriers to adoption as other Americans, such as cost of equipment and service, lack of training, and belief that on-line material is not relevant to them."

VII.43 In addition to cost and a lack of awareness of potential relevant applications, basic accessibility and interoperability issues common to other categories (Personal Computers, web sites, television and video etc.) make it difficult for PwD to access broadband based services.

VII.44 Key stakeholders involved in developing and promoting broadband accessibility:

- Disabled Persons Organizations
- Internet Service Providers
- Community Centers
- Health services
- Rehabilitation services
- Education institutions with e-learning programs
- Organizations promoting tele-working

11. Implications for CETI–D

VII.45 In order to face some of the barriers mentioned above, CETI-D could:

- Promoting mainstream accessibility of ICT products and services requires people to engage networks of partner organizations which vary with each category as per the lists appended to each of the sections above. Consolidate mix of key network participants
- Engage specific industry associations to launch joint awareness programs for their members
- Promote universal design and its social, economic and marketing benefits
- Create accessibility benchmarks for main categories of products and services and test them to create peer pressure among providers of products and services
- Promote the sale and subsidize accessible mobile phones in coordination with service providers, industry and federal authorities to rapidly and significantly improve the lives of a large number of disabled persons
- Engage main Brazilian engineering and computer science schools and universities to provide compulsory courses on ICT accessibility in the context of their graduate programs.

PART 2

VIII. CONCEPT OF A CENTER OF EXCELLENCE FOR PWD

A. Benefits of consolidation of expertise for Persons with Disabilities, government and the private sector

VIII.1 Ensuring participation in the knowledge economy puts the onus on all stakeholders to ensure that no-one gets left behind whether for reasons of disability, poverty, gender, age, locality or personal ability. Strong collaboration between public, private and third sector actors can ensure that all play a part in bridging the digital divide that exists today, particularly for people with disabilities.

VIII.2 One of the key benefits of a partnership of expertise - among the people with disabilities, governments and the private sector - is the dismantling or breakdown of silos between social policy makers, businesses and technology professionals, and end users so that the capability of AT and ICT technologies to tackle disadvantages can be fully exploited. This partnership needs to include all users groups, end-users, communities, local service providers (educational, social and health services, emergency services etc) to really achieve livable communities developed with the participation of all stakeholders.

VIII.3 The capability of technology alone to meet the needs and demands of our complex societies is very limited. It also needs the engagement of a wide array of interested parties, especially those who are the intended users and beneficiaries, in deciding why, how, what, when and where it should be put to use. That is key to successful delivery of desirable outcomes such as accessible, affordable, and available technologies.

A. International examples

1. The Centre for Excellence in Universal Design (CEUD), Ireland

VIII.4 The CEUD is part of the National Disability Authority (NDA) of Ireland. NDA is the lead state agency on disability issues and universal design, providing independent expert advice to the Government on policy and practice. CEUD was established by the National Disability Authority (NDA) in January 2007 under the Disability Act 2005.

VIII.5 Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people, regardless of their age, size or disability. This includes public places in the built environment such as buildings, streets or spaces that the public have access to; products and services provided in those places; and systems that are available including information and communications technology (ICT).

VIII.6 The Centre is dedicated to the principle of universal access, enabling people in Ireland to participate in a society that takes account of human difference and to interact with their environment to the best of their ability. The Centre focuses on three main areas of activity involving: standards development and promotion; education and professional development; and, awareness-raising.

VIII.7 To contribute to the development and promotion of standards in Universal Design, the Centre: (1) stimulates and informs research by commissioning, collaborating in and conducting studies; (2) participates in and contributes to relevant standardization work, with national, European and international standards bodies; (3) provides expert advice and information to relevant stakeholders involved in implementing and promoting standards; and (4) encourages compliance with national and international standards in Universal Design.

VIII.8 To enhance education and professional development, the Centre is responsible for: (1) ensuring the development of appropriate Universal Design courses, in liaison with relevant academic, certifying and professional bodies; (2) supporting and promoting the introduction and integration of the principles of Universal Design in educational and training courses; and (3) ensuring, whenever possible, the principles and application of Universal Design are included in examinations recognized by professional bodies.

VIII.9 To raise awareness of Universal Design, the Centre operates in a manner to: (1) develop and maintain a knowledge base of good practice in Universal Design; (2) promote public awareness of the difficulties encountered by people in relation to the environment; and (3) promote an understanding of Universal Design.

VIII.10 The CEUD is also the National Contact Centre for the European Design for All e-Accessibility Network (EDeAN). EDeAN is a network of 160 organizations in European Union member states. The goal of the network is to support all citizens' access to the Information Society.

2. The Center for Assistive Technology and Environmental Access (CATEA), USA

VIII.11CATEA is a multidisciplinary research and development center dedicated to promoting the health, activity and participation of people with all levels of ability through the application of assistive and universally designed technologies that enhance the usability, equitability and safety of real world products, environments, and devices.

VIII.12CATEA's multidisciplinary efforts are manifest in two Rehabilitation Engineering Research Centers (RERCs) on Workplace Accommodations (www.WorkRERC.org) and Wheeled Mobility (www.mobility RERC.org) funded by the National Institute on Disability and Rehabilitation Research. The 5-year federally-funded projects represent two of the 22 similar Centers nationwide and support a number of faculty and students from a variety of disciplines within the College of Architecture (COA), Georgia Tech and affiliated Universities and Healthcare facilities, including Duke University, Georgia State, University of Pittsburgh, Syracuse University, Shepherd Center, Atlanta VA and Emory University.

VIII.13CATEA has four laboratories:

- The Rehabilitation Engineering and Applied Research Laboratory focuses on the design and evaluation of wheelchairs and other rehabilitation devices as well as a broad range of interventions that impact device use, activity performance and participation in everyday life. Current projects include: Mobility RERC; Development of an Individualized Pressure Ulcer Susceptibility Model; Pressure Relief Techniques and Behaviors; Wheelchair Cushion Standards; Device to Measure Mechanical Work and Efficiency of a Manual Wheelchair; Inventor-Driven Product Development; and, Height Adjustable Wheelchair Seat to Facilitate Transfers and Reach.
- The Accessible Workplace Laboratory focuses on enabling equitable access to employment, enhancing employment outcomes, and increasing opportunities for participation in the workplace by people with functional limitations through increased availability of and access to assistive technology and universally designed accommodations. Current projects include: Work RERC; Workplace Accommodation Wizard for Manufacturing; Successful Aging in the Workplace; User Needs; Effect of Accommodations on Participation of Employees with Disabilities; Workplace Remote Assessment Protocol; Universal Design in the

Workplace; Workplace Accommodation Wizard for Office; and, NIDRR Field Initiated Disability Case Studies on Organizational Practices in Employing People with Disabilities.

- The Enabling Environments Laboratory, applies an understanding of functional diversity to design, from the design interfaces, to the design of products, to the design of spaces, to enhance the performance and participation of all individuals, to the greatest extent possible. Current projects include: Effect of Mobility Device & Environmental Facilitators on Activity and Participation; Wheelchair with Drop-Down Armrest for Sliding Transfers; Successful Aging in the Workplace; and, Universal Design in the Workplace; Remote Workplace Assessment.
- The Accessible Education and Information Laboratory, works to promote accessible and usable digital media for all people. It conducts research and training on inclusive technologies and practices for the online world, with an emphasis on accessible online education and training. Current projects include: Scitrain: Science and Math for All; SciTrain University; Georgia Tech Research on Accessible Distance Education (GRADE); and, accesselearning.net.

VIII.14 CATEA staff are engaged in a wide array of interdisciplinary collaborations across the Georgia Tech campus, including Design and Technology for Healthy Aging (DATHA), a collaboration with Industrial Design, Awarehome Research Institute (AHRI) and the Center for Healthy Aging in the Built Environment and The Accessible Aquarium Project with Psychology, the Graphics Visualization and Utilization Center (GVU), and Center for Music Technology. CATEA staff also support academic programs through course offerings in industrial design and architecture that focus on human-centered design, Universal Design and research methods; serving as advisors on dissertation and thesis projects; and through research assistantships for graduate students who are interested in pursuing areas of research related to CATEA's mission.

3. The Job Accommodation Network (JAN), USA

VIII.15 The Job Accommodation Network (JAN) is a service provided by the U.S. Department of Labor's Office of Disability Employment Policy (ODEP). JAN is one of several ODEP technical assistance centers. JAN's mission is to facilitate the employment and retention of workers with disabilities by providing employers, employment providers, people with disabilities, their family members, and other interested parties with information on job accommodations, entrepreneurship,

and related subjects. JAN's efforts are in support of the employment, including self-employment and small business ownership, of people with disabilities.

VIII.16 JAN is located on the campus of West Virginia University since its inception in 1983, the Network began with two consultants providing accommodation information over two telephone lines with no computers. At that time, JAN served only employers seeking accommodation information. Because of additional demand for its confidential, direct, and no-cost service, JAN quickly expanded beyond providing information to employers to include rehabilitation and educational professionals, individuals with disabilities, and anyone else interested in workplace accommodations.

VIII.17 Initially, JAN consulted primarily on sensory disabilities, those involving hearing, vision, touch, or speech impairments. Until the early 1990s, about 30 percent of JAN's requests addressed these disability areas. As computers, office machines, cell phones, wireless communication, and similar technology became common in workplaces, employees with all types of impairments needed to be able to use the technology. As caller questions became more technical, JAN consultants changed to a team approach, dividing into motor / mobility, sensory, and cognitive / neurological teams. A team approach allowed consultants to handle increasing case loads, yet stay current and knowledgeable about rapidly changing technology and products. With the implementation of the Americans with Disabilities Act of 1990 (ADA) in 1992, more individuals began calling JAN and more cases focused on accommodating individuals with motor / mobility disabilities. Prior to 1992, JAN averaged 630 accommodation inquiries per month. In 1992, cases soared to over 1,600 per month and continued to steadily rise throughout the 1990s, ending with an average of almost 3,000 per month. JAN now averages between 32,000 and 38,000 inquiries and nearly 4,000,000 Website customers.

VIII.18 JAN's 26 full-time consultants provide information on accommodations for all types of impairments, including sensory, motor, cognitive, and psychiatric conditions. Information is also available about rights and responsibilities under the Americans with Disabilities Act and related legislation. JAN continues to provide resources for veterans and returning wounded and injured military, including support for America's Heroes at Work.

VIII.19 JAN also offers information about entrepreneurship for people with disabilities. JAN consultants handle each inquiry on a case-by-case basis offering self-employment and small business development expertise and referrals regarding business planning, financing strategies, marketing research, disability-specific programs, income supports and benefits planning, e-commerce, independent

contracting, home-based business options, and small business initiatives for disabled veterans. JAN customers can expect to receive a resource packet tailored to their specific entrepreneurial goals with consultants available throughout all stages of the process who can provide ongoing supports.

VIII.20 This technical assistance is provided in English and Spanish and is free of charge via telephone, email, chat, and postal mail. All communications are confidential and available to employers, medical, and rehabilitation professionals, people with disabilities as well as anyone else who is interested in workplace accommodations.

VIII.21 JAN consultants also provide information through other media. JAN produces monthly webcasts on various subjects on concerns related to disabilities or limitations in the workplace. Consultants frequently present at various conferences. Interested parties can also submit requests for local, distant, and remote training events.

VIII.22 JAN supports private employers by providing JAN's customized Webcasts, Second Life training, online application systems and Website accessibility assessments, and other technical assistance materials designed specifically for their industries' workforce.

VIII.23 JAN has either a partnership or collaboration with the: United States Business Leadership Network (USBLN), Assistive Technology Industry Association (ATIA), Computer/ Electronic Accommodations Program, Equal Employment Opportunity Commission (EEOC), USDA TARGET Center, and Regional Disability and Business Technical Assistance Centers (DBTACs), to name a few.

4. State Assistive Technology Program in the United States

VIII.24 State AT Programs were originally established under the Technology-Related Assistance Act of 1988 (Tech Act) P.L. 100-407.

VIII.25 The Act was reauthorized in 1994, 1998 and 2004. With each reauthorization, the program requirements changed significantly from providing needs assessment and direct services, to a primary focus on systems change advocacy activities, to direct services and coordination. In 1998, the Technology-Related Assistance Act was repealed and the Assistive Technology Act was authorized as the Assistive Technology Act (AT Act).

VIII.26 The AT Act's reauthorization in 2004 contained a special rule that allowed if the amount of funds appropriated was greater than the base year amount, the Secretary could award grants on a competitive basis for periods of 1 year to States or outlying areas in accordance with the requirements of title III of the AT

Act (as in effect before the enactment of the Assistive Technology Act of 2004). Appropriations were made available in FY 2005 and FY 2006.

VIII.27 In 2007 Congress passed a Continuing Resolution which funded programs under the Assistive Technology (AT) Act for FY 2007 at the FY 2006 level. Appropriations in subsequent years have only funded Sections 4: State Grants for Assistive Technology; Section 5: State grants for protection and advocacy and technical assistance, data collection and the national internet site in Section 6.

VIII.28State AT Programs implement required activities focused on improving the provision of assistive technology to individuals with disabilities of all ages, through comprehensive, statewide programs that are consumer responsive. AT Programs make AT devices and services more available and accessible to individuals with disabilities and their families through state-level activities and state leadership activities. The State AT Programs are authorized under the Assistive Technology (AT) Act. The AT Act provides a formula grant for a State Assistive Technology (AT) Program to each of the 50 states, the District of Columbia, Puerto Rico and the four outlying areas. The most recent reauthorization of the AT Act provides resources so each state will receive $410,000 minimum for the state AT program and $50,000 minimum for protection and advocacy services.

VIII.29AT Act Programs implement State level and State Leadership activities which include: (i) State financing activities, such as systems for the purchase, lease or other acquisition of or payment for AT devices and services or alternative financing systems, such as low-interest loan funds, interest buy-down programs, revolving loan funds, loan guarantees or insurance programs or other mechanisms providing for the purchase, lease or other acquisition of AT devices or services; (ii) Device reutilization programs that support the exchange, repair, recycling or other reutilization of AT devices; (iii) Device loan programs that provide short-term loans of AT so that individuals can try out devices or fill a temporary need for a device; (iv) Device demonstration programs in which personnel familiar with AT demonstrate a variety of AT devices and services and provide information about AT vendors, providers and repair services; (v) Training and technical assistance, which includes developing and disseminating training materials, conducting training and providing technical assistance to enhance the AT knowledge, skills and competencies of appropriate individuals; (vi) Public awareness activities designed to provide information on the availability, benefits, appropriateness and costs of AT devices and services, including a statewide information and referral system; and (vii) Coordination

and collaboration of activities among public and private entities responsible for policies, procedures or funding for the provision of AT devices and services.

5. The Mada Center for Assistive Technologies, Qatar

VIII.30 The Qatari Supreme Council of Information and Communication Technology (ict QATAR) together with organizations from the public and private sectors announced plans on April 17, 2009, to establish an independent Center for Assistive Technology in Doha that will be dedicated to helping people with disabilities through information and communications technologies.

VIII.31 The Mada Center for Assistive Technology objective is to serve as a catalyst for research and development of ICT assistive technologies and to create public awareness around best practices and solutions. In addition to showcasing and facilitating the access to assistive technologies for PwD, the Center will serve as a vehicle for cooperation with industry partners and to coordinate the efforts of existing institutions in Qatar and the region.

VIII.32 G3ict's discussions with the leadership of the Mada Center indicate that the Mada Center will likely launch initiatives to serve the needs of disabled persons throughout the Arab Region such as a portal showcasing solutions and open source assistive software in Arabic. Qatar has already funded in the past major initiatives such as the first international conference and program to standardize Arabic Sign Language.

VIII.33 The Center is a direct outcome of series of meetings held by the Assistive Technology Working Group (ATWG), that ictQATAR formed in October 2008 in response to the International Telecommunication Union's announcement of 2008 as the year to connect PwD through ICT. ATWG includes many of the leading organizations that work with people with disabilities from the government, not-for-profits and corporate sectors. Local partner organizations include the Shafallah Center, the Al-Noor Institute, and the Qatar Society for People with Disabilities, and the Supreme Council of Family Affairs.

VIII.34 The Mada Center for Assistive Technologies is still in its start-up phase.

B. The role of universities and academic research centers

VIII.35 The past few decades have seen steady growth in the rate at which knowledge is accumulated, diversified and disseminated. One result is an increasing obsolescence in what people know, how they use that knowledge to solve problems, and even how they solve problems. Knowledge is more important than ever, as it allows people, organizations, and countries not only to generate rapid changes in communities, but also to cope with such changes. New

knowledge is increasingly being produced and applied in 'hybrid' settings that may involve groups of people from different disciplines and institutions coming together to tackle specific problems (e.g., Center for Excellence in Technology Innovation).

VIII.36 The changing role of knowledge in society means that the research agendas of universities are increasingly defined through interaction with non-academic parties, in particular government and industry. As a result, the line between academic and non-academic realms is becoming blurred.

VIII.37 Recent changes in the universities of developed countries suggest the emergence of an entrepreneurial model of academic research. The key feature of this model is acceptance by universities that they have a responsibility not only to provide teaching and carry out research, but also to contribute directly to the economic growth and social welfare of the society in which they are embedded.

VIII.38 This new model is now being presented to developing countries as a way of fostering entrepreneurship among their researchers, of creating an awareness of the needs of businesses, and thus of attracting industry funding. Some successful examples to which this model has been applied include the Instituto Tecnológico de Monterrey in Mexico, and the University of Campinas in Brazil.

C. Government supported R&D for Assistive Technologies

VIII.39 As seen above in section 4.D, ATs and ICTs involve a broad range of products and services directed toward a diverse population of users. Engaging in the development and production of useful technologies presents many challenges and obstacles. A number of barriers - e.g., lack of consumer awareness of technologies, lack of financial access - to use by people with disabilities may be encountered.

VIII.40 Developing AT and ICT products and services involves: research and development; commercial application and production; consumer and professional awareness; guidance and product or service selection; financial access to equipment and services; personnel adaptation, training, and use; and, product and/or service maintenance, repair, and replacement.

VIII.41 Many challenges, problems and obstacles relate to weaknesses in the market for ATs and ICTs. Sales may be limited by the small numbers of consumers and the lower than-average incomes of people with disabilities. Consumers and their families may not be aware of relevant product and service options, or may find them difficult to evaluate. Innovators and entrepreneurs may face high costs for

manufacturing and distribution, as well as high research and development costs in relation to potential sales.

VIII.42 One alternative is government-supported research and development. In the United States, investment in ATs and ICTs has received support from the U.S. Department of Veterans Affairs and the U.S. Department of Defense, in part because of the return of military personnel who have lost limbs in Iraq or Afghanistan. In addition, the National Institute on Disability Rehabilitation and Research (NIDRR) has funded a number of Rehabilitation Engineering Research Centers that conduct research and development. The RERCs may work on accessible mainstream technologies (e.g., household products and computers) as well as assistive technologies (e.g., wheelchairs), and the application of such technologies in environments (e.g., workplaces). Total funding for the centers program was at about $11 million in the late 1990s, but in FY 2000, the funding increased to more than $15 million and increased again in FY 2001 to more than $20 million as additional centers were. The funding for each center is modest now, averaging less than $1 million per center per year.

VIII.43 Government support for research is not restricted to government and academic researchers. The U.S. Congress has specified that a portion of certain government agency budgets for assistive technology, science, or engineering research be allocated to support technological innovation in the small business community and to encourage commercial applications of technologies developed through government-supported research.

VIII.44 Developing successful AT or ICT products depend on consumer involvement with potentially disabling conditions to be involved in technology development. For certain products, the ability of companies to assess market demand may be restricted by the limited market data on people with disability. In some cases, companies could also benefit from information on the broader market, for example, how people without mobility or sensory limitations view various accessibility features for mainstream products. Companies may be concerned that people may avoid products that suggest disability, and firms may be unaware of universal design principles that include the attractiveness of a product to a broad range of users.

VIII.45 New and more effective assistive technologies are possible. For products with large markets, a good business case for investment in research, development, and production can often be made, although it may still be useful for consumers, policy makers, and others to become more articulate and persuasive in encouraging investment. Unfortunately, many types of AT do not fit this model, and normal market processes fall short in meeting urgent consumer needs.

D. Barriers removal initiatives

VIII.46 Through government, legislation and public policies have sought to remove barriers and make some mainstream products and services more accessible, particularly telecommunications and other electronic and information technologies. Some of these policies apply only to government purchases. In the United States, the ADA focused on reducing certain kinds of environmental barriers and setting standards for the accessibility of buildings, transportation systems, and other public spaces. Although that law and accompanying regulations covered some products that are often installed in buildings (e.g., ATMs), many other mainstream products that are not covered by the ADA or other policies also present substantial barriers to people with disabilities. Section 508 of the Rehabilitation Act focused on ensuring that ATs and ICTs purchased by the U.S. government are accessible.

E. Awareness raising campaigns

VIII.47 Consumers, government leaders at all levels and entrepreneurs can address AT and ICT barriers through public awareness campaigns that would target not only the lack of knowledge about available technologies but would also help people assess whether they have developed functional deficits for which helpful products exist. The campaign would include guidance for people on: recognizing their potential needs for assistive technology; finding useful information about available technologies and their pluses and minuses; identifying and evaluating specific products; locating sources of financial assistance; and, working with health care professionals, suppliers, manufacturers, and others to obtain, maintain, adjust, repair, or replace equipment.

VIII.48 In some cases, people are aware of products but consider them unattractive or stigmatizing, which can be a major barrier to their use. A large-scale, long-term, repetitive public media campaign to increase the acceptance of ATs and ICTs can highlight what products are available to "make life easier" and convey that it is normal to use smart technologies. Promotions might show celebrities using technologies and natural-looking aids. Another strategy might be to persuade the producers of popular television programs to show the unobtrusive, routine use of various technologies. The idea is to help people feel more comfortable using technologies that may allow them to live independently longer or to stay with their families longer by reducing the amount of informal care giving needed. If a public awareness campaign identifies unattractive product design as a problem, then that knowledge can also guide contacts with manufacturers and designers

about how to modify the products to reduce this barrier to the use of helpful technologies.

VIII.49 In addition, increasing professionals' awareness of useful assistive and accessible technologies should have a positive effect on the use of these technologies and, in turn, on people's functioning and independence. The acquisition of technologies may be limited by a lack of insurance coverage or other financial access, particularly for people with disabilities who have modest or low incomes.

F. Engaging ICT Products and Services Vendors

VIII.50 Private sector ICT vendors are the driving force behind ICT innovations and the dramatic expansion of ICT usage around the world and in Brazil. Without cooperation of the private sector, it is therefore unlikely that any initiative to mainstream ICT accessibility for PwD can be effective. And, as far as the development of assistive technologies is concerned, interoperability requirements can only be met with the active participation of leading ICT vendors of core operating system environments or most widespread end user applications and interfaces. A number of ICT vendors have developed dedicated organizations specifically dealing with accessibility. In certain cases, such as IBM, accessibility, from the inception of the company in the early part of the 20th century, has been a focus of both product development and internal human resources management. Microsoft also has a large product development group dedicated to accessibility. NTT DoCoMo, the leading Japanese mobile phone operator, has developed one of the most successful universal design approaches to wireless services in the world with exceptional business results and high levels of technology adoption among PwD. Many ICT vendors, however, focus on accessibility as a regulatory and legal issue and are therefore looking at it as a constraint and potential liability that they have to deal with rather than as a market opportunity. This attitude has been historically re-enforced by the many legal challenges that industry had to face regarding lack of accessibility issues.

VIII.51 Engaging ICT vendors can be facilitated by documenting and emphasizing the market opportunity represented by accessible and assistive technologies and helping them uncover specific opportunities. Quite often, product development managers, marketing executives and top management are simply totally unaware of the issues at hand but quite willing to analyze how to best address those from a business angle. Analyzing the needs of PwD and translating those needs in marketing language is therefore a potentially important role that CETI – D can play. Such interaction can be most productive with the business associations of specific classes of vendors such as wireless service providers, television broadcasters, web sites operators. Specialized seminars with

international input and assistance in identifying appropriate standards or technical resources as well as business benefits can go a long way to help mainstream accessible and assistive products and services in private sector vendors products and services offerings.

VIII.52 Another policy angle facilitated by the Convention on the Rights of PwD is to engage ICT products and services vendors by initiating cooperations and partnerships for R&D programs specifically dedicated to new accessible and assistive technologies. This is one area where CETI – D can play an important role. Examples of such consortia exist in many different domains. The European Commission funds a number of consortia in the field of accessible and assistive technologies which can serve as models from a funding, management and intellectual property standpoint. CETI – D can physically host such research consortia on its own premises or contract with universities research departments as is done frequently in the United States when research grants are awarded by public entities for research projects.

VIII.53 From a funding standpoint, projects may be easier to justify for ICT vendors if a roadmap leading to specific products and services is clearly established. For example, CETI – D could explore wireless navigation support for PwD on mobile phones, involving from inception transportation authorities, large municipalities, wireless service providers and large IT companies and integrators which would probably work best.

G. Implications for CETI–D

VIII.54 International best practices teach us that CETI-D would be well advised to:

- Breakdown silos between social policy makers, businesses and technology professionals, and end users so that the capability of AT and ICT technologies to tackle disadvantages can be fully exploited;
- Document and emulate international good practices with demonstrated effectiveness in:
  - R&D funding
  - Support services
  - Promotion of universal design
- Launch awareness raising campaigns directed to key categories of stakeholders including disabled persons

- Develop a plan for barrier removal with a mix of legislative, regulatory and incentive programs while reaching out to ICT products and services vendors.

IX. JUSTIFICATION FOR THE ESTABLISHMENT OF CETI-D

A. Justification from a Disability Rights perspective

IX.1 Justification for the creation of CETI-D can be traced to existing commitments by Brazil to promote the rights of marginalized populations, such as the Digital Inclusion initiative cited earlier in this document. Similarly, Brazil joined the international community to promote the rights of PwD by way of its ratification of the Convention on the Rights of PwD.

IX.2 The CRPD is rooted in the goals of the United Nations. During the 1970s, a substantial evolution changed the thinking about disabilities issues moving from a medical to a human rights model. This evolution manifested itself in a number of U.N. initiatives that embraced the growing international concept of human rights for PwD and the equalization of opportunities for them.

IX.3 The most recent initiative began in 2001 when the U.N. General Assembly Ad Hoc Committee on a Comprehensive and Integral International Convention on the Protection and Promotion of the Rights and Dignity of PwD was created. The Ad Hoc Committee finalized its work in the eighth session of August 2006, which completed the text for a U.N. Convention on the Rights of PwD (CRPD) that was adopted by the General Assembly on 13 December 2006.

IX.4 As previously mentioned, the preamble of the CRPD depicts "accessibility" as a fundamental right of PwD. It specifically covers information and communication together with education, health, environment, etc. so that PwD can fully enjoy all human rights and fundamental freedoms. This language is written in the preamble in subparagraph (v), so that accessibility is like a cornerstone of the CRPD.

IX.5 In today's knowledge society and related knowledge economy, no one anywhere in the world can actually be excluded from ICT and digital interfaces. Globally, in 2008, there were 1.9 billion people with access to a personal computer at home, 1.7 billion Internet users, 4.9 billion people with access to a TV at home and over 4.6 billion mobile subscriptions. In Brazil, in 2007, there were 29 million people with access to a personal computer, 63.6 million Internet users, 113.4 million mobile subscriptions, and 36.9 million telephone land lines.

IX.6 This is increasing by the day in very large proportions. That means that in any corner of the world today, there are digital interfaces changing the lives of people, making them more productive and giving them access to a new information society. It is not a rich country paradigm, it is a universal paradigm.

IX.7 Article 9 of the CRPD defines accessibility in a very strict fashion. Article 9 actually elevates access to ICTs on a par with access to the physical environment and to transportation. It means that a webmaster has as much obligation to make a website accessible as an architect has an obligation to put a ramp at the appropriate physical access to a building. This has immense consequences because many ICT interfaces are inaccessible today. In effect, almost half of the Articles which are non-procedurals of the CRPD have some form of ICT obligation – ICT accessibility obligation.

IX.8 There are a number of application areas. Some of them are Articles of the CRPD – such as e-government, media and Internet, education, employment, political rights, emergency services, cultural life and leisure, private sector services, personal mobility, rehabilitation – all those sectors of application have mandates for accessibility or reasonable accommodation or for promoting assistive technologies in different cases.

B. Addressing the specific needs of PwD

IX.9 PwD have specificl needs – transportation, communications, medical attention, public services, among others– of whose provision the whole society is responsible, not only the State.

IX.10 In addition to the public sector accessibility provisions that Brazil must undertake, the CRPD also mentions that a ratifying State must ensure that private entities that offer facilities and services to the public take into account the accessibility of those services. That also includes ICT accessibility. This means that Brazil has to make sure that any digital interface or any services have to be accessible.

IX.11 In addition to those mandates on accessibility, there are some very specific and extremely interesting dispositions of the CRPD for Brazil, such as:

- A mandate in the CRPD to promote research and development for assistive technologies (AT).
- Guidelines to actually adopt accessibility at an early stage of product development for ICT products design.
- Reasonable accommodation is defined and mandated.
- An obligation to set accessibility standards.

- In the chapter on cultural life, there is the recommendation to accommodate property rights legislation so that content can be accessible to PwD.

- Not only must ICT and new media be accessible, but there needs to be actual promotion of the use of ICTs and the Internet and new media among PwD for their own benefit.

C. Identifying specific capabilities of PwD

IX.12 PwD have specific capabilities and specialized knowledge revealed by scientific research and empirical evidence, associated to the need to compensate for lost senses, limited mobility or other impediment.

IX.13 Innovation in technology is regarded as a cardinal priority for society and government. Disability has the potential to figure very strongly in this focus on innovation. The role of PwD as innovators can and should be active. PwD should be included in the design process because they are good at it. There are two reasons given for this expertise of PwD in design. First, PwD are often outstanding problem solvers because they have to be … life is often a series of challenges to be overcome. Second, innovative ideas are more likely to come from people who have a new or different angle on old problems. Greater participation of PwD in (all aspects of) technology innovation in the short term may just be the necessary trigger for creating a different, and better, system of innovation for everyone in the future. Given its commitment to inclusion, CETI-D's approach involves a rethinking of ideas about productivity and human ability in the light of new notions of PwD as active users and designers of technologic innovations.

D. Leveraging capabilities of PwD

IX.14 Through social inclusion, PwD can make significant contributions to today's Knowledge Society and Knowledge Economy, as their specific capabilities -- currently underutilized in the absence of means to make practical use of them– could become very useful.

IX.15 CETI-D's design for research and theorization can help clarify the contribution of disability to innovation; in some instances, there could be work that would be undertaken and directed by PwD themselves as part of a career path. The economic benefits of such an approach could be considerable, not to mention the implications for innovation and productivity. Increasing existing systems of participatory design, could introduce new user-driven approaches into

strategically important places in the design processes of ICTs for all people (and possibly in the national innovation system).

IX.16 In another vein, CETI-D's research and development work in the area of producing accessible technology products has the potential to place accessible and affordable ICTs (and ATs) in the hands of millions of Brazilians who currently may not be involved in the burgeoning knowledge economy.

IX.17 Table 8 below represents "low hanging fruits" and priorities for standards and policy making, and research and technologic development, simply based upon Brazil's installed base of information devices as of 2007: 29.2 million personal computers, 63.6 million Internet users, 36.9 million telephone land lines, and, 113 million mobile cell phones which includes text messaging users.

IX.18 Table 1 roughly estimates the "proforma" size of the population of PwD in Brazil who could be impacted by policy, program, and research which emphasizes ICT (or AT) accessibility or affordability. This was be done by assuming an equal penetration of each category of device of the Brazil population among specific groups of PwD (ideal outcome targeted by the CRPD). For example, at the intersection of mobile cell phones and permanent difficulty to hear, it is possible to estimate the number of persons possibly deprived of cell phone access by multiplying the national penetration of ICTs over national population (i.e., estimated to be 180 million for 2007) by the number of people who have permanent difficulty to hear.

Table 8. Number of PwD in Brazil Possibly Deprived of Access to ICTs (numbers in 000s, 2007)

Target Population	Telephone Land Lines 36,900	Mobile Phones 113,400	Internet Users 63,600	Personal Computers 29,000
Some or great permanent difficulty to see	3,432	10,546	5,915	2,697
Some or great permanent difficulty to hear	1,107	3,402	1,908	870
Physical difficulty	295	907	509	232
Permanent intellectual	738	2,268	1,272	584
Mobility	1,476	454	2,544	1,160

Source: ICT Statistics Database. Country data by region. 2. Basic indicators: Geneva: International Telecommunication Union, 2007.
Link: http://www.itu.int/ITU-D/icteye/Indicators/Indicators.aspx

IX.19 The data from Table 8, in turn gives us an idea of the scope of improvement which could be derived from relatively simple standardization and policy

initiatives. For example, making text to speech capabilities compulsory in cell phones could address the needs of approximately 3.4 million individuals who have some or great permanent difficulty to hear in Brazil. As a second example, if CETI-D was to focus its research and development work towards low-cost ICTs (or ATs) and personal computers for people with permanent intellectual disabilities, 584 thousand people could potentially benefit.

IX.20 It is very important not to forget the real goal of providing ICTs in Brazil. The point is to use ICTs (and ATs and related technologies) as a mean to provide information and services (health, banking, government services, education, business, etc.) to improve the life of PwD and other marginalized populations.

E. Potential benefits for Brazil

IX.21 CETI-D can catalyze the bridging of the knowledge and information gap and foster opportunity which would put technologies - such as ATs and ICTs - at the service of development for all population groups. The CETI-D is being designed with the vision of creating an information-rich society to enhance the development and strategic utilization of technologies for national development. The CETI-D is expected to act as a think-tank at the highest level and advise the Brazilian Government on matters pertaining to the development of critical technologies (adaptive, assistive, and information). It is a "smart partnership" between the private, public and community sectors.

IX.22 Furthermore, CETI-D's work portfolio could address a range of issues that benefit marginalized populations (e.g., PwD, people who are illiterate, rural poor, children) across Brazil. Important issues to consider include potential differences in language, literacy, relevance of content, connection speed, access to ATs and ICTs, and cultural patterns of education and leisure and work. Potentially useful directions for CETI-D's work include not just whether prevailing assumptions about technology use correspond with reality, but how these assumptions are formed and perpetuated. For instance, an interesting project could be to evaluate the plans and suggestions made by agencies regarding ATs and ICTs in comparison with how PwD and/or people who are illiterate, in reality, conceive of and make use of these technologies. For example, in recent initiatives and funding programs for AT-based and ICT–based projects, what sorts of application criteria and project guidelines have emerged? What types of project designs are supported or rejected? Why? In these designs what assumptions are made? How do funders, policymakers, and agency workers conceptualize how ATs and ICTs might influence PwD and/or people who are illiterate? How are projects evaluated, and what counts as "success"?

F. Benefits for the international community

IX.23 With its strong IT industry, proactive government, leading Internet usage, commitment to promoting the rights of disabled persons and its large domestic market, Brazil has all the ingredients to become a global leader in accessible and assistive technologies. In order to achieve such a position, CETI–D could organize a symposium for industry and government leaders with the objective to develop a roadmap for developing accessibility services and R&D programs with global potential which would also strengthen its own domestic objectives. Areas of greatest opportunity will likely be in the three following segments:

- Mobile phone applications
- Cloud based AT services
- High added value IT based condition specific ATs

IX.24 Brazil's success could lead to significant AT volumes and economies of scale thus contributing to lowering costs for international markets as well.

X. SCOPE OF CETI-D

A. General objective

X.1 CETI-D's institutional objective is to support the work of SEDPcD by identifying technologic and organizational solutions to strengthen the Lucy Montoro Network as well as the rehabilitation and social inclusion of PwD, and developing such solutions to a level where they can be applied massively in a cost-effective way.

X.2 CETI-D's operational objectives will be to:

a. Attract high level Brazilian and international experts working in the various fields of interest for PwD, and offer them an environment where innovation and creativity are encouraged, in close interaction with the international community;

b. Conduct research to improve skills, particular conditions, and specific cognitive abilities of PwD, which could constitute attractive capabilities in the job market;

c. Produce knowledge about assistive technology for non-specialists and share it through different means (forums, blogs, guidelines, websites);

d. Act as a certifying agency for assistive technology;

e. Develop technological innovations, and their industrial applications, to generate products directed at facilitating the use of the specific abilities of PwD, improving their quality of life and facilitating their inclusion in society;

f. Develop technological solutions to improve rehabilitation and social inclusion for people with visual, hearing, physical and intellectual disabilities.

g. Conduct market research analysis to qualify demand and distribution channels;

h. Identify and develop job market niches able to utilize the specific capabilities of PwD in cooperation with private sector enterprises looking to pursue this new source of specialized labor force for the benefit of their own private companies;

i. Identify possible products, services and solutions that could be made in the main areas of interaction between PwD and the rest of

society, in order to improve their social inclusion and quality of life, starting from the architecture of housing and public services, to social communications and human relations;

j. Identify national and international financing mechanisms to support research; industrial innovation; education, training and job-generation; social structure adaptations and other proposals advanced by CETI-D with help from its support networks;

k. Create communication mechanisms with organizations, councils of rights and public departments, to capture priority needs and share the projects developed.

B. CETI-D STRATEGY

X.3 CETI-D will adopt as core strategy the application of the concept and instruments of the Knowledge Economy. For CETI-D, utilizing a KE strategy would mean to pursue a given concrete objective through **simultaneous investment and work** in the five areas that constitute the instruments of the KE, not in one of them alone, but in all of them at the same time with highly focused purposes and doable targets.

C. CETI-D INSTITUTIONAL STRUCTURES

1. Institutional affiliation

X.4 The creation of CETI-D will instrument a number of specific objectives of the Government of Sao Paulo in general, and the Lucy Montoro Network in particular, towards promoting the social inclusion of PwD through the mobilization of financial, technical and institutional resources aimed at identifying and implementing modern concepts, solutions, technologies and infrastructure, among others, to make possible, facilitate and enhance the active participation of PwD in economic and social activities and within the context of a globalized knowledge society and economy.

X.5 Indeed, the creation of CETI-D as a new organization acknowledges the need for the participation of various instances of the Government of Sao Paulo including the SEDPcD, the State Secretariat of Housing, and the State Secretariat of Development, among others, along with the implementation of the means to promote and mobilize the contribution of knowledge networks and private sector participation from various academic, social, industrial, services, entrepreneurial and other sectors.

X.6 Subject to further definitions from the Government of the State of Sao Paulo, CETI-D would be created as public institution of decentralized administration linked to the SEDPcD and Lucy Montoro Network and created by Executive Decree of the Governor, by State Decree of the Legislative Assembly, or alternative judicial/legislative instrument which will expedite it conformation. The "Terms of Cooperation" signed between the SEDPcD and the State Secretary of Development on December 29, 2010 will serve as the basis for the establishment of CETI-D.

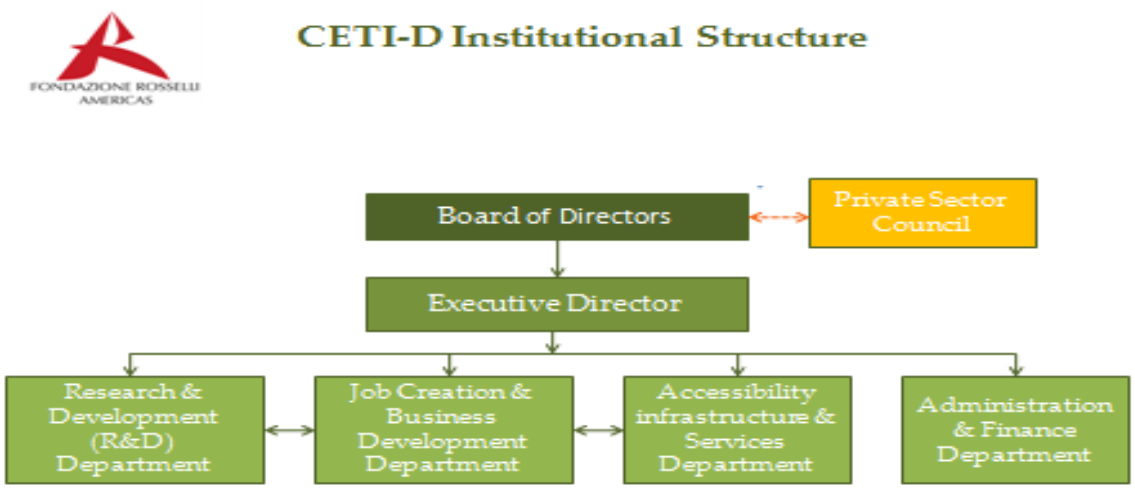
X.7 Initially, CETI-D would be established as a Nucleus of Technological Innovation (NIT) within the framework of, among others: (i) State Decree No. 54.504 of February 6, 2006 which created the "System of Technological Parks of the Sate of Sao Paulo"; (ii) State Decree No. 54.196 of April 2, 2009 which "Regulates the System of Technological Parks of the State of Sao Paulo"; and (iii) the Terms of Cooperation signed between SEDPcD and the State Secretary of Development of December 21, 2009 for the establishment of CETI-D and its respective integration to the Technological Park of Jaguaré.

X.8 This should expedite the legal and organizational establishment of CETI-D along with the provision of the necessary institutional capabilities to obtain the budget allocation from the State of Sao Paulo for 2011. At a later stage and, among the consolidation of CETI-D as a on-going concern, an institutional transition may take place towards the conformation of a "public foundation" under the pertinent legislation of the State of Sao Paulo.

2. Internal Governance Structure

X.9 The Statutes or Bylaws of CETI-D will establish, among others, the overall mandate and objectives of the Institution as well as the structure of its net worth, sources of income, and its governance, organizational and personnel structure. Figure 1 below shows the principal structures for CETI-D at its start-up phase.

Figure 1. CETI-D Organizational Structures



a. Board of Directors

X.10 The Board of Directors will represent the highest governing body of CETI-D and will comprise a minimum of seven members to be designated by the Governor of Sao Paulo including:

- the Secretary of the SEDPcD, who will preside over the Board;
- one representative from the State Secretariat of Development;
- one representative from the State Secretariat of Housing/Housing and Urban Development Company (CDHU);
- one representative from Lucy Montoro Network; and
- leaders of CETI-D Networks.

X.11 The Board of Directors will be responsible for, among others:

- establishing the strategic objectives of CETI-D within the framework of the KE along with the broad policies established in its statutes;
- defining the general scope for the activities of CETI-D;

- approving the strategic institutional plan as well as the pluri-annual and annual operating plans of CETI-D;
- selecting, appointing, supporting and reviewing the performance of the Executive Director/President of CETI-D; approving the overall scope and content of the Internal Regulations and Operations Manual;
- approving CETI-D's organizational and personnel structure;
- defining CETI-D's personnel remuneration policy, and ensuring the consistency and compliance with the guidelines of the Government of Sao Paulo;
- ensuring the availability of adequate financial resources to sustain CETI-D's operating and investment activities;
- setting priorities for budgetary expenditures and programming, and analyzing and approving the annual budget or modifications to the budget;
- evaluating financial and physical implementation progress reports; and
- accounting to the stakeholders for the organization's performance.

X.12 As a decentralized institution, CETI-D will be able to retain a significant degree of autonomy to allow it effectively conduct its activities in the discharge of its mandate including, among others, the establishment of effective cooperation with the private sector and public/private organizations. Such autonomy will precisely come from the presence of the Board of Directors representing the deliberative body, capable of making independent decisions to guide the strategy followed by CETI-D. Even though SEDPcD will retain a significant level of control, being the SEDPcD's Secretary the President of the Board, decisions will still be made by consensus and therefore the Board members could exert significant influence on the outcome of each discussion. Moreover, external sources of funding are expected to complement resources drawn from the State Treasury which could eventually match or surpass the contributions by the State, giving Board members additional leeway in their decision-making.

b. Private sector council

X.13 The President of the Board of CETI-D will have the support of a Private Sector Council, made of representatives from outstanding private companies and

businesses in different areas of private investment, willing to participate voluntarily to support the work of CETI-D as it concerns its relations with the private, entrepreneurial, sector. Potential members of the Council would convene upon the invitation of the President of the Board, and membership in the Council will be confirmed by the Board. Members could rotate or remain according to the work plan agreed with the President, who would seek to maintain a balance in the sector representation of its member to match the strategic orientation of the work of CETI-D.

X.14 The objectives of the Private Sector Council would be:

- Orient the R&D in specific abilities, innovation, industrial applications Department to learn from research, technological advances, and information made available to them by CETI-D, of the specific abilities that are peculiar to people with disabilities and which could be highly useful in different industrial, commercial or service areas;

- Orient the Job creation, Education, Training and Business Services Department to strengthen the job market for people with disabilities where they can receive competitive wages and insert themselves in a productive cycle;

- Involve the group of entrepreneurs participating in the Council and other that can be reached and engaged in the task, to tap this underestimated potential regarding the fastest and cost-effective ways to incorporate people with disabilities in their everyday operations.

X.15 The Council will have access to external guidance and support through inter-agency cooperation MOU established by the SEDPcD with international organizations specialized in the various technical and strategic areas of concern to the Council. Such MOU will be used to provide support to international fund-raising and other operative functions of CETI-D, as is the case of the MOU with FRA[2].

X.16 Progress in the involvement of prominent local entrepreneurs, development of pilot experiences and expansion of those pilots to make these best practices into standard sector employment practice will be reported periodically to the Board under the guidance of the Board's President.

[2] An MOU with FRA is under preparation, in the expectation of it being signed in October 2010

3. Management

X.17 CETI-D will be managed by a small core group of employees including: one Executive Director; four heads of Department; and no more than five support personnel. This structure will allow limiting payroll-overhead costs to the minimum necessary while freeing financial/budgetary resources to support CETI-D's investment programs. This will also be made possible by CETI-D's capability, as a decentralized institution of the SEDPcD to draw, as necessary, from the Secretary's institutional resources including legal counsel, internal audit, public relations and other.

X.18 Indeed such structure will allow CETI-D to effectively allocate most of its budgetary resources to development programs while maintaining the necessary personnel to guarantee, among others: (i) an efficient and transparent administration of its financial and technical resources; (ii) the compliance with national and State regulations with respect to public financial administration and internal control systems; (iii) the compliance with the overall legislation of the State of Sao Paulo for decentralized institutions; (iv) an effective line of communication and reporting to the SEDPcD and other instances of the Government of Sao Paulo; and (v) strong links, lines of communication and collaboration efforts with the private sector and non-governmental organizations.

X.19 On the technical side, the core group of staff will be supported by the contracting of high-level short-term consultants to support, on a case by case basis and as to be established in the annual operating plans of CETI-D, the design and implementation of CETI-D's investment plans and individual projects, as well as the provision of knowledge-based technical support to CETI-D in the discharge of its strategic mandate and objectives. The flexibility in the contracting of short-term personnel and consultants will allow CETI-D to count on specialized manpower while minimizing the organization's overhead costs.

a. Executive Director

X.20 The Secretary of the SEDPcD, upon approval from the Board of Directors will designate an Executive Director of CETI-D who will represent the highest managerial authority in CETI-D and whose responsibilities will include, among others:

- guiding and coordinating the activities of CETI-D while ensuring its effective compliance with the norms, regulations and national and state legislation;

- elaborating the internal regulations manual of CETI-D as the organizational norms to be submitted to the Board of Directors for approval;
- designating the heads of departments;
- allocating the necessary budgetary, human and technical resources to each of the institutional instances in the organizational structure;
- leading and coordinating the preparation of the strategic and operational operating and investment plans of CETI-D;
- ensuring and effective and transparent administration of the organization's resources;
- leading the efforts aimed at leveraging CETI-D's State budget allocations with financial resources from external public, private and non-governmental entities;
- providing for the legal representation of CETI-D; and
- undertaking other activities as instructed by the Board of Directors.

X.21 The Executive Director will be characterized by strong managerial skills that will allow him/her to exercise effective leadership in the organization and, in addition, must have solid planning, coordination, execution and implementation capabilities to guide the overall administrative and technical governance structure of CETI-D.

X.22 A central responsibility of the Executive Director will be to guide the work of the Departments and the work of the networks, towards constructing a robust program strategy for CETI-D, one that follows the strategic guidelines provided by the KE, that is, a program that tackles the objectives it pursues through concerted and simultaneous investment in the five KE areas: innovation, education, social inclusion, ICT and enabling policies. The ability to perform this function skillfully is essential, and should be a determining factor at the time of choosing the person who would be CETI-D's Executive Director. He/she must be able to work under this multi-disciplinary and multi-faceted approach, avoiding the risk of giving more weigh to any one of the sectors or areas over the others.

X.23 Besides this over-arching objective, CETI-D Executive Director will be directly responsible for identifying national and international financing mechanisms to

support research; industrial innovation; education, training and job-generation; social structure adaptations and other proposals advanced by CETI-D with help from its support networks. In performing this function, the Executive Director could be assisted by technical assistance and fund-raising organizations with which CETI-D had established cooperation agreements or contracts.

b. Departments

X.24 R&D in Specific Abilities, Innovation, Industrial Applications Department. The R&D in Specific Abilities, Innovation, Industrial Applications Department would be responsible for contributing to the fulfillment of two of CETI-D's objectives: (i) attract high level Brazilian and international experts working in the various fields of interest for PwD, and offer them an environment where innovation and creativity are encouraged, in close interaction with the international community; (ii) conduct research to unveil and demonstrate skills, particular conditions, and specific cognitive abilities of PwD, which could constitute attractive capabilities in the job market; and (iii) develop technological innovations, and their industrial applications, to generate products directed at facilitating the activities of daily living of PwD, improving their quality of life and facilitating their inclusion in society.

X.25 In order to implement a significant R&D agenda for CETI-D, this Department will work with the coordinators of the Research and Innovation & Industrial Application Networks (see below) to tackle three complementary functions:

- Operate as a research and certification lab, where most promising projects are analyzed and their applications developed, and where products or services developed by other institutions could gain quality certification;
- Act as a clearing house for research and applied research projects conducted by others, establishing connections with organizations outside of Brazil; promoting peer reviews and other means of testing the proposals; and suggesting possible applications and development opportunities within CETI-D and through institutions to which CETI-D is associated; and
- Become a project funding mechanism if and when project proposals are deemed to have commercial or institutional value and could be subject to State, Federal or international financing.

X.26 First year operation budget for this Department should include funds to conduct at least one priority project for which State funding has been identified at the

time of presentation of the 2011 budget. The proposed "R&D" Department project will be part of a larger project designed in coordination with the other Departments of CETI-D, so that the R&D Department will contribute with research, innovation and industrial application activities to the fulfillment of a central objective being pursued simultaneously by the other two Departments.…

X.27 Job Creation, Education, Training and Business Services Department.The Jobs Creation, Education, Training and Business Services Department would be responsible for contributing to the fulfillment of CETI-D's objective to identify and develop job market niches able to utilize the specific capabilities of PwD in cooperation with private sector enterprises looking to pursue this new source of specialized labor force for the benefit of their own private companies.

X.28 The Department will also interact with the Social Inclusion Network (see below) in the subjects of Education and Training, as these would be public sector contributions essential to develop the skill needed by PwD to participate effectively in the job market.

X.29 First year operation budget for this Department should include funds to conduct at least one priority project for which State funding has been identified at the time of presentation of the 2011 budget. The proposed Jobs Creation, Education, Training and Business Services Department project will be part of a larger project designed in coordination with the other Departments of CETI-D, so that the Jobs Creation, Education, Training and Business Services Department will contribute with the entrepreneurial connections to support the central objective being pursued simultaneously by the other two Departments.

X.30 Accessibility Infrastructure, Housing and Public Services Department. The Accessibility Infrastructure, Housing and Public Services Department would be responsible for contributing to the fulfillment of CETI-D's objective to identify possible adaptations that could be made in the main areas of interaction between PwD and the rest of society, in order to improve their social inclusion and quality of life, starting from the architecture of housing and public services, to social communications and human relations.

X.31 This Department will work in close coordination with the Social Inclusion Network (see below) to secure the cooperation of the various public sector agencies (State Secretariats, Municipalities, Federal Agencies, and others), whose collaboration will be needed to undertake the experimental projects to be designed by CETI-D.

X.32 First year operation budget for this Department should include funds to conduct at least one priority project for which State funding has been identified at the

time of presentation of the 2011 budget. The proposed Accessibility Infrastructure, Housing and Public Services Department project will be part of a larger project designed in coordination with the other Departments of CETI-D, so that the Accessibility Infrastructure, Housing and Public Services Department will contribute with the inter-agency connections and collaboration to support the central objective being pursued simultaneously by the other Departments.

X.33 Administration and Finance Department. The Administration and Finance Department will be responsible for overseeing the budgeting, accounting and treasury functions of CETI-D, in addition to ensuring the efficient functioning of the internal control systems. It will also be responsible for personnel management, goods and services administration and, in general, overseeing the overall administrative processes and ensuring an adequate safeguard of the Institution's assets. The Department will operate under strict guidelines, controls and regulations applicable to public institutions of the Government of Sao Paulo, and in direct coordination with the SEDPcD.

c. Associated structures: CETI-D Support Networks

X.34 The ambitious task the SEDPcD has set out to accomplish through CETI-D cannot be achieved without the support of the community, in particular the support of those in the community in a position to make a change in the conditions and opportunities open to Persons with Disabilities (PwD), physical, sensorial and/or intellectual. Thus, the SEDPcD shall establish a set of "networks" that will link CETI-D with different sectors and actors in the entrepreneurial, industrial, academic and social-work sectors, who can be instrumental in applying the principles and programs sustained by the Center.

X.35 Members of the research, academic, education, research, public sector agencies involved with issues of concern of PwD and members of the private sector willing to participate in the design of solutions to their needs will be sought to integrate CETI-D's support networks. For them, participating in CETI-D networks would respond to some of the following reasons:

- The hope to enhance the impact of their individual work by becoming part of a larger group under the guide of SEDPcD to pursue joint – focused-- goals which can multiply the effect of otherwise disparate and uncoordinated efforts;

- The benefit of undertaking joint research, education, and social development projects in partnerships with CETI-D, thus gaining access

not only to additional funds but to international sources of innovation and technology;

X.36 The opportunity to apply academic or theoretical research to operational projects through the connections CETI-D has with the public and private sector involved in actual provision of services for PwD.

X.37 The networks will be responsible for performing the following functions:

- Participate in the definition of objectives and start-up of CETI-D, and later, contribute to its development through active participation in the annual programming of CETI-D´s activities;
- Suggest long, medium and short term programs that could be undertaken by CETI-D with public funds, which could facilitate the private and academy sectors ability to meet the demand of PwD with products and innovative technologies for their benefit;
- Undertake joint public-private projects, or private sector projects alone, in the context of the programs agreed upon with CETI-D, and do so matching the funds provided by CETI-D with those made available by the private sector or academia involved in such projects...

X.38 The networks will work under the following guidelines and terms or reference:

- A Network should consist of a Leader and other members. All of them should be willing and able to work efficiently, at no cost;
- The Network Leader is appointed by the Secretary of the SEDPcD, chair of CETI-D's Board, for a one-year period, renewable;
- The Network Leader is a member of the CETI-D Board;
- Standing network personnel will be appointed by the network leader, and validated by the CETI-D Board;
- Members of the Network may serve as "Full-Member" or "Co-opted Member". Full membership means participation in every Network discussion and planning, and leadership of initiatives. Co-opted membership means participation in single or periodic initiatives or discussions;

- A Network should have a maximum of 6 Full-Members. There shall be no limits for co-opted membership;
- Members may serve on a Network for a maximum of six years. This may be extended to 8 consecutive years in total if a member is appointed Leader. In special cases, the Board may extend the period of membership for the benefit of the CETI-D;
- Members who, for any circumstance, cannot fulfill their duty, should be replaced, thus giving others the opportunity to serve;
- To assure continuity, no more than half of the Network's members should be replaced at the same time;
- A person may serve as a full member on only one Network at a time;
- There will be no co-Leaders for the Networks.

X.39 Leaders of the networks must have the following qualifications:

- Management skills:
  - Lead a Network;
  - Motivate Network members;
  - Effective written/verbal communication skills;
  - Meet deadlines and observe regulations / budget;
  - Deal effectively / sensitivity with all members and CETI-D's Board.
- Expertise in the relevant areas of Network responsibility;
- Mature, responsible and respectable person;
- Common Sense;
- Time and commitment to perform the required duties.

X.40 The networks would attract members of civil society and special interest groups to buttress and leverage the operation of CETI-D in its main areas of activity: (i) research; (ii) technological innovation & industry; and (iii) social inclusion. A

forth network would operate to look for ways to make CETI-D and network financing sustainable.

Figure 2. CETI-D Support Networks

X.41 Research network. The purpose of this network is to connect universities and research centers in Brazil and internationally, working in scientific and technological developments to prevent, deter, solve, or in any other way improve the conditions of people with disabilities. This network will:

- Make CETI-D aware of latest developments in science & technology in this area;
- Guide CETI-D's fund-raising in support of priority programs;
- Create synergies, reduce duplication, and build critical mass in Brazil's and international research efforts directed towards meeting the needs of PwD.

X.42 Priority tasks for this network at the time of CETI-D structuring could include:

- Appoint a network coordinator for a one-year period, renewable;
- Suggest a set of highest priority research programs to support the achievement of CETI-D objectives;

- Identify and describe existing local (Brazilian) and international research projects which could contribute or become part of those priority research programs;
- Identify needs for additional research and/or inter-agency coordination (including federal to state government coordination) to fill the gaps between the research goals and existing projects;
- Suggest means by which CETI-D could help close those gaps with funds, supporting the creation of research platforms joining currently disconnected efforts, international connections or other support, in cooperation with other specialized agencies active in this field;
- Report to CETI-D the results of this analysis and suggest a set of research programs and projects which could be included in the five-year CETI-D strategic plan.
- Participate in the discussion of CETI-D's short, medium and long term strategic planning, seeking to include those programs and projects deemed priority by the network.

X.43 Industrial innovation network**.** The purpose of this network is to bridge the supply of technological innovation and its industrial applications, with the demand for such products and technologies useful to people with disabilities. This network will:

- Allow direct communications between the supply and demand of technologically advanced products specialized in areas of interest of PwD;
- Permit CETI-D to understand the workings of the market for these products and learn how to influence the market so as to include lower-income people with disabilities ;
- Allow CETI-D to act as a "clearing house" for technologically advanced products which have been tested and approved by corresponding certifying authorities in their countries of origin.

X.44 Priority tasks for this network at the time of CETI-D structuring could include:

- Appoint a network coordinator for a one-year period, renewable;

- Analyze main areas of demand for technology innovation in the various areas of interest of PwD (among others: homecare tools; low cost technology to aid education at all levels; communication tools and low cost software including computer, television, telephone access;
- Identify main fields of supply of industrial applications of technology innovation both in Brazil and abroad;
- Identify main channels of communication between supply and demand, and report on deficiencies or inadequacies;
- Identify means to promote production and commercialization of industrial applications of technology innovations for PwD at prices that would make them accessible to all;
- Participate in the discussion of CETI-D's short, medium and long term strategic planning, seeking to include those programs and projects deemed priority by the network.

X.45 Social inclusion network**.** The purpose of this network is to identify and contribute with the social transformation, based on equivalent opportunities, to ease the social inclusion of PwD. This network will:

- Research any Brazilian and worldwide developments in education, health, rehabilitation, culture, leisure, sport, urban design, housing, public services, and transportation infrastructure, aimed at improving the social inclusion of PwD;
- Develop campaigns to raise society's awareness towards an inclusive culture, that values diversity;
- Identify new job opportunities for PwD, based on research, technological development and development of the job market;
- Articulate and mediate PwD's priority needs, from society and public sector with CETI-D;
- Share developed solutions and help train PwD and those serving PwD to use these solutions.

X.46 Priority tasks for this network at the time of CETI-D structuring could include:

- Appoint a network coordinator for a one-year period, renewable;
- Identify the greatest priorities in the fields of education, health, rehabilitation, culture, leisure, sport, urban design, housing, public services, and transportation infrastructure;
- Identify best-practices and lessons-learned from previous efforts by local (Brazilian) and international agencies specialized in these fields;
- Identify possible lines of action to raise society awareness for the social inclusion of PwD;
- Define priorities and articulate needs of training for professionals in the areas of services applied to PwD;
- Help implement the public policies related to PwD, defining programs that articulate education, accessibility, communication, management, research, monitoring and evaluation;
- Participate in the discussion of CETI-D's short, medium and long term strategic plan, seeking to include those programs and projects deemed priority by the network.

X.47 Sustainable financing network**.** The purpose of this network is to propose financial mechanisms to make CETI-D and its services, including the applications of the services derived from the same Support Networks, financially sustainable. This network will:

- Device a fund-raising strategy directed towards the private sector;
- Discuss ways to get the general public involved in supporting specific activities, programs or campaigns; and
- Suggest means to make the operation of CETI-D as cost-effective as possible.

X.48 Priority tasks for this network at the time of CETI-D structuring could include:

- Appoint a network coordinator for a one-year period, renewable;
- Review core budget projection for CETI-D and identified public sector financing;
- Contribute to the structuring of CETI-D's short, medium and long term strategic plan, and help estimate the cost of those programs selected as priority;
- Analyze sources of long-term support from fiscal sources;
- Identify potential international sources of credits and grants;
- Discuss with CETI-D possible fund-raising strategies, including professional services required to undertake them;
- Suggest programs and projects potentially subject to international financing through loans and technical cooperation;
- Suggest possible means to get community financial support through campaigns or membership options.

XI. OPERATION OF CETI-D

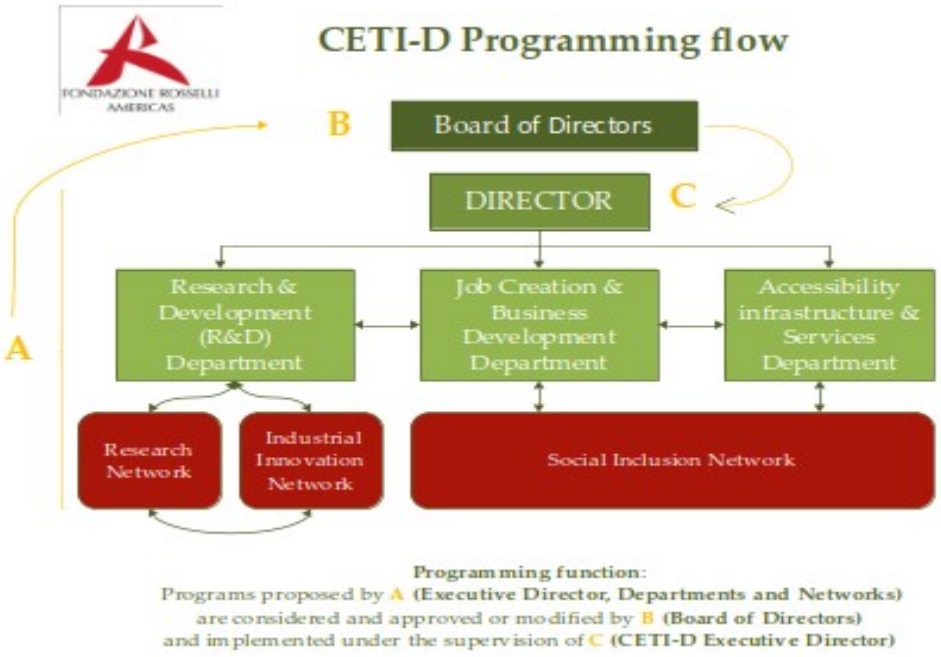
A. Policy making

XI.1 Sao Paulo State policy regarding PwD, which will guide the work of CETI-D, will be expressed by the SEDPcD through the figure of its Secretary acting as President of the Board of Directors. All major institutional decisions will be weighed against this policy background ensuring consistency with overall State-wide policy directives.

B. Programming

XI.2 Long term programs for CETI-D will be drafted by the Board of Directors under the orientations provided by State policy and CETI-D institutional mandate; long-term programming will also reflect the intention of making CETI-D a cooperative effort between the public and the private sector, including support drawn from international cooperative efforts. Such long-term programming will be reflected in five-year strategic plans.

Figure 3. CETI-D Programming Function



1. Five-year strategic plans

XI.3 Each five-year strategic plan will be designed to fulfill four goals:

- To reflect the strategic priorities set by the Board in the pursuit of CETI-D's mandate and objectives;
- To reflect long-term goals for public-private and inter-agency cooperation suggested by CETI-D Networks;
- To ensure that all CETI-D efforts are implemented following the KE model of simultaneous investment and work in the five KE instruments: innovation, education, social inclusion, TICs and habilitating policies, all converging towards clearly defined and discrete objectives for each five-year period; and,
- To associate objectives and targets to potential sources of financial support, so that each priority is matched with a viable source of financing that would make it likely to be accomplished. After the first year of implementation, progress towards attainment of goals set in the five-year plans would be reviewed and assessed at the conclusion of each annual exercise, on the results of the respective annual Business Plan.

XI.4 The "Five-Year Program" or strategic plan of CETI-D will comprise a description of each of the programs, subprograms and activities to be undertaken toward the attainment of CETI-D's strategic mandate and objectives in the medium-term, and based on the programmatic structure of CETI-D; a codification of the programs following the SEDPcD's overall strategic plan and following the medium-term programming guidelines of the Government of Sao Paulo; the objectives and justification of each of the programs that form part of the plan; the projection of operating and capital/investment resources needed to undertake CETI-D's activities including the corresponding sources of funding; the estimated period for execution and completion of each program and activity; and the final product along with an output/outcome indicator.

2. Annual programming

XI.5 The objectives set by the five-year strategic plans will guide annual programming for CETI-D. The annual programming will have the function of setting short-term goals and targets as defined by the Executive Director for each Department and for associated support structures such as the Networks themselves as well as other organizations with which CETI-D had established collaboration agreements. Short-term planning would be greatly influenced by

programs suggested by the Networks, and therefore annual programming would be a participatory process at the stage of setting goals and priorities for each year.

XI.6 However, once ideal goals and priorities have been set, annual programming will be driven by a Business Plan structure; that is, annual programming will correspond to CETI-D's ability to secure funding for each one of the programs, projects and activities planned, either from its own internal sources of from sources outside of the organization.

XI.7 The one-year business plan will be mainly derived from the five-year strategic plan and taking into consideration the accomplishments, progress and results of previous years, as well as adjustments that may take place as a result of the dynamics of the overall social and economic development objectives of the Government of Sao Paulo, the SEDPcD and CETI-D itself. The annual plan will contain, as a minimum: a concrete description of the vision and mission of CETI-D along with the overarching objectives for the calendar year; a detailed description of all operating and project/investment initiatives to be undertaken during the year including programs, subprograms and activities; a cost structure and corresponding budget for each program based on CETI-D's and SEDPcD's programmatic structure, as well as the sources of funding; the internal instances responsible for the implementation of the various programs and activities; timing for the implementation; and product/outcome indicators.

XI.8 The Business Plan mode of operation is congruent with the effort to keep CETI-D recurrent costs and core staff to a minimum, as only those activities which have funding will be undertaken, and only the consulting personnel required for those activities will be hired or confirmed in their posts. In order for this Business Plan structure to work properly, a number of conditions must be met:

- Close coordination between Business Plan development and the fund-raising function, so as to direct the search for funding towards those areas where programs are being identified;
- Programs and projects that are multi-year and have secured external and/or internal financing must be treated separately from other activities; the latter must respond to a strict short-term (annual or shorter) planning and budgeting, so as to avoid interruption of activities mid-way in their implementation;
- Contracts with consultants must include all necessary provisions to allow for flexibility in case funding for a given program comes to be cancelled or suffers delays or reductions;

XI.9 Once the Business Plan is completed, it would be put to consideration and approval by the Board of Directors, and once approved, specific responsibilities will be assigned to the Departments, the Networks, and the various institutional instances that will operate in cooperation with CETI-D.

C. Project execution

XI.10 CETI-D projects would include multi-year engagements and short-term activities. Project will stem from: mandates of the Board of Directors; initiative of CETI-D Departments; or recommendations from the Networks. In each case, CETI-D staff, lead by its Executive Director, will prepare project proposals in the context of CETI-D's annual Business Plans.

XI.11 While CETI-D is expected to be very active in the identification and development of project proposals, it is not expected to acquire the internal ability to be in charge of all implementation activities. Project implementation could be organized along these lines:

- Projects involving public sector investment in the realm of responsibility of the SEDPcD would be implemented by the SEDPcD itself, drawing funds from the Secretariat's budget, but will receive technical support from CETI-D;

- Projects involving public sector investment in sectors other than those under responsibility of SEDPcD (for example, projects involving urban infrastructure, education, or other areas where CETI-D and its networks has identified a project designed to improve social inclusion and quality of life for PwD) would be implemented by the respective specialized public sector agencies; CETI-D could provide technical assistance for its implementation, and could co-finance them if funds have been secured in its Business Plan;

- Projects which involve private sector agencies either exclusively or jointly with public sector agencies would be: (i) financed and implemented by those same private agencies with technical support from CETI-D; or (ii) co-financed by CETI-D utilizing resources secured in the respective Business Plans or raised from external sources, but still implemented by those same private agencies.

XI.12 Project-specific consultants could work in the implementing agencies, but must keep close coordination with CETI-D's Departments.

D. Procurement

XI.13 As CETI-D's administrative capabilities would be limited, it is recommended that CETI-D, through the administrative structure of SEDPcD avails itself of the services of a Contract Management Firm (*Companhia Gerenciadora*), hired through a retainer contract or appropriate legal means, which would become responsible for managing project-related contracts and others for CETI-D. Nonetheless, all procurement processes undertaken on behalf of CETI-D will fully comply with Federal Legislation with respect to procurement of goods, services and works and administrative contracts, while ensuring the application of all the necessary control systems to guarantee the efficiency and transparency of such processes.

E. Inter-agency agreements within Brazil

XI.14 The intention is to make CETI-D a "hub" organization where information and documentation obtained by other agencies are processed, applied and disseminated to other interested parties. Likewise, information and documentation generated by CETI-D will be shared with organizations working in its field of work. To further this purpose a number of inter-agency agreements will be established during the life time of CETI-D. At the time of start-up, at least the following are considered priority:

1. Secretariat for Development

XI.15 On December 21, 2009, the SEDPcD and the State Secretary of Development of the Government of Sao Paulo signed the "Terms for Cooperation" agreement which established the foundation for the implementation of CETI-D. Under such collaboration framework, the two State Secretaries agreed to: (i) jointly developing and implementing technical cooperation projects aimed social inclusion, integration and support to persons with disabilities; (ii) exercise the necessary inter-institutional collaboration and coordination at the federal, state and municipal levels in the implementation of related programs and projects; (iii) provide specialized technical assistance and information in this field, towards the design and implementation of investment programs; and (iv) accompanying and validating the results of the projects and programmed activities *vis-à-vis* the joint objectives in the framework of the agreement.

2. Secretariat of Housing

XI.16 Sao Paulo's State Secretariat of Housing (SH) is expected to have a significant role in the start-up and long-term operation of CETI-D.

XI.17 The coordination between SEDPcD and CDHU will take place within the framework of: (i) a new "Terms for Collaboration" or "Collaboration

Agreement", specifically signed between the two institutions towards the implementation of a new Line of Project Financing "Innovation in Housing, Services and Urban Integration in Favor of Persons with Disabilities" for the purpose of financing technology innovations in housing units and urban development complexes financed by CDHU[3]; or (ii) an addendum to the existing "Terms for Technical Cooperation" and "Agreement" between SH/CDHU and SEDPcD of 2009, in order to establish the action and collaboration areas and guidelines within the framework of the establishment and objectives of CETI-D. In this respect, it is important to note that the transfer of financial/budgetary resources within institutions of the Government of Sao Paulo requires the existence of a signed "Agreement", making the second option a more viable alternative.

XI.18 In this context, SEDPcD/CETI-D would be expected to contribute with:

- Identification of technology and innovation solutions to improve housing accessibility and functionality for PwD, and to form part of the specific line of financing within the CDHU in social housing;
- guiding the Research & Development (R&D) activities of its Departments to cover the needs of specific projects selected by CDHU, which would later become products and services that would be part of its financing portfolio; and
- supporting technical oversight by CDHU of technology innovation projects contracted by CDHU but undertaken by third parties.

XI.19 SH/CDHU and SEDPcD/CETI-D would agree on financial terms so that the first can compensate the second for services rendered in the fulfillment of this Agreement.

XI.20 Once the Agreement has been finalized, the two institutions will coordinate, among others, the effective execution of the following actions:

- establishing the roster of projects in innovation and technology to be considered by CDHU to form part of the new Line of Project Financing;
- establishing the financial administration mechanisms for CDHU to execute the periodic budgeted financial resources to CETI-D, along with the establishment of the necessary control mechanisms to ensure its

[3] The New Line of Project Financing is described in a separate document, as well as a proposed contents for an Agreement document that could be signed by SH and SEDPcD in this context.

efficient and transparent allocation of agreed activities within the annual Operating Plan of CETI-D;

- expediting the project and business plan evaluation and selection by CDHU and streamlining its communications with CETI-D and SEDPcD as necessary;
- following up on all activities related to goods and services management and, in particular, with respect to the procurement processes of CETI-D for consulting services;
- ensuring the timely and proper submission by CETI-D to CDHU of the periodic financial statements and budget execution reports, based on the latter's periodic transfers to CETI-D;
- jointly contributing to the implementation and monitoring of the selected pilot projects;
- finalizing the projects and initiatives that will form part of CDHU's financing activities; and
- undertaking joint promotional and dissemination efforts between SEDPcD and SH/CDHU.

3. Others

XI.21 CETI-D would be advised to enter into collaboration agreements with other State agencies to achieve their support in the sectors of Education, Health, Training, and many others, which will become apparent as CETI-D develops its core program and projects. MOU similar to the ones described above would be the instrument of choice to formalize such collaboration agreements.

F. International relations

1. Long term technical assistance agreements

XI.22 CETI-D will be encouraged to enter into long- or medium-term agreements with international organizations, both within the areas of specialty of CETI-D as well as within other areas which could make a contribution on the way CETI-D conducts business or approaches the pursuit of its objectives. At the start-up phase, establishing a relation with at least the following organizations could prove beneficial:

- *Fondazione Rosselli Americas* (FRA) could continue to provide technical assistance to CETI-D through a Memorandum of Understanding to cover the following main tasks:
    - Technical assistance on the application of KE instruments to the building of a strategic program for CETI-D, which will imply a strategic analysis of potential program areas suggested by the Board of Directors and Networks in order to find out which of those ideas holds the most promise and which can benefit more from the application of the KE architecture –simultaneous investment and work in the five areas mentioned elsewhere: innovation, education, social inclusion, ICT and enabling policies;
    - Strategic support to CETI-D's Executive Director and Board of Directors to explore new areas of work, expansion and cooperation to gradually build CETI-D into a center of excellence at the international level;
    - Strategic support to CETI-D's Private Sector Council to develop strong complementarities between the interests of the job market and the aspirations of PwD, based on the introduction of technology innovation as the driving force behind this relationship;
    - Support fund-raising activities, identifying and pursuing potential sources of patrimonial contributions, international lending organizations, and horizontal cooperation agreements with agencies such as United Nation's GAID and G3ICT, United Nation's Industrial Development Organization and associated Foundations, the Pan-American Health Organization, and others, including other Center of Excellence for Technology Innovation for PwD around the world.

2. Horizontal cooperation with other Centers of Excellence for PwD

XI.23 Given that Qatar is in the process of establishing its own center of excellence with similar purposes than CETI-D, it seems advisable to start collaboration with such center as soon as its institutional structure is announced. Specific lines of cooperation would be proposed once the Qatar Center becomes operational, as no information is available as yet regarding the scope of the Center.

XI.24 CETI-D must be on the look-out to learn when and where other centers of excellence or other umbrella organizations specialized in areas of interest to

CETI-D exist or are being established in order to open bridges of cooperation and thus enlarge the reach of CETI-D.

3. Participation in international development organizations

XI.25 A number of options are open to CETI-D as to entering as a member in international organizations. Once CETI-D has been established formally, consideration to options in this respect can be given by its Board of Directors. At the start-up phase, at least the following are considered useful:

- Joining as a member the United Nations Global Alliance for ICT and Development (GAID) and contribute actively to its world-wide Matrix Program; this collaboration would be a way to include targets concerning achievements in social inclusion and quality of life standards for PwD in the context of Millenium Development Goals (MDG);

- Other international organizations could become attractive as the work of CETI-D develops; for example: (i) Workability International --the largest organization representing providers of work and employment to people with disabilities; establishing a working relation with WI could bring best practices information to CETI-D and open ways of cooperation among private sector providers; (ii) Asia-Pacific Development Center on Disability, (http://www.apcdfoundation.org/) which could add an interesting perspective on non-Western concepts of disability and corresponding treatments; (iii) Disabled People's International (http://v1.dpi.org/lang-en/) could also be a contact of interest, as it holds a number of regional offices, one in Latin America , which could be helpful for the use of their extensive data bases; (iv) finally, Inclusion International (http://www.inclusion-international.org/en/) could also be a link to study for its strong lobbying expertise.

XII. ESTIMATED COST AND FINANCING

A. Estimated Start-up Costs

XII.1 The start-up costs of CETI-D will be established by the Government of Sao Paulo based on further assessments regarding the possible utilization of the following infrastructure and institutional services from SEDPcD by CETI-D: use of office space, provision of office equipment, transportation equipment and other assets, utilization of legal and internal audit services and other. In order to minimize the initial investment and corresponding procurement costs, the necessary efforts will be undertaken in order to leverage the existing capabilities of SEDPcD that can be effectively transferred to CETI-D.

Table 9 Estimated CETI-D Start-up Costs for Fiscal Year 2010-2011 (Reais)

Description	Number of Units	Cost per Unit	Total
I. INFORMATION AND COMMUNICATIONS TECHNOLOGY			**178,560**
A. Personal Computers and Monitors	12	4,500	68,400
B. Laptop Computers	6	3,600	21,600
C. Servers	2	10,800	21,600
D. Printers			21,600
1. Desk-Top Laser Color Printers	12	900	10,800
2. High-Volume Laser Color Printers	2	5,400	10,800
E. Software			32,760
1. PC - Microsoft Office Licenses	12	900	10,800
2. Severs and Database	2	7,200	14,400
3. Other	14	540	7,560
F. Peripherals, Cabling, Routers and Power Sources			12,600
II. OFFICE FURNITURE			**41,220**
A. Personal Desks	12	900	10,800
B. Computer Desks	12	540	6,480
C. Personal/Executive Chairs	12	360	4,320
D. Tables	6	540	3,240
E. Chairs	24	270	6,480
F. Conference/Meeting Room Table and Chairs (Set)	1	6,300	6,300
G. Kitchen Furniture, Equipment and Other			3,600
III. OTHER			**19,800**
A. Telephone System			9,000
B. GPS	6	900	5,400
C. Other			5,400
T o t a l			**239,580**

XII.2 Nevertheless, it is recommended that SEDPcD secures the financial allocation from the State Secretary of Finance (Secretaría da Fazenda, SF) for fiscal year 2011, which will guarantee the availability of budgetary resources to cover the minimum potential establishment needs of CETI-D. As can be seen in the following table such costs will reach approximately R$240,000 (two hundred and forty thousand Brazilian Reais) and will cover mainly office furniture and equipment including information and communications technology hardware and software for the establishment of the integrated administrative and technical computer network.

B. Estimated annual operation costs

XII.3 It is estimated that the annual operating costs of CETI-D, once fully staffed, will reach approximately R$2,400,000 (two million four hundred thousand Brazilian Reais), including salaries, consulting fees, travel, maintenance services, marketing and dissemination expenses and other (see Table 10 below).

XII.4 Such budget allocation will allow CETI-D to cover all administrative costs of a lean governance structure comprising, as indicated above, the Executive Director at the highest level, the three technical departments and the Finance and Administration Department. Specialized technical capabilities will be subcontracted under short-term consultancy contracts budgeted for each strategic technical area of CETI-D. Administrative support costs will be kept to the minimum expecting a cross-sectional support to all departments from these resources. Financial resources will also be allocated to network costs associated to coordinators and members fees.

XII.5 Promotion and dissemination costs include the elaboration of information materials, the undertaking of the necessary awareness campaigns, and efforts related to fund-raising. An allocation for travel expenses has been included for in-state and out-of-state travel, in support of technical, administrative and promotional activities. Finally, the necessary recurrent resources have been budgeted to cover the rental of office space/building for CETI-D within the complex of Jaguaré, Technological Park of Sao Paulo.

Table 10 Estimated CETI-D Operating Budget for Fiscal Year 2010-2011 (Reais)

Description	Number of Units 1/	Cost per Unit	Total
I. PAYROLL			**1,685,150**
A. Salaries			882,050
1. Executive Director	1	169,000	169,000
2. Department Heads	4		442,000
- R&D Department	1	110,500	110,500
- Jobs Department	1	110,500	110,500
- Access Department	1	110,500	110,500
- Administration and Finance Department	1	110,500	110,500
3. Technical and Accounting Support Personnel	3	81,250	243,750
4. Administrative Support	2	13,650	27,300
B. Consulting Services			275,100
1. Research and Development PwD	60	1,310	78,600
2. Jobs Creation, Training and Business Development	60	1,310	78,600
3. Accessibility Infrastructure and Housing	60	1,310	78,600
4. Other	30	1,310	39,300
C. Network Fees			528,000
1. Coordinators	48	5,000	240,000
2. Member Fees	288	1,000	288,000
II. TRAVEL			**264,600**
A. Air Transportation	60	3,600	216,000
B. Per Diem	180	270	48,600
III. SERVICES, UTILITIES AND OTHER			**267,600**
A. Office Space	12	16,000	192,000
B. Utilities	12	1,800	21,600
C. Office Supplies, Materials and Other	12	4,500	54,000
IV. MARKETING AND PROMOTION			**90,000**
V. PROCUREMENT, MISCELLANEOUS, INCIDENTALS			**90,000**
T o t a l			**2,397,350**

1/ Units expressed in the following manner: (a) salaries in person-months for 13 months; (b) consulting services in consultant-days; (c) network fees in person-months for 4 coordinators, and member fees for 6 members for 4 networks for 12 meetings in 1 year; (d) air transportation in number of airline tickets and per diem for 3 days per trip; (e) services, utilities and other in costs per month; (f) marketing and promotion as lump sum; and (g) procurement, miscellaneous and incidentals as lump sum.

C. Estimated investment costs

XII.6 The above operating budget estimation should support, in the initial year of operations of SETI-D a level of direct investments of no less than R$3,600,000 (three million six hundred thousand Brazilian Reais) allocated to a number of

activities including applied research and development, studies, technical assistance, demonstrative projects and other, as to be established in CETI-D's annual operating or business plan.

XII.7 Actual budget execution will be directly dependent on, among others, the timely incorporation of all staff needs, organizational procedures and intra and inter-institutional collaboration and coordination mechanisms with CDHU and other pertinent agencies. This in addition to: (i) the level of activity of CETI-D's support networks which will also represent sources for the identification of needs and actions areas that will translate into investment projects; and (ii) the execution of the promotional and dissemination activities which, on one hand should allow building a solid project pipeline and, on the other hand, undertaking the fund-raising activities to leverage its operating and investment budget.

XII.8 As a decentralized institution and, based on Government of Sao Paulo's integrated financial management procedures and regulations, CETI-D's budget will be consolidated as part of SEDPcD annual budget.

D. Consolidated costs and financing

XII.9 As can be seen in the Table below, based on the above cost projections, it is estimated that CETI-D's total budget for fiscal year 2011 will reach approximately R$6,240,000 (six million two hundred and forty thousand Brazilian Reais) to cover the necessary start-up and operating costs as well as the estimated direct investment/project costs.

Table 11 **CETI-D Consolidated Budget (Reais)**

Description	Total
I. START-UP COSTS - ONE TIME	239,580
II. OPERATING COSTS - YEAR 1 (2010-2011)	2,397,350
II. ESTIMATED INVESTMENT COSTS - YEAR 1 (2010-2011)	3,600,000
T o t a l	6,236,930

XII.10 It is recommended that SEDPcD secures such financial resources for CETI-D entirely with a 2011 budgetary allocation from the SF of no less than R$6.2 million. This should allow for a timely and effective start-up, launch and instrumentation of the first year's operating and investment activities.

XII.11 With respect to the latter, this base capital/investment resources base should in the immediate future allow CETI-D to instrument its efforts aimed at leveraging SF's budgetary allocation with: (i) private donations resulting from the fund

raising efforts undertaken by CETI-D in Brazil with potential private sector and non-for-profit organizations; (ii) technical assistance, non-reimbursable technical and financial resources from bilateral and multilateral development organizations; (iii) co-financing arrangements through CETI-D's established support networks; and (d) CDHU's budgetary resources executed directly by the Company under direct coordination with CETI-D or transferred to CETI-D, according to the corresponding Agreement. This resource base will also set the stage for the establishment of future debt financing arrangements—through the SF, with multilateral organizations, national development banks and other.

XII.12 From a legal standpoint, most financial arrangements will be formalized through the establishment of memoranda of understanding (MOU) with potential partners and cofinancing national and international agencies which, among others, will establish: (i) the monetary value of the contributions; (ii) the technical responsibilities of the partners; and (iii) the expected end results and products of the joint actions.

XII.13 Finally, in order to optimize the use and return of the financial resources made available to CEDI-T by external partners, individual trust funds may be established following Government of Sao Paulo' rules and regulations delineating the financial administration of private sector resources by public institutions, and under the governance of CETI-D's Board of Directors.