

An Approach for e-inclusion: Bringing illiterates and disabled people into play

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Abstract

In emergent economies, the continued process of digitalizing the ICTs, summed up with some sociocultural particularities and poverty, contributes to cleave the society into two groups: the connected and the increasingly more disconnected or socially excluded. However, efforts to effectively narrow this kind of divide transcends the provision of access to web and other digital networks, mainly if the attention is focused on people with disabilities and lack of literacy. For these social groups, accessibility and intelligibility are the key barriers to e-society. A manner to mitigate then is the objective of an ongoing research project in which we are engaged and that comprises the elaboration and application of a methodology for developing solutions to e-inclusion in Brazil. This paper presents the central aspects of such an approach, focusing on some activities which go beyond the connectivity provision and may help the most “excluded” in bridging the divide.

Keywords: digital divide, disabled people, ICT, functional illiterate, e-inclusion.

Introduction

Similar to any kind of social segregation, digital divide is also consequence of political, economic and sociocultural factors acting jointly. As new Information and Communication Technologies – ICTs – are more diffused into all society activities, mainly as consequence of the market logic, the digital gap reaches dimensions not imagined before, mostly if someone considers the economic limitations and cultural issues of the developing countries, which are important to technology appropriation.

For Latin America countries, ICTs typify a new phase in the continued pace towards modernity, from which no one can refrain, under risk of cultural and economic stagnancy (Martín-Barbero 1987). However, the sudden diffusion of such technologies produces and deepens the symbolic and physical gap, posing a complex issue that transcends the decision between merely adopt or not the new technologies. As believes Martín-Barbero (1987), the rise of ICTs in

Latin America shifts the question from a technical view to the production model that is established, with new access and use properties which define a schizophrenic process between modernization and the effective social appropriation. In accordance to our perception, schizophrenia is understood as a dissociation between thinking and action, or better, between intention and results effectively obtained.

The technological barriers of the divide are overlap with sociocultural aspects of population, in the same way that low income regions are weakly connected to telecommunication infrastructure. However, the fact of enlarging backbone capacity or the access network reaching is not sufficient for countries with high poverty rates. Initiatives on this direction only have been successful in raising diffusion in most favorable socio-economic classes, like A and B, what occurred with pay-TV in Brazil, for instance. This action contributes to separate A-B from C-D-

E classes and consequently to deepen the digital and social divide.

The overlap may also be illustrated with the bandwidth paradox usually faced by developing economies (OECD 2005), since mostly part of the potential users does not have literacy or ICT skills and consequently they need audio and video technologies to support their web use. Such technologies are not compatible with low bandwidth networks.

In any case, there is a consensus that current initiatives to narrow the digital divide are essential to foster development and improve the quality of life of the population, mainly in countries with urgent social needs. To provide means to digitally empower excluded groups implies in real benefits to society, as way of enlarging citizenship, reinforcing identities and creating job opportunities.

In Brazil, almost 70% of its citizens may be considered as digitally excluded, due to not having computers or because they do not access internet. In addition, a significant part of its population is comprised of functional illiterates and of people with some kind of disability, in such a way that they do not have sufficient skills to fulfill the demand of their social context and are therefore most excluded. Functional illiterates are those individuals who, despite reading and writing short phrases, cannot use literacy and numeracy abilities in his or her social context for personal learning and development.

These social groups are the most disadvantaged ones, accumulating several kinds of barriers to perform everyday tasks and be inserted into societal life. Some of such inequalities are addressed by Brazilian public policies, expressed for example in the Law No 10,098 devoted to promote the accessibility of disabled individuals.

However, we do not believe this divide is simply overcome with the provision of computers or by connecting people to internet. The problem is more properly addressed by means of solutions based on novel paradigms, inclusive in terms of methods and multi-dimensional approaches, which might indeed contribute to e-inclusion, that is, an effort to include people in the space circumscribed by the digital world.

As an initial procedure, some orientation should be offered on the aspects that impede the use of ICTs, that is, lack of literacy and numeracy; cognitive, sensorial or motor disabilities; and economic, cultural or linguistics barriers. In this sense, someone may inquire how or to what extent policies and initiatives based only on physical resources are effective in bridging digital divide (cf. Warschauer 2003). Indeed, the full inclusion in the informational society just occurs when provided the needed resources and capabilities to overcome all kind of barriers, including access, usability and literacy issues.

Under this scenario, the present paper aims to describe (i) the central lines of a paradigm to deal with the digital divide challenges in a developing country like Brazil and (ii) the general aspects of a methodology for planning solutions to digitally include people with special needs, in such a case, illiterates and disabled people.

The paradigm is represented by means of a hierarchy of barriers, which are factors contributing to enlarge the divide. Regarding the planning approach, special attention is paid to activities conceived to identify the actual needs of the target public and to design solutions for satisfying them, mitigating the barriers that appear beyond connectivity.

Before presenting a typology of barriers for e-inclusion and a methodological framework for providing solutions and bridging the gap, we briefly introduce a rationale on the motivation for addressing this people with special needs. In this preamble and in the typology description we also prepare the basis to face the question posed by ITU (2005a) about what are the promises of the new technologies for unassisted populations.

Why illiterates and people with disabilities

In regions with huge cultural and socio-economic heterogeneity, the fast diffusion of news technologies into certain social groups may augment the digital divide and weaken social cohesion. Moreover, these technologies should be flexible to allow their use by multiple ways and by different groups of individuals (Mansel and Steinmueller 2000). In this sense, the ICTs should be designed considering the perspective of the people with risk of exclusion, whatever the reason: physical, sensory, locality or learning challenges.

The impact over the most excluded groups of people reflects the unequal distribution of income and education, beside other characteristics that magnify the inequalities and deepen the symbolic and material gap. In addition, some of these characteristics are cumulative, for instance, low income, lack of literacy and disabilities.

The high correlation between low income of population and lack of access to ICTs is due to either the disinterest to expand the communication infrastructure or the difficulties in using the technologies when they are available.

One of the Brazilian poorest regions, the Northeast, has almost 25% of illiterates, whereas in most favored regions, like the South and the Southeast, this figure is around 7% (IBGE 2000). Such unserved regions also exhibit a broader spectrum of disability cases.

In accordance with the last demographic census carried out by the Brazilian Institute of Geography and Statistics (IBGE 2000), 14.5% of the population (around 25 millions of persons) had some kind of disability – physical, mental

or sensory. By not considering multiple disabilities, the amount of persons with some visual dysfunction was near to 10% of the entire population; and those with motor challenges represented 4.6% of the Brazilian citizens.

Yet, the proportion of people with disabilities grows with aging and lack of literacy (around 33% of disabled individuals are functional illiterates), what makes the gap dimensions larger to these groups of excluded. As pointed out by Montenegro/Ibope Institute (2005), 37% of the Brazilians are complete illiterates or functional illiterates.

In turn, the Internet Management Committee in Brazil, by means of data gathered up to September of 2005, reports that almost 70% of Brazilian population (CGI.br 2005a) had never accessed Internet and 95% of the functional illiterates had never used a computer (CGI.br 2005b).

As can be noted, the groups of persons with disabilities and with lack of literacy are undeniably the most disadvantaged in the society, facing different kinds of barriers to participate of their social context. Reminding Paulo Freire in that respect, the individual does only learn how to be an actor of its own society by means of an education process that goes beyond the mere act of jointing words (cf. Freire 1970). Thus, issues related to ICTs' access and usability, as well as cultural compatibility, are important to providing equal access and equal opportunity to them.

A typology of barriers for e-inclusion

Over the last years, some researchers have proposed new frameworks to address the digital divide, such as Warschauer (2002), Sorj (2003) and Potter (2006). Despite them having a differentiated perspective about the complex

barriers of such a challenge and being preferably focused on developing countries, a more nuanced approach is need to attain the Brazilian particularities, mainly when we consider the public herein addressed.

From Warschauer's point of view, four categories of resources are necessary to narrowing the social divide, including since access to computers and content culturally compatible up to education and communities' support. Sorj adopts a similar perspective in which the digital inclusion depends on five factors related to ICT diffusion and universalization: two factors of passive nature, encompassing access to computers and internet; and three corresponding to the active appropriation, for example, training and contextualized use of contents. The framework proposed by Potter is more concerned with this latter factor, i.e., in understanding local contexts and providing an authentic environment for dialogue and knowledge sharing.

By believing that access to ICTs is just the first step to overcome the divide and with the aim of better understanding the very significance of the Brazilian difficulties to reducing the divide, we adopt a typology that hierarchizes the access barriers to the informational society. Figure 1 depicts the main obstacles to a full participation in such a society, corresponding to three sets of requirements: access availability or access to terminals and web, accessibility and usability issues, and content intelligibility (Tambascia et al. 2006). The categorization is therefore sequential, each level (set of requirements) is dependent on the previous.

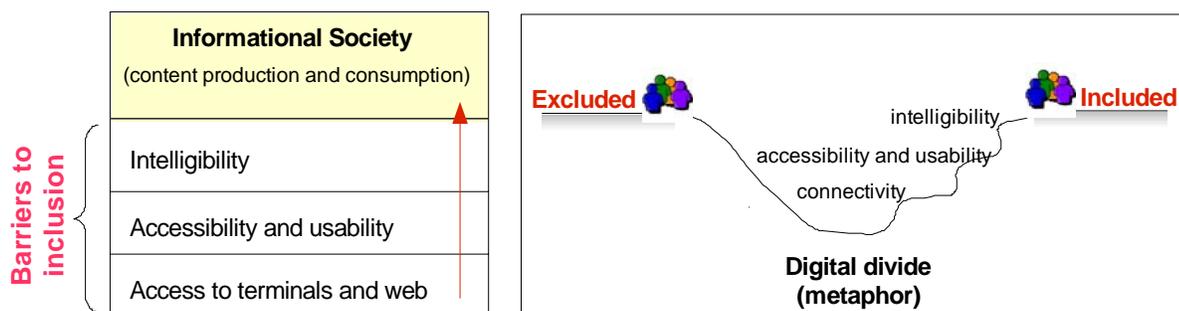


Figure 1: Digital divide typology and metaphor

The first level represents the provision of access to physical resources, that is, equipment (computer and other access terminals) and network infrastructure, as well as building

facilities in case of promoting public access to population, such as kiosks and telecenters. In general, solutions focused on access technologies and transmission networks

(backhaul or core IP) faces not a trivial trade-off among coverage, bandwidth and cost. Some recent broadband solutions, like WiFi (Wireless Fidelity) and WiMAX (Worldwide Interoperability for Microwave Access) applied either to access or backhaul, have changed the weights of the factors influencing on this trade-off. However, for emerging economies, a fair balance for universalization solutions is far of being reached.

In the metaphorical representation of figure 1, this first level corresponds to connectivity, meaning the first step towards bridging the divide. Most of inclusion initiatives are focused on this level, to some extent as a corollary of a technoculture ideology.

Solved connectivity problems, the second level barrier rises, corresponding to users' cognitive, physical and sensory limitations. To overcome such obstacles some usability aspects should be considered aiming to make interfaces and human-machine relations accessible and more friendly. In that respect, e-accessibility tools, like assistive and adaptive technologies, may equally contribute. However, these tools and interfaces will only be effective with support programs oriented to people with special needs.

After withdrawing the accessibility and usability barrier, there still is the need to adjust contents and interfaces to cultural and linguistic profile of each users' community, that is, to surpass the third barrier. At last, once these obstacles are eliminated, the individuals acquire the knowledge and skills for an active participation in the cyberspace. In other words, people only can consume or even produce contents if they are in this forth level of the digital divide typology. In addition, the true access to the informational society is only assured when the contents are culturally contextualized and everyone has its voice and expression rights guaranteed.

Nevertheless, if nothing will be done, the people with special needs will not reach the prerequisites for e-inclusion. At this point, we propose two theses: (i) our target-public requires a differentiated treatment, something like a novel language (though limited, but a new code: an innovation); and (ii) it is necessary to push the excluded people through the slope, since motivating them to climb the gap and reach the other side, as the metaphor in figure 1 illustrates.

In this latter case, the young people – independent of socioeconomic class or genre – have a higher propensity to move towards the other side, but the same is not true concerning people with special needs, principally the older one. Therefore, the shove is just the first step and should be followed by additional actions, besides all inclusion infrastructure. For example, an action for electronic

citizenship is the first push, which should be combined with community actions like local health agents.

All barriers and restraining factors up to here discussed are strongly inter-related, contributing to a dynamic behavior often counterintuitive. An evidence of such an aspect may be noted by means of ICT figures and metrics, like the DOI (Digital Opportunity Index), which is based on a set of internationally-agreed indicators (ITU 2005b). This index joints the indicators into three categories: opportunity, infrastructure and utilization, which are combined to produce a unique figure. Roughly speaking, the first category corresponds to the users' opportunities to be connected (access to ICTs), while the third expresses the degree of ICT usage. So, a country may exhibit an opportunity value higher than the utilization one, revealing, for example, that despite having a comparatively best ranking in access requirements the same does not occur in terms of use. In other words, the people have little interest in using ICT since they do not perceive value in its appropriation, what can be due to incompatible contents (lack of intelligibility) or even due to usability issues.

In a broad sense, the communication technologies play a key role in the post-modern world, even avoiding traps like the technomania warned by Langdon Winner (1997) or the idea – considered by Wolton (2000) as being a limited one – that the interunderstanding will be in a better condition when the world will be enclosed by techniques. Despite this importance, the access to new technologies does not eliminate the difficulties of understanding among communities and civilizations, which historically were always separated by cultural and language issues.

In that respect, which are the ultimate promises of ICTs to unserved people? By connecting individuals with their social network, since provided access and skills to effectively use ICTs, we can foresight gains in terms of social capital and a good chance for unleashing human development. In specific terms, this is an opportunity for linking the local and the global, and putting communities together, by means of multicultural expression. Multiculturalism understood from a point of view in which the diversity has no meaning if the identities are not taken into account.

This is not a simply question when someone considers people with special needs and particular perspectives to see the world. Initiatives to include them in cyberspace may help to prevent discrimination and attend to social programs. However, for bridging the divide, as suggested in the metaphor from figure 1, people and policy-makers have to face unexampled challenges, what implies in an initial descendent way that is progressively reverted, with efforts from everyone, towards a higher quality of life level. The path for that is no natural and requires appropriate

methodology.

A methodology for providing solutions and bridging the gap

Indeed, some actions are more than desirable to surmount the lack of literacy and the barriers to equitable access, for instance, evaluating and developing solutions based on several knowledge frontiers, either in terms of methods or technology. Concerning the former, our approach includes, among others, activities like (i) identifying and localizing of

latent demands; (ii) usage modeling; and (iii) proposing and developing of new solutions for bridging digital divide, comprising services, networks and low-cost terminals, new communication languages and interaction models.

A methodology for attaining this goal is shown in figure 2, enclosing all the creation cycle of a technology or solution for digital inclusion, since the start point, as a response to a public demand or a ICT policy, up to its deployment and provisioning to the society.

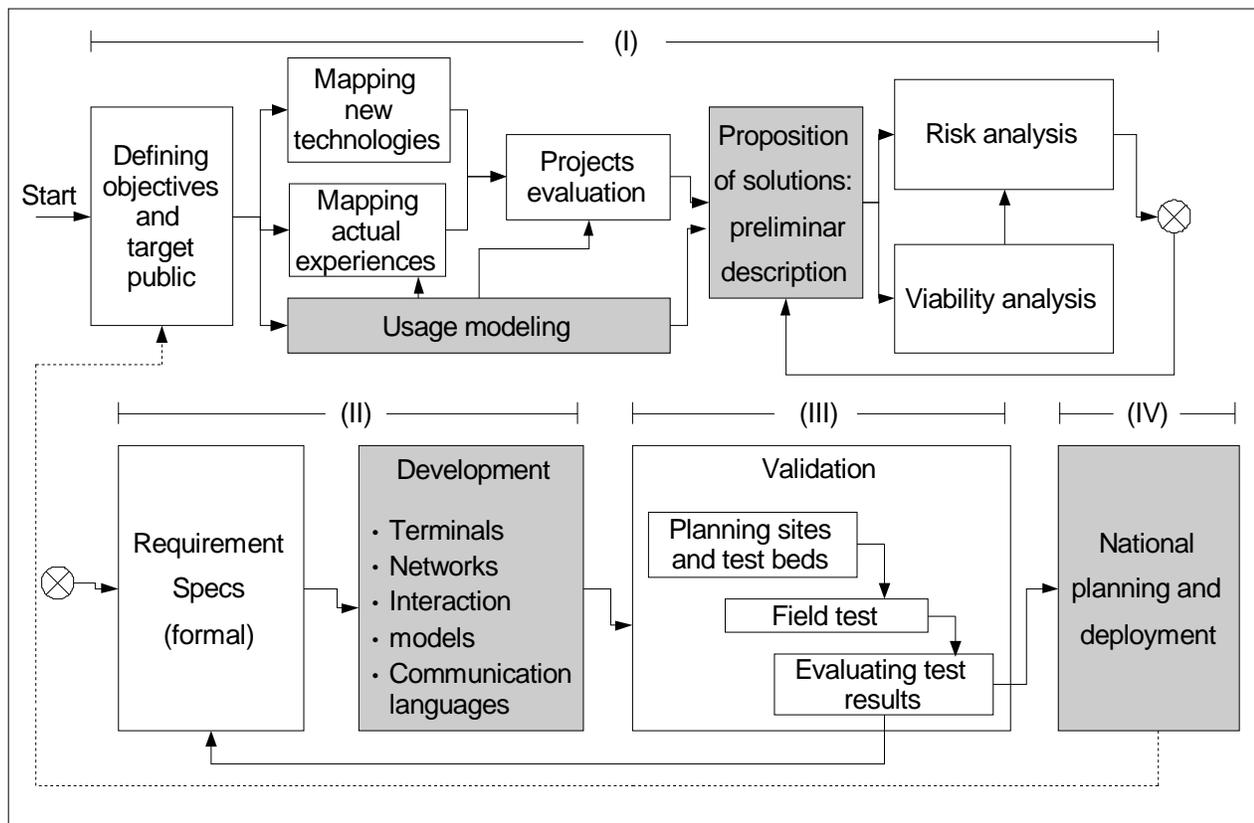


Figure 2: A methodology for creating e-inclusion solutions

In a broad view, the methodology depicted in figure 2 may be visualized as a sequence of four phases: (i) planning, that encompasses the capture process and the requirement analysis; (ii) development, including formal requirement specification; (iii) validation of the developed solutions and (iv) national scale deployment.

Despite all these phases and activities being part of a whole – in this case, a indivisible methodological sequence –, some of them play a key role in terms of materializing the proposed solutions, namely, (i) usage modeling and proposition of solutions; (ii) development of solutions, in

special, low-cost terminal or assistive technologies, languages and interaction models; and (iii) national planning and development. Such activities are shortly described as follows.

Modeling ICTs' usage and proposing new solutions

In the objective of identifying the requirements for developing solutions, modeling ICTs' usage becomes a central activity, comprising the characterization of target-public and the building of scenarios about the use of ICTs. Due to the characteristics of the social groups we are focusing on, the usage modeling is started by quantifying the types of disabilities and the literacy levels,

contextualizing them in a Brazilian demographic model which relates each disability kind to geographic region, social class, age and genre.

In addition to the main barriers inherent to the social groups addressed by this approach, there are others which are often gathered to the former, namely, absence or lack of infrastructure and economic limitation to allow the access to ICTs. So, the exclusion dynamic also depends on the socioeconomic conditions and on geographic position of population.

However, the understanding about the collective effects from all barriers is only broadened by taking other modeling approach into account: the behavioral and the social ones. As described in (Ávila et al. 2006), the former comprises the identification and analysis of behaviors and attitudes of the target-public, determining actions and reactions that each user's profile has in dealing with ICTs or in interacting with the environment of a digital inclusion initiative. The latter considers that user's behavior in making use of ICTs consequence of social processes of learning, for example, a digitally excluded individual will exhibit a very low tendency to participate in digital communities if the people to which she or he has contact do not belong to such a group. In this sense, the social network comprised of excluded individuals exerts influence over her or his behavior.

Seeking for understanding these subjective and interrelational issues, we analyze by an integrated perspective the following vectors: socioeconomic, geographic, behavioral and social. This analysis allows identifying the factors which, for the digitally excluded people, are the most obstacles for using ICTs. Since such barriers are identified, the various usage profiles may be known as well as the related problems to bridge the gap. By combining these profiles, the most usual scenarios are so described, affording to know the main difficulties to be overcome with new solutions.

Other information sources are added to this set of secondary data. In case, the additional sources correspond to data gathered directly from the population of excluded people which have yet some kind of disability or lack of literacy. These primary data is comprised of users' and non-users' expectations in terms of ICTs, and are obtained by means of focal groups, in-depth interviews and in site visitations to selected initiatives. Among the attributes to be surveyed are:

Desirable configurations of the physical resources for accessing ICTs.

Inhibition factors that illiterates (functional and full) and disabled people face by using – or even by intending to use – ICTs.

Desirable requirements of usability and accessibility.

Opportunities for adjusting contents and languages to the users' preferences and needs, including regional and multicultural issues.

Yet, the effective capture of the above-mentioned aspects requires also identifying the users' latent and non-articulated needs, which exert strong influence over the rational cognitive processes. An approach in line with such concerns is based on special techniques for inquiring, analyzing and comprehending the prospective users' metaphors (cf. Zaltman 2003).

Having as input the information so gathered, the acceptance of new technologies and solutions by prospective users may be modeled and simulated based, for example, on the users' behavior characterization for each social group, on their mutual influence and on the phenomena which will emerge from these relationships. Someone can note therefore that such a representation reflects the usual modeling ontology in which the system is comprised of individuals, categories, attributes and relationships.

The agent-based modeling and simulation – ABMS – is a useful approach by considering these aspects in ex ante analyses, mainly in terms of investigating socioeconomic impacts due to disruptive technologies, as exemplified in (Holanda et al. 2006). In this sense, we are constructing a simulation model in which the users, represented by agents, are characterized in terms of their attitude towards technological innovations and their susceptibility to the social influence, whereas their ICT acceptance or policy adoption occurs as consequence of a utility function. The neighborhood in the virtual world and the social networks representation are based on the Moore's cellular automaton and on small world theory (Watts 1999).

Such an analysis has the purpose of shedding some light on the ICT dissemination and adoption as a function of a given inclusion program. This allows understanding their impacts, both on the inclusion perception amongst the public, and on the inclusion modalities they ensure. As input of the simulation model we intend to use data from an ongoing market survey, whose purpose is identifying the preferences and needs of illiterates and people with disabilities.

In addition to this information, the methodology also considers the use of other primary data, gathered by means of in site visitations to digital divide initiatives which present state-of-art solutions. Based on the complete data survey, also including secondary sources, and on simulation results, we might identify opportunities and propose solutions to prevent behavioral trends and attain latent or non-articulated needs.

Ultimately, the objective of this phase is to gather elements

that allow people to bridge their way across the digital divide. But the complete transition will only be possible if what is offered on the other side of the gap is attractive enough. The climb should thus be designed to overcome the difficulties faced by each excluded segment.

Developing solutions and deploying them

Since specific needs have been detected and new solutions proposed in planning phase, the development is started. Aiming to expand the usability and accessibility resources, as well as mitigating the illiteracy effects over the ICTs' use, such solutions are for the most part focused on the development of (i) languages, (ii) interaction models and (iii) special terminals at low cost.

Why are accessibility and usability important? The answer to this question may fill in a comprehensive list, including, for example, the following reasons:

Clicking with a mouse is so far difficult for people with limited manual dexterity and yet more for those with visual disabilities.

Several public places for ICT use, as kiosks and telecenters, have no appropriate access for people in wheel chairs.

Most of ICTs have no adaptive mechanisms for people with motor dysfunctions.

The development pace of web usability is slower than that of web technologies (Nielsen 2000) and the usage of any format different from plain text implies on hindering people with special needs from being a potential user of the contents provided by ICTs.

Several contents available in web are not appropriate to local cultural context, or even are complete unaccessible to illiterates or social groups with languages spoken by few people.

Emerging and existing alternatives, or even a combination of them, to overcome such obstacles may be simple and so far useful. Among them, there are: Braille labeler, touch screens, word prediction software, screen enlargement tools, etc. In function of very special scenarios of use, for instance, when some disabilities are cumulated in one individual, to develop adaptive strategies and assistive technologies may be simultaneously a great opportunity and a huge challenge. Some organizations have developed large expertise on computer resources for people with special needs, for example, The Alliance for Technology Access (2000) and the Web Accessibility Initiative – WAI. The latter provides standards (W3C/WAI) that may be observed for adapting formats and languages to make the web use easier for persons with disabilities.

Why intelligibility is also important? From a semiotic standpoint, the fast and intensive diffusion of ICTs changed

the temporal and spatial nature of the production and reception of informational contents, and with the distance shrink, the widest remaining gap between the individuals might be the cultural one. Under such an aspect, Brazil has an additional challenge. Due to its continental dimensions and to its particularities in terms of civilizing process, the country has a huge sociocultural heterogeneity among the population, whose implications in ICTs' context are briefly addressed in (Holanda et al. 2006).

Besides cultural preferences, several regional accents and different social needs, this panorama is nuanced by the existency of around two hundred languages actually spoken – although the Portuguese is the official one, spoken by almost the totality of the Brazilian population, that is, 180 millions of inhabitants. According to Araújo (2006), most of these idioms (181, in precise terms) are indigenous and they have no more than 40 thousand of speakers. Despite of being idioms spoken by few people, the Federal Constitution recognizes the linguistic rights of indigenous people (Araújo 2006). In addition, there is the Brazilian sign language (LIBRAS), for people with hearing impairment and deafness. This aspect poses a new challenge in terms of e-accessibility.

To become content accessible to illiterates, disabled people and to multicultural and multilanguages regions is not trivial. As Nielsen argues (2000), part of this problem is related to use web formats in the way for which language was created, i.e., to essentially encode and transmit meaning, instead of appearance. The very need of such a concern is also related to limitations in bandwidth and to equipment costs: the more simple is the content format, the less bandwidth and terminal sophistication is required. Here there is other key development branch: on low cost technologies to overcome the economic barrier and to allow larger bandwidth for incorporating assistive applications.

Despite all these advances in accessibility and usability, the focus of the approach addressed by this paper is on the development of new languages and interaction models. Solutions on this matter provide, on a hand, a scheme of human-machine relationship and, as consequence, help in defining a set of interface patterns to guide the user in dealing with ICTs.

Accordingly to the needs of illiterates and disabled people, new languages, on the other hand, may sediment a novel grammar with potential to enlarge user skills for content fruition. So, this methodological step also includes guideline elaboration to support the content production and supply, compatible to various social segments. In this sense, the common understanding may be extended, preserving cultural and linguistic diversity, and creating mechanisms to foster digital literacy. After development phase, the solutions are validated and enabled to the last and equally

important step, that is, the country-wide deployment.

In that last phase, the approach is not merely a techno-economic planning, but a public policy issue concerned with the economic viability and, consequently, with the sustainability of the initiative which will accommodate the solution to be deployed. In a word, the last approach is related to promote the first push and after guiding the excluded people towards the benefits on the other side of the gap.

Final discussion and perspectives

In terms of providing means for the effective participation in informational society, we believe that connectivity initiatives are not enough per se, and that to bring illiterates and disabled people into play is so far complex than merely put them in touch with technologies designed for the mass market. The very path towards narrowing this kind of divide requires the appropriate use of accessibility, usability and intelligibility resources, in a larger scale than we see today. The research approach addressed in this paper is complete in line with such concerns.

Efforts to overcome literacy barriers and enable real access to web and other ICT applications may help to enhance social cohesion and to assure equal access to illiterates and people with disabilities. Based on what was herein discussed, we believe two types of actions must be implemented: (i) the development of new solutions, such as a novel language, which will contribute to mitigate access and intelligibility barriers; and (ii) additional actions in order to really motivate and assist people in bridging their way across the digital divide.

Thus, by providing means for e-inclusion is also an opportunity for attending to rehabilitation programs and assisting “disconnecteds” to better determine their own social and economic future. In short, the new ICTs may represent the manner how people think, acquire information and communicate with each other. Independent of the euphoria or dysphoria about the promises of ICTs and cyberspace, to impede social groups of this potential may be the nowadays hubris, understood in ancient Greek terms, that is, disregard for the rights of excluded people.

At the moment, our project is concluding the planning phase. With this research effort we wait to contribute to narrowing social and digital divide in Brazil, as well as in other emergent economy, by providing means compatible to the excluded groups' needs, in such a manner they might take exclusive possession of the new communication technologies.

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