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Contribution of ICT (Information and Communication Technology) for development: a case study in Brazil

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Abstract:

The concept of development as freedom can be seen as an expansion process of real freedoms people enjoy, associated with their freedom of choices in social, political and economical spheres. Certain international agencies propose that Information and Communication Technology (ICT) allow this development to be reached more efficiently and quickly. While there are success stories galore, there is acknowledgement of not all investments in ICT bringing positive effects towards development. Following this development approach and choice framework, this paper discusses how the use of ICT can promote a more effective development, buy studying the case of Sudotec (an association for technological and industrial development in the southwest of the state of Paraná, in Brazil). It is a non-profit organization that saw in ICT the opportunity to change the local scenario. The results revealed positive effects of the use of ICT in social, economical and cultural spheres, not presenting political effect.

Keywords:

ICT, Development as Freedom, Choice Framework, ICT effects.

1. Introduction

The potential for development and the effects of the diffusion of Information and Communication Technologies (ICT) has been the focus of studies in emerging countries (Avgerou, 2009). Constantly, studies on this theme are based on the premise that ICT can contribute towards an improvement in socio-economical conditions in developing countries (Mann, 2004; Sahay, 2001; Walsham et al., 2007). The potential of ICT for development has been implicitly assumed for specific research purposes, ranging from proper technologies implementation for developing countries, by means of the facilitation of the diffusion of technologies (Kraemer et al., 2009) to understanding of institutional changes needed for the development of a given community (Ma et al., 2005). Researches on ICT and development are based on the belief that ICT has, potentially, the capacity of contributing towards the improvement of various aspects of life, from the reduction of poverty to the strengthening of democratic politics (Avgerou, 2010).

However, the application of ICT has not always been successful. There are many examples of complete or partial failures (Avgerou & Walsham, 2000). The efficacy of ICT as a decisive factor for development is not unanimous among authors. Nevertheless, the greater understanding is that ICT allow development, reducing poverty, enabling less favored groups and improving governance (Kanungo & Kanungo, 2004). Some defend that ICT are a luxury for needy regions or an imprint of a relation of power (Sorj, 2003).

Considering the above and following the Sen's development as freedom (Sen, 1999), this paper investigates how local development can benefit from ICT, based on case study of Sudotec (an association for technological and industrial development in southwestern Paraná, Brazil), a non-profit entity that saw on ICT an opportunity to change the local scenario. This paper aims to discuss how the use of ICT can bring about a more effective local development. One of the main contributions of this work lies on providing a theoretical structure that can be used in future studies, as well as in how implications for development professionals can stimulate initiatives towards effective development.

This paper is structured as follows: firstly, approaching concepts regarding development as freedom, unfolding in relations between ICT and development. Secondly, describing the case of Sudotec. Thirdly, analyzing data and discussing results. Finally, concluding with a reflection on the implications of our choices for a better understanding of this particular case of ICT for local development.

2. Development as freedom
The concept of development is found in constant discussion and review, especially when it comes to concerts about what to do so as to thrust further development. The focus now is on development no longer conceived only as economical growth, expressed by Gross Domestic Product (GDP). What is now defended is that the main purpose of development is to universally promote the quality of life, health, education, etc (Passoni, 2007).

For Amartya Sen (1999), development can be seen as a process of expansion of real freedoms people enjoy, associated with freedom of choice in personal, social, political and economical spheres. In Sen's (1999) terminology, "functionings" are things people value and can have, and a person's "capabilities" consists in alternative combinations of functionings whose realization is feasible for him/her. Thus, the focus of development becomes increasing a person's capability set, or their substantial freedoms to lead the life they value. The model proposed by Sen (1999) contemplates people's freedom of choice regarding the use of resources available to them, the conditionings of these choices and how these resources are put. Sen (1999) points that the mere availability of a resource does not necessarily imply an improvement in social well-being. It is essential to ensure people have access to the ways of life they wish.

This new prism of thought on development shapes up the dimension of interaction and articulation among social actors (productive units, public power, civilian society) under a more cooperative action logic, in counterpoint with individualistic and competitive behaviors, highlighting the importance of building social networks. The basic idea is that a development process is deeply rooted in its immediate social context, in social relations and interactions among actors sharing resources, establishing reciprocal obligations built on trust.

3. ICT and development

There is growing literature on ICT in developing countries (Avgerou, 2009; Pozzebon, Diniz & Reinhard, 2011; Walsham & Saray, 2006). However, a number of researchers (e.g. Heeks, 2006; Thompson, 2008) point out that a great part of this literature does not approach the matter of what is understood as development. Heeks (2010) argues that the true attention towards understanding the contributions of ICT for development must be found in the results. Thus, research involving ICT and development is often focused on specific objectives regarding development, such as the enhancement of subsistence means in rural areas (Duncombe & Heeks, 2002), or programs implanted by the government (Lin, Kuo & Myers, 2009; Krishna & Walsham, 2005; Qvortup, 1995), and seeks to understand the effort needed for the implementation of ICT and for organizational changes to successfully occur, providing the expected benefits. However, confronting complex challenges and policies of efforts on development, it's necessary to assume a critical posture in the role of ICT for this purpose (Avgerou, 2010).

In this aspect, aiming to investigate how local development can benefit from ICT, it is assumed that development is not limited to countries, considering communities and regions where people have limited access to resources, social services and education necessary to support them (Kamel, 2008). Hence the importance of thinking development in an integrated fashion, where basic demands are systemic in terms of simulating "capabilities", and where the challenge to reduce socio-economical inequalities among cities and regions is huge.

Kleine (2010) introduced a framework as a form of operational approach for Sen's Capabilities (1985; 1992; 1999), visualizing elements of a systemic conceptualization in a process of development. Choice Framework was inspired by the work of Alsop and Heinsohn (2005), in the operational for Sen's capabilities approach, taking elements from the sustainable life framework (DFID, 1999) to expand it. The Choice Framework (Figure 1) is a form of conceptualizing individuals' choices. The focus lays on developmental results, being the preliminary result of development the choice itself. Secondary results depend on individuals' choices, such as facilitating communication among people, increasing knowledge or local income. Development projects should start from these wishes for results, measure how far they were reached and how results can/should take place.

The agency includes 10 tangible resources (social, cultural, educational, psychological, health, information, financial, natural, geographical and material resources) that place specific challenges for mediation, but need to be taken into account. The ICT can affect resources such as social resources (cheaper communication), geographical resources (proximity of access to installations), cultural resources (space to share knowledge), and material resources (hardware and software). Factors such as gender, age, ethnic group, etc can influence access to ICT, but it can sometimes become less relevant or invisible in certain contexts.

The structure includes the rules, laws, formal and informal norms and policies that can influence an agency. In the access to ICT can be divided in the dimensions of accessibility, availability and different necessary capacities for ICT access (Gerster & Zimmermann, 2003).

The process described by the CF sees individuals as using their agency to navigate the structure to be in a position of choice. Following Kleine (2010) the choice is conceptualized as being multidimensional (degrees of empowerment): it has to exist (existence of choice), individuals have to be aware of it (sense of choice), they have to exercise it (use of choice) and then it may or not be effective (achievement of choice). The existence of choice and

sense of choice is a way to interpret the Sen's capabilities, while outcomes can be seen as achieved functionings.
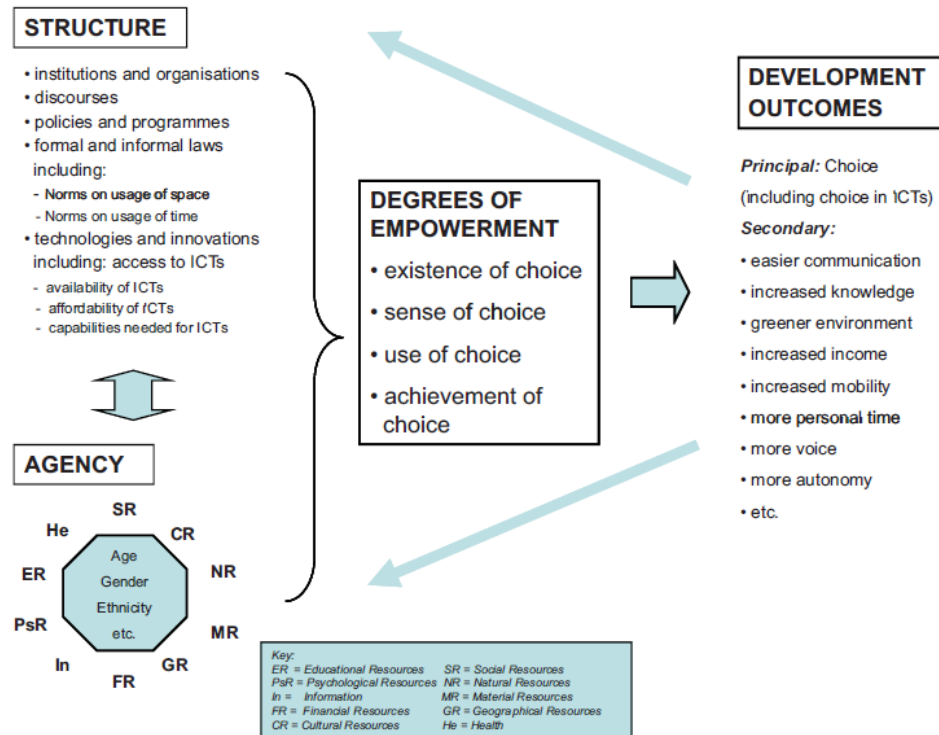

Figure 1 – Choice Framework
Source: (Kleine, 2010)

In general, the Choice Framework is an attempt to operationalize the Sen's Capability of the holistic and systemic view, maintaining much of its conceptual wealth, particularly useful in ITC for development. It's indicated not only as process analysis, but also for planning and evaluation of development activities (Kleine, 2010), including being as extension of two frameworks (Alsop and Heinsohn, 2005; DFID, 1999).

Finally, the Choice Framework draws attention to the important roles that the innovation and the ICT, have in shaping social structure. Some technologies, such as the internet, mobile phone or, more recently, the social networking have showed powerful influences on social, economic, politic and cultural spheres (Kleine *et al.*, 2012). So, the framework allows to see the complexity of interventions in systems while placing the choice at the centre of process analysis. Therefore, the selection of Choice framework is adequate for this research.

4. Methodological aspects

This research uses a interpretative case study (Walsham, 1995) to understand how an institution's use of ICT can contribute for the development of a locality. Sudotec was chosen for being a singular case. Placed in Dois Vizinhos, a small city in the southwest of Paraná state, Brazil, this association is considered exemplar in the state and exports its programs to bigger cities in that region.

The case study was conducted by means of semi-structured interviews, with strategic people for the understanding of the analyzed questions. Six interviews were performed in July 2012, with the manager, superintendent of the institution and users of the offered programs.

Secondary data were collected, such as documents, advertisement leaflets, activity reports and reports on certificates given to students to complement the information collected. The data collected in the interview were recorded and later transcribed, codified and analyzed. The transcriptions were read to make a first description and to identify fragments regarding the effects of ICT found in literature. The analysis of content was performed with the help of ATLAS.ti® software. The transcriptions of the interviews and the documents found during the stay in the institution were sent to the software. Concepts were mobilized, so as to give meaning and interpret the constitutive role of the data. Based on development as freedom approach, other concepts were applied, as suggested by Choice Framework, in the attempt to identify the development outcomes, structure, agency and degrees of empowerment, forming webs and connections. Regarding the validity of the construct, multiple sources of evidences were used to create initial categories based on literature. As to reliability, the protocol and database were used.

5. Presenting and discussing results

5.1. Study object: Dois Vizinhos and Sudotec

Brazil was categorized as the sixth greatest economy in the world (IMF, 2012), but when it comes to ICT, it is below the average of other western countries, regarding both ownership of equipment and internet access at households, and citizens using them. The TIC Domicílios 2011 research (CGI, 2012) revealed that 45% of Brazilian population has access to computers and about four in every ten Brazilin homes (38%) possess Internet access. Regionally, the penetration of Internet in Brazilian households is the greatest in the southeast of the country, where technology is present in practically half of the households (49%). The south of the country is in a similar situation, where 45% of households possess Internet access, as opposed to the northeast, where the Internet is in less than one quarter of households (21%).

 Paraná state is one of the 26 states in Brazil. It is placed in the southern region of the country. Brazil itself is officially divided in five regions: North, Northeast, Midwest, Southeast and South. Paraná ranks the fifth in the country in economic importance. It is one of the states with the greatest number of computer software producers and developers, and the 5th Brazilian state in number of companies connected with software activities, and the 10th in terms of IT formal employees (Ipardes, 2006).

With a population of approximately 36,000 inhabitants and a territorial extension of 418 km2 (Ibge, 2010), Dois Vizinhos is economically highlighted in agrobusiness sectors, with emphasis in swine, ranking third place in collection among 39 cities of the southwestern region of the state. However, from the 1990s, companies developing computer software started to establish themselves in the region. In the 2000s, the scenario has benefited of the approval of a fiscal incentive law for electronic and information technologies, with new opportunities for the economy of the city. At that time, movements towards to create a Cluster TI started in the region, formally instituted in 2003. Facing this scenario and concerns with possible instabilities of agrobusiness, local businesspeople had the initiative of uniting with the city power and academics to create a technological center focusing on this growing field. Thus, in 2003, the idea was presented and in 2004, Sudotec was legally constituted.
Sudotec aims to be a transformation agent in technological development for southwestern Paraná. It acts promoting courses of professional enabling and development, digital inclusion and support for new businesses in information technology. Its goal is to promote incentives to technology through qualification of young people, diffusion of entrepreneurial culture and

increase knowledge level of the professionals. So, it allows increase income and reduction of the qualified professional deficit in the technology sector of the region. These are the main Sudotec's projects:

- Learn to Grow: it aims to promote the professional capacity in the areas of business management and programming, so as to provide better professional qualification for people getting their first jobs and/or low income people;
- Digital Inclusion: it aims to allow the population access to technological resources, enabling them in computational techniques, both including them in the digital world and improving professional qualifications and education;
- PeopleWare: it consists in promoting and organizing courses, mini-courses, lectures and discussions, in knowledge areas mapped by IEEE Computer Society Courses;
- Software Incubator – ITS: it stimulates the creation of development in technology base companies, offering physical space, business enabling and consulting for limited time;
- Sucatec: it works with electronic waste recycling, by means of meta-art and meta-recycling, providing preservation of the environment and sustainable development.

Excepting PeopleWare, the other programs are offered for free to the communities they help. Sudotec also promotes complementary programs such as: 1) national and international travels to fairs, congresses and conventions – four international and several national "caravans" have been performed. 2) Technical missions for the exchange of experiences with projects in other regions. 3) Graduate courses in software engineering, in partnership with Univel (Educational Union of the city of Cascavel), a course not offered by local educational institutions. Approximately 2,000 students have benefited from the programs Sudotec.

5.2 Results analysis and discussion

It is possible to spot that the installation of Sudotec brought about changes in the regions, intervening in local development. The best assessment of facts revealed that, as the community was inserted in the universe of technology, it became aware of how ICT can bring benefits to the city. Learning about computing raised local productivity, improvements such as training of entrepreneurs for use IT to control stocks and sales, before manually, that later, they could be broaden the business using e-Commerce, with acquired knowledge in a course offered by the institution.

The constructors of Choice Framework (development outcomes, structure, agency and degree of empowerment) - presented in figure 1 - were analyzed individually and are presented bellow.

Development outcomes
In the context of research on ICT, the results may be measured by what people value in their life (Kleine, 2010). The main result was the possibility given to the population to choose to connect and use ICT for their own benefit, in this use enjoying programs made available, often by Sudotec. Secondary results depend on individual choices, translated in this case as the possibility of learning new technologies, to include up in the workforce, to communicate virtually with others, to improve income in local commerce, either to contact with other cultures or by traveling.

Sen's (1999) approach, with individual's choice as primary result, however, suggests that the analysis should start from the bottom upwards, asking people how they live, what they value, and the results to want to see. For one of the interviewees, two of the biggest impacts of

Sudotec were: giving young people the possibility of choice for conduct their careers; and allow that people using the internet to communicate with distant ones. In fact, some may question if this is a valid "development result" or "impact" for a project, according to Sen's approach, expressed by means of Choice Framework, it is a result of development.

Agency
Sudotec offers programs that benefit the whole community, as well as provide installations, hardware, software and network infrastructure (material resources), besides free or low-cost programs, payment for the instructors (financial resources) that provide the community the opportunity to access information and improve qualify of live for those that choose to take part of the program. Furthermore, the access provide can broaden knowledge (educational resources) and it's motivational factor of participation (psychological resources). However, the contacts with peers, relatives, teachers (social resources) are also used to obtain information on courses and availability of vacancies, representing a form of interaction among members of the community (social resources). Interaction and contact with people from other cities and countries (social resources) can also be provided with the "caravans" and technical missions (cultural resources) in which the people can leave their city (geographical resources) to travel and participate of congresses, international fairs and other events. The availability of such resources allows the community to understand their choices and find what they value, reaching results of the chosen development. Students' testimonials indicate the enrollment in one of the programs not only improved their level of education, but also provided them with other abilities and resources, such as confidence to speak in public and express their opinions, improving with relations with relatives and friends.

Structure
The agency is formed by the structure in which it operates. Since rules, laws, norms (formal and informal) and policies are included as part of structure elements (Kleine, 2010). Certain recent policies implemented by the federal government of Brazil, such as the National Broadband Plan and the creation of informatics labs in the ambit of the National Program of Educational Technology (Proinfo), tend to contribute for the effective digital inclusion of the part of Brazilian population that still lacked Internet access. In Paraná, the Law for fiscal incentive to electronic and telecommunications industry favors the Southwest Paraná. There is also, in that region, a Cluster Software, with certain companies are placed in Dois Vizinhos, favoring the actions by Sudotec.

In addition to the favorable context, Sudotec possesses a physical structure capable of accommodating the necessary installations to offer programs, kept in a monthly repay by City Hall and partner companies. Sudotec policies were based on international experiences of success, known in a technical mission made by the president and directors of local entities in Europe. Its main purposes: the improvement and scientific progress of the sectors of production and services; the experimentation, non-profit, of new socio-educational models and alternative systems of production, commerce, jobs and credit; the free promotion of education; the performing symposiums, conferences, congresses and seminaries regarding the institution's aims; the defense and preservation of the environment and promoting sustainable development; and the promoting integration of public agencies and private entities. Formal rules are stipulated according to the profile of each program.

Degrees of empowerment
In Choice Framework, the agency of an individual can operate inside a given structure to reach degrees of enabling, such as the existence of choice, sense of choice, use of choice and

achievement choice (Kleine, 2010). In this case, both "ICT use" and "no ICT use" are existing choice options. However, Sudotec possesses adequate resources and is inserted in a structural context that gives individuals the option to choose, to use their resources for their own benefit, thus reaching the expected individual results.

6. Final considerations

Pursuing the objective to discuss how the use of ICT can collaborate for effective local development, we sought to found, in-field, evidences that would help explore this matter. The results revealed positive effects of the use of ICT in social, economical and cultural spheres, as more than 2000 students benefited, more than 200 young people entered the labor market by means of programs, providing increased incomes, higher qualification and other; expand the project to other cities because of its positives results, incubation of new businesses, etc.
The analyze by means of Choice framework allowed to identify those who opted to use ICT for their own benefit, participating in programs offered by Sudotec (primary result of choice) obtained benefits as the insertion in the work market, better participation in school, knowledge in different cultures, digital inclusion, facility of access to information and learning (secondary results). The structure and agency proved appropriate and favorable to support these choices. However, drew our attention of fact that there were no substantial evidences the ICT are not yet perceived as possibility to improve of democratic practice, facilitating communication between government and citizens.

This research highlights the fact that the effective use of ICT, the cities can count with a further impulse to f development. Given the great potential of ICT to give choices to individuals, Sen's approach and Choice Framework have proved appropriate and can contribute to future discussions on the use and role of ICT for development work in the practice of development.

Nevertheless, there are limitations in this study regarding its pretense to state that the use of ICT alone can promote a more effective local development. The main limitation is the fact that it is the study of a single case, not counting with research and comparing with other social, economical or even geographical contexts.

Finally, we believe this paper shows that the research in the use of the implications of ICT for development can be enriched by multidisciplinarity. The work that starts in this paper can be amplified. Other actors (political actors and entrepreneurs, for instance) can become part of the study to deepen the results of individuals' choices, as well as studying more deeply the actions of government on development. Quantitative research can also be used to raise indicators and test hypotheses. It will be interesting to gather experiences with the application of Choice Framework in other cultural and socio-economical contexts and compare them with the study initiated here.

References

Alsop R. and Heinsohn N. (2005). Measuring Empowerment in Practice—Structuring Analysis and Framing Indicators. World Bank: Washington DC.

Avgerou, C. (2008). "Information systems in developing countries: a critical research review". Journal of Information Technology, (23)3, pp. 133. Doi:10.1057/palgrave.jit.2000136.

Avgerou, C. (2010). "Discourses on ICT and development". Information technologies and international development, (6)3, pp. 1-18.

Avgerou, C. and Walsham,G. (Eds.). (2000). Information technology in context: Implementing systems in the developing world. Brookfield, VT: Ashgate Publishing.

CGI - Comitê Gestor da Internet no Brasil (2012). "Pesquisa sobre o uso das Tecnologias da Informação e da Comunicação no Brasil: TIC Domicílios e TIC Empresas 2011". São Paulo: Comitê Gestor da Internet no Brasil. Análise dos resultados TIC Domicílios. http://cetic.br (website) last accessed June 01, 2012.

DFID. 1999. Sustainable Livelihoods Guidance Sheets. Department for International Development: London.

Duncombe, R.A. and Heeks, R.B. (2002). "Entreprise across the digital divide: information systems and rural micro-enterprise in Botswana". Journal of International Development, (14)1, pp. 61-74.

Ipardes – Instituto Paranaense de Desenvolvimento Econômico e Social (2006). Arranjo Produtivo Local de Software de Pato Branco, Dois Vizinhos e região Sudoeste: estudo de caso. Secretaria de Estado do Planejamento e Coordenação Geral. – Curitiba : IPARDES.

Heeks, R. and Kenny, C. (2002). "ICTs and Development: Convergence or divergence for developing countries?" Information and Communication Technologies and Development: New Opportunities, Perspectives and Challenges, IFIP WG9.4 Conference. Bangalore.

Heeks, R. (2006). "Theorizing ICT4D research". Information Technologies and International Development, (3)3, pp. 1-4.

Heeks, R. (2010). "Policy arena do information and communication technologies (ICTs) contribute to development?" Journal of International of Development. (640), pp.625–640.

Ibge - Instituto Brasileiro de Geografia e Estatística (2010). "Censo demográfico 2010". http://www.ibge.gov.br (website) last accessed June 02, 2012.

Kamel, S. (2008). "The Use of ICT for Social Development in Underprivileged Communities in Egypt". CONF-IRM 2008 Proceedings. Paper 58.

Kanungo, S. and Kanungo, P. (2004). "Understanding the Linkage of ICT to other Developmental Constructs in Underserved and Poor Rural Regions". PACIS 2004 Proceedings. Paper 18.

Kleine, D. (2010). "ICT4WHAT□? - Using the choice framework to operationalise the capability approach to development." Journal of International Development, (22), pp. 674–692. DOI: 10.1002/jid.1719

Kleine, D., Light, A. and Montero, M. (2012). "Information Technology for Development Signifiers of the life we value ? – considering human development , technologies and Fair Trade from the perspective of the capabilities approach". Information Tecnology for Development, (18)1, pp.42-60.

Kraemer, K.L., Dedrick, J. and Sharma, P. (2009). "One laptop per child: vision vs reality". Communications of the ACM, (52)6, pp. 66-73.

Krishna, S. and Walsham, G. (2005). "Implementing public information systems in developing countries: Learning from a success story". Information Technology for Development, (11)2, pp. 1-18. Doi: 10.1002/itdj.20007.

Lin, C. I., Kuo, F.-Y. and Myers, M. D. (2009). "ICT for Development: Two Contradictory Stories of an ICT Initiative". AMCIS 2009 Proceedings. Paper 759.

Mann, C. L. (2004). "Information technologies and international development: conceptual clarity in the search for commonality and diversity". Information Technologies and International Development, (1)2, pp. 67-79.

Passoni, I.,R. (2007). Conhecimento e cidadania 2: tecnologia social e desenvolvimento local. São Paulo, Instituto de Tecnologia Social.

Pozzebon, M., Diniz, E. and Reinhard, N. (2011). "Creating a Brazilian School in International Information Systems Research: Opportunities and Challenges". RAE - revista de administração de empresas, (51)1.

Sahay, S. (2001). "Introduction to the special issue on IT and Health Care in Developing Countries". Electronic Journal on Information Systems in Developing Countries, (5)0, pp. 1-6.

Sen, A. (1985). "Well-being, agency and freedom: The Dewey lectures 1984". The Journal of Philosophy, (82)4, pp.169–221.

Sen, A. (1992). Inequality re-examined. Oxford: Clarendon Press.

Sen, A. (1999). Development as freedom. Oxford: Oxford University Press.

Sorj, B. (2003). Brasil@povo.com: a luta contra a desigualdade na sociedade de informação. Rio de Janeiro: Zahar; Brasília: Unesco.

Thompson, M.P.A. (2008). "ICT and development studies: towards development 2.0". Journal of International Development, (20)6, pp. 821-835.

Walsham, G. (1995). "The Emergence of Intrepretivism in IS Research". Information Systems Research, (4), pp.376-394.

Walsham, G., Robey, D. and Sahay, S. (2007). "Foreword: Special issue on information systems in developing countries". MIS Quarterly, (31)2, pp. 317-326.

Walsham, G. and Sahay, S. (2006). "Research on Information Systems in Developing Countries: Current Landscape and Future Prospects". Information Technology for Development, (12)1, pp. 7-24.