J Communication, 4(1): 33-40 (2013)
PRINT: ISSN 0976-691X ONLINE: ISSN 2456-6586 DOI: 10.31901/24566586.2013/04.01.05

Information and Communication Technology (ICT) and Attainment of the Millennium Development Goals (MDGs): The Interdependence between MDGs' Educational and Socio-economic Goals

Luckson Muganyizi Kaino

College of Education, University of South Africa (UNISA), South Africa,
169 Ezra Road, Die Wilgers, 0184 Pretoria, South Africa
Telephone: +27 766 000 182; E-mail: kainolm@unisa.ac.za

KEYWORDS ICT. MDGs Attainment. Educational Development. Socio- economic Development

ABSTRACT This paper focuses on the extent to which university-based research on Information and Communication Technology (ICT) addressed and impacted the Millennium Development Goals (MDGs) in education, social and economic development in the countries of Botswana, Namibia and Zimbabwe. Twenty- two ICT-related projects were selected on the basis of (a) having a focus on ICT research knowledge production, (b) intensive involvement of ICTs, and (c) not being more than five years old. The study was descriptive in nature and used both qualitative and quantitative in design using questionnaires, structured interviews and documentary schedules. The data collected was qualitatively analyzed. The findings of the study showed that ICT applications were a means to extend access to wider educational opportunities and this added value to productivity-related socio-economic activities. It was concluded that the studies surveyed did make some positive contributions and education was the base for socio-economic development in attainment of MDG's agenda through the use of ICT.

INTRODUCTION

In year 2000, eight Millennium Development Goals (MDGs) were agreed upon by the United Nation's member states (MDGs 2008). These were: "(1) Eradication of poverty and hunger; (2) Achieve universal primary education; (3) Promote gender equality and empower women; (4) Reduce child mortality; (5) Improve maternal health; (6) Combat HIV/AIDS, malaria and other diseases; (7) Ensure environmental sustainability; and (8) Develop a global partnership for development" (GRN 2004: 1). The purpose of these eight MDGs aimed to tackle the vestiges of poverty by addressing factors that impacted negatively on the lives of communities in all member states and the eradication of these by year 2015 (MDGs 2008). From the year 2000 a variety of activities and projects aimed at achieving the goals have been undertaken and reported (GRN 2004; Oneworld.net 2009). Although ICTs pervade all our everyday activities (Kankaanranta 2005), not every person, especially those in the remote areas of the countries in Sub-Saharan Africa, has access to them. Many such rural communities do not have easy access to current information that may be useful for their day to day activities, resulting in them being bypassed by both social and economic development. Therefore, research that addresses the rural communities' ICT needs helps in bridging the gap between the rural and urban areas and brings development closer to them.

The contribution of ICTs in achieving the MDGs has been emphasized in many studies (see for example OECD 2005; Heeks 2005; MDGs 2008; Kaino 2008 and others) and the participation of higher learning institutions in particular cannot be over emphasized. The significance of ICTs is realized in many aspects such as improved access to learning by all, creation of conducive learning environment by gender, quality of knowledge delivery, expanded secondary and post-secondary education, reduction of expenditure on training and many others (Pelgrum 2001; Oates 2003; Smeets 2005; Kaino 2005, 2006, 2007, 2008). ICTs have been found to be useful tools with achievement of the MDGs as they can enhance accountability, transparency, citizen engagement, public debate, participation and local ownership of the development process (Raftree 2010). ICTs are also believed to make possessors of the associated skills become lifelong learners who can use information to make their standard of living better. A few projects undertaken in some African countries in efforts to achieve the MDGs using ICTs have indicated that ICTs have the capacity to empower targeted communities (SIDA 2009). For example, social, economic development and

gender balance projects undertaken for the youth and women showed some positive results through such initiatives (UN 2009; Gill et al. 2010). ICTs have also been found to be an essential tool for supporting education in African countries (Dzidonu 2010).

The attainment of the MDGs has been assessed as remarkably successful in focusing attention and mobilizing resources to address the major gaps in human development (Carin et al. 2012). Carin et al believe that the MDGs' key targets, such as halving the poverty rate, will be met by 2015. However, these authors seem to be too ambitious on the reduction of poverty by half in particular in African and other developing countries where poverty is on the rise due to the number of educational, social and economic factors that have still to be tackled. The post-2015 MDGs agenda is already debated and authors suggest a comprehensive and holistic notion of development with 'one-world' sustainable goals that shall apply to the poor and rich countries alike (Carin and Bates-Eamer 2013).

Theoretical Framework

The eight MDGs that aimed to tackle the vestiges of poverty are considered in this paper to be embedded in educational, social and economic factors that had to be addressed to achieve the MDGs by year 2015. This study realizes the contribution of ICT policies to education, social and economic development as indicated in Kozma's (2005) ICT policy framework and premises the interdependence of educational and socio-economic factors in the realization of the MDGs through the use of ICT. Kozma's framework shows how the development framework and a systemic approach to policy formulation can align economic, social and educational strategies. To address educational, social and economic issues, ICT knowledge and infrastructure have to be extended to rural areas and establish community technology centers, and the resulting impact could differ from country to country. The internet for example, would allow for inexpensive access to resources to remote areas such as learning materials and programmes for teachers in rural areas, adult education programmes, knowledge of modern farming, business adverts etc. The emphasis here has to be put on a deeper understanding of developing technological skills. Equipped with knowledge and skills, rural learners would for example be able to access information and further their education, use modern agricultural practices, work in nearby and the like. The plan to succeed should have the policy formulation that aligns educational, social and economic strategies. In addition, the implementation strategy should be put in place for the plan to succeed. In this paper, the three components, that is, educational, social and economic developments are connected as illustrated in the diagram below (Fig. 1) to indicate that education is the key for both socio and economic developments. The social and economic development components are analyzed in a socio-economic development context and the findings are used to certify the author's premised framework.

This study was also premised on the transforming knowledge into action (theory into prac-

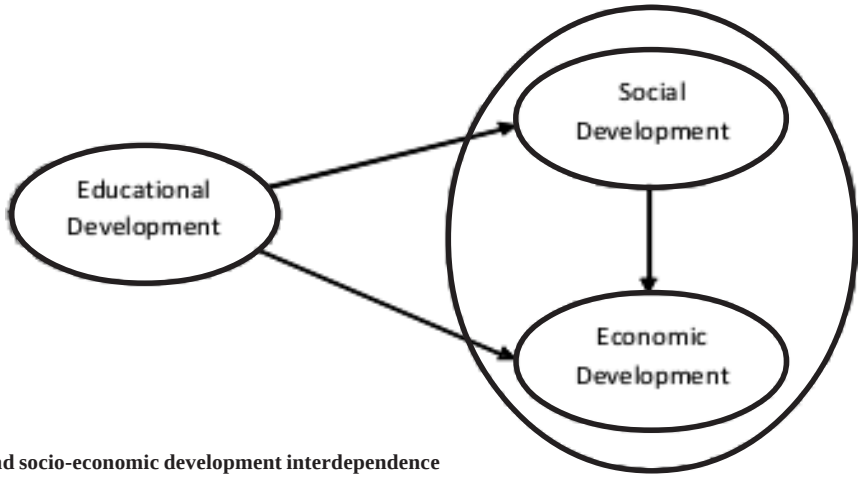

Fig. 1. Educational and socio-economic development interdependence

tice) framework and the notion of impact. Rogers (2003) was of the view that individuals accept innovation if they see and realize its importance to their lives. This realization of the importance would result in using the knowledge that they have learned to better their practice or performance. The majority of the participants surveyed in this study was adults and as such were aware of the importance and usefulness of the ICTs they were being exposed to. Research findings or knowledge need to be widely disseminated if it is to receive acceptance and use by others. Studies in the field of knowledge utilization are based on two designs or models: the discrete event design and the decision-making process design. In the first design, respondents are asked to identify how the results of a single study affect a discrete decision by the users of the research, while in the second view respondents are asked to identify how the knowledge produced across all the stages of the research process influences the users' decision making process (Lomas 1997; Landry et al. 2000). Conceptualization and operation of utilization in terms of instrumental use transforms utilization of information into events. Weiss (1980) noted that instrumental use of research results was rare and when observed would tend to be more frequent in private than in public organizations (Dunn 1980; Caplan 1975). This study was therefore based on a decision-making process model due to the fact that research produces many effects and not a single effect (Mandell and Sauter 1984) and as such it was important to consider a number of researches dealing with the same or related issue to come up with practice or utilization of the results, that is, research or theory being transformed into action by the recipients because of its perceived utility (Rogers 2003).

Goals of the Study

The aim of the study was to find out the contribution of Information and Communication Technology (ICT) in the achievement of the Millennium Development Goals (MDGs). Specifically, the study analyzed the interdependence between the MDGs' educational and socio-economic goals in the achievement of MDGs using ICT.

METHODS

Research Design

The study was descriptive in nature and used a survey research design. The Questionnaires (comprising both open- and close- ended questions), structured interviews and documentary schedules were used to collect data. These instruments were constructed by the researcher and piloted in the three countries before the main data collection exercise was conducted in the same countries. The study used a mixed methods technique to collect both qualitative and quantitative data from the respondents (De Vos 1998).

Target and Sample of the Study

The three neighboring countries of Botswana, Namibia and Zimbabwe in the Southern African region were targeted for this study. The sample was ICT-related projects selected on the basis of (a) having a focus on ICT research knowledge production, (b) intensive involvement of ICTs, and (c) not being more than five years old. A total of twenty two (22) ICT-related projects were selected: Botswana-5, Namibia-6 and Zimbabwe-11.

Data Collection

The data were collected by local research teams in the three universities and analyzed by the main researcher. Information from questionnaires, structured interviews and documentary schedules were obtained from informants and offices at the three universities who were actively involved in the selected ICT research projects, and also from selected people in communities that directly benefited from those projects. The questionnaire reflected aspects related to the infusion of ICTs in the lives of the participants and the face to face structured interviews with the researchers/benefiting participants. The third was a documentary analysis schedule that obtained information from the university libraries, university research offices and departments. The use of three ways of data collection was an adoption of a triangulation procedure that helps to increase the validity of

the collected data (Sarantakos 2005) and provide a better understanding of the respondents' thinking.

Data Analysis

The categories and themes were developed from the data collected. The data were then corroborated across instruments and methods by the researcher. The validity and reliability of the data were increased through triangulatory measures taken by the researcher: the instruments used, and by the items within the instruments. The data was analyzed both qualitatively and quantitatively. Similar views were grouped and categorized. Some other information was presented in frequencies and percentages.

FINDINGS AND DISCUSSION

Accessibility of Research Outputs

The issue of accessibility of the research products by the intended beneficiaries – an indirect outcome of dissemination - is at the heart of utilization of the products. For this group of 22 studies there was a wide variation in the nature of accessibility of the products to the intended users (Table 1). Only 2 studies claimed that their findings were not accessible at all to their intended members, 9 accessible to a few, with another 9 studies claiming accessibility to all of their target members. There was an interesting discrepancy in perspectives on the issue of accessibility between researchers and community members. While the ratio of 'accessibility to a few' to 'accessibility to all' was 1:1 from the researcher responses, it was 2:1 from the community member responses. This discrepancy may be explained by the observation that the research products may have come to the target community in forms that may have required specific skills, for example, literacy that the beneficiaries may not have possessed to enable them to interact with the products.

Table 1: Extent of accessibility of ICT research outputs

Response	*Frequency*
Not accessible at all	2
Accessible to a few	9
Accessible to all	2
Potentially accessible to all	9
Total	22

Accessibility for members could be direct, for example, through action/participation of members, teaching/training, workshops and publications; or indirect, for example, via intermediaries like district offices, stakeholders, libraries, etc. It could be mediated by instrumental tools, for example, internet facility; IT equipment, physical space such as distance to a repository/library; by deciphering skills for example, literary, ICT, reading, and technical domain language; or by the operating environment, for example, official legislation and political undercurrents. Accessibility could also be affected through a single mode, for example, conference paper, or multiple modes, for example, journals, teaching, conferences, training, etc. A comparison of research output accessibility in the countries of the study indicated that outputs were more accessible in Zimbabwe than in Botswana and Namibia (Fig. 2). The findings indicate that ICT research outputs reached many people in the three countries as also noted for the past years by GRN (2004) and Oneworld.net (2009), but still not every person had access to them. Such a large population that had no access to ICT outputs was likely to be disadvantaged both socially and economically.

MDG on Educational Development

The overall finding on this MDG from the surveyed studies was that ICT applications in general and those context in the educational domain in particular were seen by the researchers and to a lesser extent by the targeted beneficiaries as a means to extend access to a wider clientele to educational opportunities, information, other learning resources and tools, and communications. For example, three out of five, of the Botswana studies had something to do with learning-for-all anywhere, while the other 2 were for higher degrees; the Zimbabwe group of studies encompassed those about obtaining higher degree qualifications, those on community-based learning, and those with strong educational training aspects. Five out of six studies from the Namibian group were on increasing educational opportunities and operational efficiency of learning provisions within various sections of the population. "The research involved training of the community on water management," "… content is well suited for lifelong learning," "…. e-learning promotes ac-

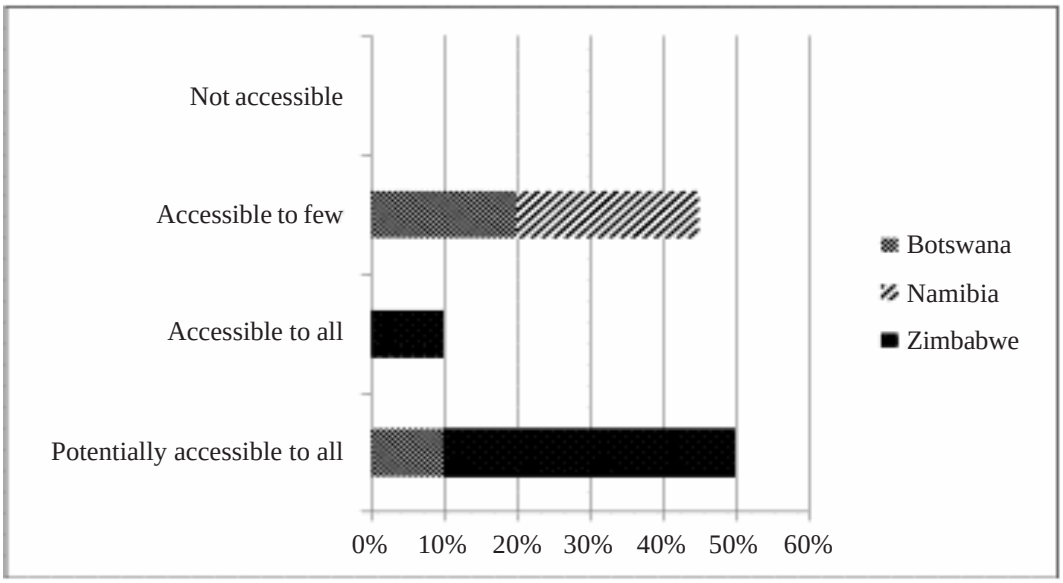

Fig. 2. Accessibility of ICT research outputs by country

cess to education by a lot of people in remote areas …," "…. staff development in the area of ICT …., " "…. the research involved post graduate female students …. ," "… equal provision of facilities and full participation of everyone in new educational programs," etc., were some of the expressions captured from interviews with the researchers and are in line with our main observation.

Two things need to be acknowledged, though, as pointed out by some respondents in 2 of the surveyed studies. As with most educational impact assessments, evidence for the impact may not be tangible or immediate. Often it becomes visible way down the road. Also, the increased accessibility to educational provisions claimed in most of the surveyed studies may remain just a claim, if the research outcome interventions do not come packaged together with attendant training on skills essential for realizing the accessibility.

On the whole it was noted that data gathered from the surveyed studies show a large intersection between ICTs and their applications as deployed in the studies and educational development at both general and specific levels. That led to the conclusion that university-based research outcomes on ICT-related issues had substantial impact on the MDG on educational development. This effect, though fairly large, may be by default, considering that many of the researchers involved were generally unfamiliar with MDG statements as a whole, and that the majority of the 22 studies happened (most likely coincidentally as well) to be context within educational programs or projects. Nonetheless, support for this main conclusion regarding the extent of impact also comes from sampled members of the targeted community. The unfamiliarity of the MDGs by the researchers for about 13 years since these goals were agreed upon by the United Nation's member states (MDGs 2008) should be considered as a setback to their achievement by year 2015. It is through the researchers that knowledge would have been easily disseminated and not coincidentally as found out in this study.

Beneficiaries acknowledged in either real or potential terms, that among the surveyed studies are those that have modified (or will modify when completed) (a) knowledge and skill levels in related aspects of their lives, (b) efficiencies, for example, by offering better media for planning and delivering classroom lessons, (c) capacity to innovate and create educational resources, (d) accessibility to current and more diverse information, (e) affordability by lowering the costs of educational provisions, and (f) confidence in the use of ICT as a learning medium and tool.

For evidence of these acknowledgments by the beneficiaries, they cite such things as (a) more participation (enrolment) in educational courses, including higher education, (b) lecturers pursuing higher degrees through on-line provisions, (c) obtaining advisory services directly and essential information from professionals at a distance, for example, managerial advices for farmers and information on epidemic outbreaks for health workers in the rural areas, and (d) easing the design and delivery of short courses for in-house trainings. One Zimbabwean study, for example, claimed that one real outcome of their ICT applications research was that "the local community was now able to manage their water resources properly." Such admissions, if they could be positively verified can be regarded as providing more evidence of substantial impact of university-based research on ICT on the quality of education within the community. As Rogers (2003) argues, people accept innovation if they see and realize its importance to their lives. The realization of the importance of ICT would result into more usage to the advantage the communities. Some positive results realized through such initiatives as also reported by UN (2009) and Gill et al. (2010) are promote the usage of ICTs that have been recommended to be essential tool for supporting education in African countries (Dzidonu 2010).

From surveyed studies, to achieve MDGs in the education domain, the following had to be done:

- Equip all learners with ICT skills
- Training communities to conserve resources through workshops
- Expanding educational opportunities to all through e-learning
- Best practices to be shared with others in the community and beyond the country borders
- Developing training manuals for teaching the community

Awareness of MDGs among university researchers in general, and those who research ICTs in particular, should be intensified. In this way MDG considerations could be brought onto the foreground during conceptualization, design, and execution of the research study or project.

MDG on Socio-economic Development

A main observation was that the impact from the university-based studies on ICT came largely through increasing access to educational resources (Botswana group of studies); encouraging more sustainable use of local resources, enhancing quality of educational processes, and adding value to primary local economic resources (Zimbabwe group); application of ICTs to productivity-related socio-economic activities (Namibia group). An associated observation is that the impact was generally not direct. It was more indirect and long term, suggesting that socio-economic development from research outcomes of studies such as those surveyed for this report could be experienced within targeted communities more from trickle down evolutionary effects of the outcomes than from immediate and direct effects. No more that 4 of the surveyed studies, for example, had the possibility of influencing socio-economic activity in a direct manner. Direct influence could be through, for example, increasing accessibility information relevant for specific socio-economic activity within the benefitting community, or intervening directly into a production process. The rest of the surveyed studies could produce more indirect impact through (a) increasing access to higher education, which correlates positively with sustainability of economic productivity; (b) enhancing the value and employability of users of their research outcomes, and (c) better understanding by community members of their own environments as a result of, for instance, better planning with information generated by ICT driven early warning systems for, say, adverse weather and other natural disasters.

All the observations above gleaned from the data relating to the socio-economic development MDG led to one main conclusion. The research outcome effects of the surveyed studies could be linked to the socio-economic development MDG in a largely indirect and long-term manner, via improved educational attainments. In other words, addressing MDGs on educational development vigorously and directly through such research studies will, by default, also address the MDG on socio-economic development. Not many of the studies examined here could produce mediating effects on this MDG in a direct fashion. These could include, for example, 2 of the studies which targeted sustainability aspects of economic productive activity, 2 that targeted direct reduction of costs for communication services, and one whose research outcome encouraged raising of family incomes through plant-

ing trees with economic value while using the trees to fight land degradation effects at the same time.

A few of the studies showed some form of evidence of a concrete or immediate nature in support of possible impact of research outcomes of such studies. For example, there were acknowledgements for increased capacity for productivity through lowering of operating/service costs (as with the digital data storage study from Botswana), and raising efficiency of operations – hence lowering costs and increasing productivity – (as with the Health-Net study from Zimbabwe). One study claimed a more concrete and direct evidence for impact in the form of increased employability of beneficiaries, as indicated by, for example, individuals winning many consultancies.

The findings of this study indicated that more impact would have been realized if ICT products consumers were involved in the research process and not expected to participate fully at the end of the process. Involvement of the consumers was important to identify how the knowledge produced across all the stages of the research process influences the users' decision making process (Lomas 1997; Landry et al. 2000). ICTs have been found to have the capacity to empower targeted communities (SIDA 2009) and the community engagement in the research process could accelerate the achievement of MDGs.

From surveyed studies, to achieve MDGs Socio-economic development goals the following had to be done:

- Improvement service provision in the community (public and private)
- Training community in management of resources
- Sharing of information on how to address problems and best solutions to improved living standards
- Open up remote areas via wireless communication technology and results in improved ways of living, hence development
- Alleviation of poverty through better practices, for example methods of farming.

CONCLUSION

The overall conclusion was that university-based ICT-related research studies surveyed did indeed make some positive contribution towards the MDGs agenda, but that contribution was actualized in somewhat tenuous ways. The studies reviewed here indicated such contribution could filter to poverty alleviation through, for instance, researching with and training the community to plant trees (for say, home perimeter fence) with economic value; to education through, for instance, use of e-learning and development of training manuals for any intervention within the community. The sample of studies also revealed that their contribution to the educational development MDG was more substantial, direct, and long term. Contributions to the socio-economic development MDG, however, were somewhat modest and came through more in an indirect and long term (via the education MDGs) than in a direct and immediate manner.

REFERENCES

Carin B, Bates-Eamer N 2013. The Millennium Development Goals and Post-2015: Squaring the Circle. From <http://www.cigionline.org/publications/2013/5/millennium-development-goals-and-post-2015-squaring-circle> (Retrieved May 14, 2013).

Carin B, Bates-Eamer N, Lee MH, Wonhyuk 2012. Post-2015 Development Agenda: Goals, Targets and Indicators. From <http://www.cigionline.org/publications/2012/10/post-2015-development-agenda-goals-targets-and-indicators?gclid=CM3_v-rvlbcCFa7KtAodLj4A7g> (Retrieved May 13, 2013).

Caplan N 1975. The use of social science information by Federal Executives. In: GM Lyons (Ed.): *Social Science and Public Policies*. Hanover: N H Darmouth Center, pp. 47 – 67.

De Vos AS 1998. Combined quantitative and qualitative approach. In: AS De Vos (Ed.): *Research at Grass Roots*. Pretoria: JL van Schaik, pp. 357 – 363.

Dunn WN 1980. The two communities: Metaphor and models of knowledge use. *The International Journal of Knowledge Creation, Diffusion and Utilization*, 1: 515 – 536.

Dzidonu C 2010. The Role of ICTs to Achieve the MDGs in Education: An Analysis of the Case of African Countries. From <http://unpan1.un.org/intradoc/groups/public/documents/UN-DPADM/UNPAN039076.pdf> (Retrieved January 7, 2011).

Etzkowitz H, Webster A, Gebhardt C, Terra B 2000. The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. *Research Policy*, 29: 313-330.

Gill K, Brooks K, McDougall J, Patel P, Kes A 2010. Bridging the Gender Divide: How Technology Can Advance Women Economically. The International Centre for Research on Women (ICRW). From <http://www.icrw.org/files/publications/Bridging-the-Gender-Divide-How-Technology-can-Advance-Women-Economically.pdf> (Retrieved May 20, 2010).

GRN 2004. *Namibia 2004 Millennium Development Goals*. National Planning Commission Document.

Heeks R 2005. ICTs and the MDGs: On the Wrong Track*?* Development Informatics Group. From <http://www.i4donline.net/feb05/perspective.pdf> (Retrieved January 7, 2011).

Kaino LM 2005. Analysis of ICT availability, utilization and policy in Botswana schools. *African Journal of Educational Studies*, 3(1): 287-308.

Kaino LM 2006. Gender attitudes toward Information and Communication Technology (ICT): A case study of Botswana Junior schools on the use of computers in learning. *African Journal of Educational Studies*, 4: 1-14.

Kaino LM 2007. The Use of Information and Communication Technology (ICT) in Learning: Students' Attitudes in Botswana Secondary Schools by Gender. The Organization of Social Science Research in Eastern and Southern Africa (OSSREA). *OSSREA Report*, Addis Ababa, Ethiopia.

Kaino LM 2008. ICT Developments, Utilization and Challenges in International Commission Mathematical Instruction (ICMI) History. Symposium of the 100th Anniversary of ICMI, Rome, Italy. From <http://www.unige.ch/math/EnsMath/Rome2008/ALL/Papers/KAINO.pdf> (Retrieved May 20, 2011).

Kankaanranta M 2005. International perspectives on the pedagogically innovative uses of technology. *Human Technology*, 1(2): 111 – 116.

Kozma R 2005. National policies that connect ICT-based education reform to economic and social development. *Human Technology*, 1(2): 117-156.

Landry R, Amara N, Lamari M 2000. Utilization of social science research knowledge in Canada. *Research Policy*, 30(2): 333-349.

Lomas J 1997. Research and evidence-based decision making. *Australian and New Zealand Journal of Public Health*, 21(5): 439 – 441.

Mandell MB, Sauter VL 1984. Approaches to the study of information utilization in public agencies. *Journal of Knowledge Creation, Diffusion and Utilization*, 6(2): 145 – 163.

MDGs 2008. Millennium Development Goals (MDGs) Report. From <http://www.undp.org/mdg/> (Retrieved October 29, 2008).

Oates B J 2003. The potential contribution of ICTs to the political process. *Electronic Journal of e-Government*, 1(1): 33-42.

OECD 2005. The Contribution of ICTs to Achieving the Millennium Development Goals (MDGs). *Report, 380(5/1), OECD.*

Oneworld.net 2009. MDG Plus: Millennium Campaign. From < http://southasia.oneworld.net/articles/mdg-plus-millennium-campaign?b_start:int=60> (Retrieved May 10, 2013).

Pelgrum W J 2001. Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers and Education*, 37: 163–178.

Raftree L 2010. Three Ways to Integrate ICTs into Development Work. From <http://lindaraftree.com/2010/09/15/3-ways-to-integrate-icts-into-development-work/> (Retrieved May 13, 2013).

Rogers F M 2003. *Diffusion of Innovations*. 5th Edition. New York: Free Press.

Sarantos S 2005. *Social Research*. 3rd Edition. New York: Palgrave Macmillan.

SIDA 2009. ICTs for Democracy: Information and Communication Technologies for the Enhancement of Democracy - with a Focus on Empowerment. From <http://www.apc.org/en/system/files/SIDA_ICTs+for+Democracy.pdf> (Retrieved July 11, 2009).

Smeets E D 2005. Does ICT contribute to powerful learning environments in primary education? *Computers and Education Archive*, 44(3): 343 – 355.

United Nations 2009. A Digital Shift: Youth and ICT for Development. From <http://unpan1.un.org/intradoc/groups/public/documents/gaid/unpan036084.pdf> (Retrieved May 24, 2009).

Weiss C H 1980. Knowledge creep, decision accretion and knowledge. *Creation, Diffusion and Utilization*, 1: 381 – 404.