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Issues of ICTs and Development in Less Developed Countries: A Case of Africa and a View Towards Bridging the Digital Divide

George E.M. Ditsa

College of Information Technology, UAE University, Al Ain, georged@uaeu.ac.ae

ABSTRACT

This paper examines the trends and challenges facing Less Developed Countries (LDCs), in particular African nations, in this ICT era and offers some views towards bridging the "digital divide" between LDCs and the developed world. The paper suggests some frameworks for formulating ICT strategies to sustain the growth of ICTs in LDCs, particularly in Africa.

INTRODUCTION

The subject of technological change and development in Africa has received increasing scholarly and public attention in recent years, and there are a number of publications on how information and communication technologies (ICTs) could offer business opportunities to enable Africa to develop. Perhaps the most significant study was published in 2003 by the United Nations Development Program: "Human Development Report 2001: Making new technologies work for human development". The UNDP report, which covers the entire developing world, offers many valuable insights into the role of technology and development. But the report, while offering scores of examples of the role of innovation in social and material change, pays scant attention to the role of location and the relationship between geography and innovation. Location is crucial to understanding technological capacity – and creating policies to expand it, especially in the areas of computing and communications (Zachary, 2003).

Indeed, an article by Pankaj Ghemawhat in 2001 and cited recently by Frank Dubois (2004) also eloquently addresses the problem of distance, not only geographical distance, but also cultural, administrative and economic distance that separate countries. Dubois refers to geographical distance as "the simple notion that as the distance between trading partners [countries] increases, the likelihood that they will trade falls. Administrative distance refers to the differences in the legal and regulatory environments of the trading nations which may impede trade, [and] economic distance may mean dramatic differences in the adoption and diffusion of technological innovations in some host countries" (p. ii).

Some of the publications on the subject paint bright and promising pictures about the use of ICTs as a means of generating quick wealth, bridging the "digital divide" and consequently accelerating national and regional development (e.g., Moyo, 1996; Morales-Gomez and Melesse, 1998). Much attention has, however, not been paid to the underlying factors that can and would inhibit the successful adoption, diffusion and use of these technologies towards the development of the LDCs.

This paper presents some of the underlying factors contributing to the "digital divide" between Africa and the developed world with an attempt to present some views towards bridging the "digital divide". The focus of the paper is a bit more on sub-Saharan Africa, particularly Ghana, Nigeria and South Africa. The paper is structured as follows. The "digital divide" is first explained with some of the strategic policies leading to it, and then the advocacy for adopting an evolutionary technological intake in Africa. This is followed by a brief overview of technological breakthroughs and poverty reduction. The paper continues by taking a look at the challenges faced by ICT projects in Africa. Some ICT initiatives in Ghana and South Africa are briefly then presented. Finally, the paper suggests some models for formulating and maintaining ICT strategies in Africa and concludes with some suggestions.

THE DIGITAL DIVIDE

Information technology was introduced into development as early as the 1970s. This introduction was facilitated by international development agencies, such as the UNDP (United Nations Development Program) and World Bank, who supported a large number of IT related development projects in the 1970s and 1980s (Berman, 1992). Once again, there was the familiar progression of initial enthusiasm and optimism leading to top-down strategies of implementation which accompanied the implementations of earlier technologies. The apparent "push" rather than "pull" implementation strategies by developing countries appeared to have resulted in significant failures (Heeks 2002) and has often worsened the development states of most developing countries (Berman 1992; Brohman 1996). This also resulted in the ripple effect of widening the gap between the developed and the developing countries in their use of ICTs.

There is an increasingly growing disparity between the involvement of developed and developing countries in the new "information age". Developed countries are harnessing the information age to revolutionize the way their industries operate. Developing countries, on the other hand, appeared not to have the capabilities to do so. The disparity that exists in the access to and use of information and communications technology between countries, and between groups within countries is what is termed to today as the "digital divide" (Bridges.org 2001). The "digital divide" is also defined as "the gap between individuals, households, businesses and geographical areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and their use of the Internet for a wide variety of activities" (OECD, 2001, p. 5).

Whatever the definition, this gap will continue to widen unless and until developing countries recognize the role these technologies can and should play in their development and take urgent and proactive actions to bridge the gap between them and their developed counterparts.

Intermediate Technology

In his book, "Small is Beautiful", Schumacher (1999 - first published in 1973) highlights another gap in terms of the level of technology deployment in developing countries. He states:

We can call the indigenous technology of a typical developing country – symbolically speaking – a £1-technology, while that of the developed countries could be called a £1,000-technology. The gap between these two technologies is so enormous that a transition from the one to the other is simply impossible. In fact, the current attempt of the developing countries to infiltrate the £1,000-technology into their economies inevitably kills off the £1-technology at an alarming rate, destroying traditional workplaces much faster than modern workplaces can be created, and thus leaves the poor in a more desperate and helpless position than ever before. If effective help is to be brought to those who need it most, a technology is required which would range in some intermediate position between the £1-technology and the £1,000-technology. Let us call it – again symbolically speaking – a £100-technology (pp. 149 –150).

Thus, Schumacher contends that such an intermediate technology would be immensely more productive than the indigenous technology (which is often in a condition of decay), but also be immensely cheaper than the sophisticated, highly capital-intensive technology of modern industry. Put another way, Schumacher is advocating for an evolutionary process in technological intake by developing countries rather than leapfrogging as advocated by others such as Fontaine (1999). It is important to add that such an evolutionary process would not only make ICTs succeed in Africa, but would also suit the limited resource allocation problems faced by developing countries, as mentioned in the next two section of this paper.

TECHNOLOGICAL BREAKTHROUGHS AND POVERTY REDUCTION

Advance information technology – from computing to communications – played a crucial role in the creation of wealth and rise in quality of life in industrialized countries in the 20th century (Zachary, 2003).

ICTs are a technological breakthrough of the 20th century. Like all technological breakthroughs before it, starting from the steam engine to sending man to the moon, there are the promised opportunities of: erasing poverty from the face of the earth; bridging the gap between the "have" and the "have-nots"; and bringing developing countries to the status of their developed counterparts. Some of the problems of these missed opportunities lie in the desperation for "quick fixes" without addressing the fundamental factors that impact on the sustainability of the advantages gained from the use of these technologies.

To solve these problems, a careful planning using complicated but sustainable interventions are required. Most of the time, the outcome may be in the long-term and not immediately visible. For example, good solid economic decisions and choices before deploying ICTs as enablers are very necessary. Stable political environments are required to support the successful implementation, diffusion and use of these technologies. The social environment should be ripe for the implementation of ICT projects. Pressing basic social amenity projects, such as water, electricity, education and healthcare, may need to take priority over ICT projects in order for the latter to succeed. The cultural atmosphere should be conducive to embrace the use ICTs. National information infrastructure strategies are necessary and should be formulated. Without regard to these and other factors, any attempt to "leapfrog" ICTs for development in the LDCs may fail, if not very miserably: thus further widening the "digital divide" between the LDCs and the developed world.

CHALLENGES FACED BY ICT PROJECTS IN AFRICA

There are compelling arguments on whether developing countries should focus the very limited resources on ICTs and ignore basic necessities such as, clean water, basic education, healthcare and other basic necessities of life that are hard to come by in most African communities. Although, this thinking could be discarded as too narrow, a closer examination would reveal how poverty is eroding most of the abilities required to remain focused and committed to technological breakthroughs and development. Lack of adequate national information infrastructure could affect organizations' technological capabilities, especially, those organizations that primarily depend on government for support and funding (Adewumi and Okunoye, 2004).

The Internet, for example, is simply priced beyond the reach of many people in Africa. Computers are still relatively expensive and prices for telephones are not cheap either. Considering the average income of most workers, these seemed beyond the reach of a large number of the peoples in Africa. Many companies in the continent cannot even afford the "luxury" of being hooked onto the Internet. However, for information to be truly available and useful, people should be able to cheaply afford and access it anywhere at anytime: and that appears currently to be quite a distance for many people in Africa, and indeed almost all the developing countries.

At times, the basic infrastructure for ICTs barely exists before the proposal for these systems are made, and barely any viable details of maintenance worked out for these systems over their life cycles. There is the tendency to leapfrog ICT developments without due regard to a whole range of basic problems that could undermine the advancement of the technology in the continent.

In Ghana, for example, there has been a government proposal to hook many classrooms to the Internet. Although this proposal appears to be laudable and in the right direction, it also sounds ambitious. Having Internet access requires hardware, network, software, and most importantly people to develop, support and maintain the network. Above all, many school buildings in that country are in dire need of maintenance (for those who have one): roofs are falling; walls are dangerously hanging to crumble anytime. The question is how does one maintain Internet equipment and connection in such buildings? To add to that, many schools in the country are in need of basic textbooks and writing materials. And on top of these, computer science departments in the country's universities are ill-equipped, both in human and material resources, to produce the needed qualified graduates; and there are no computer science or related masters programs, let alone doctoral programs in any of the country's universities. I believe this situation is not much different in most African countries; and this poses a dilemma on the allocation of the limited resources by national leaders in Africa.

Principles Underlying the ICT Sector and Other Sectors

To enable many people to afford using telecommunication/ICTs, African authorities need to understand the principles underlying this sector. The principles underlying this sector in a nation's economy and development are significantly different from other sectors, such as energy. The Hon. John Mahama, an MP and Minority Spokesperson on Communications in the Ghanaian Parliament, rightly pointed out recently that: "While conservation is advocated in Energy and in many circumstances high tariffs are utilized to restrict consumption, the telecom sector thrives on the principle of universal access and aims at profitability through economies of scale by building up traffic volumes. While you can enjoy electric power all by yourself while the rest of your neighbours remain in darkness, you cannot communicate with yourself. The wider and more affordable the telecom network is, the more valuable and beneficial the system is for everyone. Access and affordability are an in-built concept in the entire product philosophy of communications.

"True to this philosophy, telecom/ICT tariffs have continued to decline across the world. Gone are the times when international telephone traffic attracted between 80c and $1 per minute of talk time. Today there are tariffs as low as between 1c and 2c per minute. In some cases consumers are even offered free talk time at weekends and at off-peak hours. What Telecom companies have done in response to this trend has not been to attempt as a cartel to artificially shore up tariffs. What they have done is to cut waste and trim costs as savagely as possible. To survive in the highly competitive telecom/ICT market one has to be able to deliver service at the lowest possible cost" (Mahama, 2003, pp. 1-2).

Without due regard for these principles, telecom/ICTs will still be out of the reach of many people in Africa: cumulating into high information-illiterate societies and underdevelopment.

Can ICTs Save Africa?

Observers of computerization and new forms of communications agree that these technological systems ought to promote productivity growth, wealth and human happiness – and perhaps more so in parts of the world that are traditionally marginalized economically and technologically. In response, skeptics have pointed out that technological advancement is a symptom of a healthy society, not the source of one (Zachary, 2003).

However, without strong political, social and economic institutions, innovations developed by others cannot easily be imported into a society. And without a strong educational system and baseline of health and safety, the talented people necessary for the application of existing technical knowledge and growth of new know-how would not be available in the society.

The initial problem is, advancement of technology in Africa was not much a priority of most African leaders after their independence from colonial rules. And currently few are doing something practically to advance ICTs their countries, regional, and the continental organizations. Aside the very poor countries and those torn by civil wars, the relatively wealthy ones seemed to be doing little to advace technologically. For example, in Nigeria, the most populous sub-Saharan African country and the best endowed in terms of oil wealth, a mere 200,000 telephone lines exist to serve an estimated 100 million people (Zachary, 2003). The political instabilities in most African countries also gave rise to the bureaucratic crackdown on the communication technology advancement in the continent: the citizenry should have the least opportunity for communicating with the outside world to "know too much". For example, in Ghana, the imported upgrade equipment by Mobitel in 2001 (a mobile phone company in that country) to re-launch its services with leading-edge technology and to compete with its rivals was seized by the government for a month, with the accusation that the company imported the equipment for the secret purpose of designing a surveillance capability into its telephone system and to systematically eavesdrop on Ghanaian telephone conversations (Zachary, 2003).

There is also the challenge of attracting multinational corporations for the development of ICTs in the continent. A review of the experience of a large American IT company in Ghana, for example, reveals the potential for multinational corporations to transform the IT landscape in Africa (see Zachary, 2003). It also reveals the limitations of contributions of foreign companies to the technological development. Most multinational companies will be attracted to Africa for cheap labour, as pertains in India and China, and conditions must be made favourable for this to happen. This will mean changing or implementing policies to suit these multinational corporations. There will also be the need for basic communications infrastructure being in place to support these corporations. Property acquisition laws in some countries also need to be amended to attract these multinational corporations. The need for education towards "progress culture" to ward off resistance to advancement as pertains in most African cultures is required. The availability of local entrepreneurs, which is lacking, needs a boost. Above all, there is the need for African states to pull their resources together, learn from their developing counterparts, such India, the Koreas, Malaysia and Singapore who are far ahead in this area, in order to bridge the "digital divide".

Another problem African states face, especially those in the West African region, is how to prevent or minimize the brain drain hitting the continent. In spite of the lack of human resource in this sector, indeed other sectors too, most of the elite well trained Africans in this sector leave their countries for the developed world for "greener pastures". The elite migration pattern especially in the West African region is quite high comparatively. For example, by one estimate cited in the World Competitive Yearbook 2001, 26 percent of professional educated in Ghana today live in the developed countries, compared with about 3 percent of the professionals educated by China and India who live abroad. The challenge then is, how do African states make conditions favourable in order to retain their own educated professionals? To provide valid answers to this question will require a research study in this direction.

ICT INITIATIVES IN DEVELOPMENT IN SOUTH AFRICA AND GHANA

There are a number of ICT initiatives in most, if not all, the nations in Africa: some of which are barely off the ground. Undoubtedly South Africa is clearly ahead of the other African countries in the use ICTs, particularly in sub-Saharan African. The literature revealed that ICT initiatives in developing countries, particularly in sub-Saharan Africa, are dominated by three prevalent initiatives currently (see for example, Bridges.org 2001; Benjamin 2000; and Burton 2000). The three are:

1. Online information resources (providing relevant content);
2. School computer programmes and distance learning programmes;
3. Telecentres.

Perhaps, a brief highlight on the latter initiatives in South Africa and Ghana will suffice.

Telecentre Initiatives in South Africa

The telecentre idea first originated from Denmark in the 1980s where *telecottages* were set up in response to the increased marginalization of rural communities (Ernberg 1996; Benjamin 2000; Roman & Colle 2002). It then spread to other European countries with a focus of giving more people access to ICTs. Telecentre is defined variously. Gomez *et al*. (1999), for example defines it as: "a physical space that provides public access to ICTs for educational, personal, social, and economic development".

The next major development in telecentre occurred when the International Telecommunication Unit (ITU) issued a report titled, *The Missing Link* (also known as the Maitland Report). The report went on to note the growing disparity between the rich and poor countries of the world in terms of their access to ICTs (Benjamin 2000). International organizations, such as International Development Research Centre (IDRC) in Canada, various United Nations organisations such as UNESCO, UNDP, the Economic Commission for Africa, the World Bank and the World Links Organization, joined in the crusade in support of spreading the telecentre idea (Mayanja 2001). The World Bank (1998), for example, canvassed the idea with statements like: "[telecentres are] a powerful engine of rural development and a preferred instrument in the fight against poverty".

The South African government embraced the idea by setting up telecentres across the country. There has been a number of studies (e.g., Benjamin and Dahms 1999; Benjamin 2000 and 2001; Burton 2000; Trusler, 2004) to investigate the success or otherwise of these centres. The overall findings of these studies indicate that while the telecentres are becoming more and more widespread, the embedding of the processes which they facilitate is not occurring at any significant level. Burton for example states that:

It is clear that while existing telecentre facilities offer a variety of services that are both desired and needed by many communities, these facilities remain under-utilised by the majority of communities in which they are located. Reasons for this range from cost and pricing issues to mere awareness of the facilities (Burton 2000).

Jonathan Trusler who recently studied a rural multi-purpose community centre (MPCC) in South Africa also concludes that:

… it appears that the attempt to use '£1,000-technology' presented an impossible transition, not in terms of use – but rather in terms of ownership. We could see the computer training conducted by the PM as an attempt to 'leap-frog' certain developmental stages. Intuitively, if we had substituted the £1,000-technology (the MPCC) with a more intermediate technology (say a small-scale hydroponics plant) ownership and empowerment could have been significantly greater (Trusler, 2004).

These studies indicate the telecentre initiative is laudable, but more research is required to make them meet the objective of ICTs enabling development in South Africa.

Telecentre Initiatives in Ghana

Ghana prides itself for being number one in sub-Saharan Africa and Africa for implementing a number of ICT initiatives. For example, the country prides itself for having the first 10mbs wireless and voice technology in Africa, the first EDGE-capable network in Africa, and the first full Internet connectivity in sub-Sahara Africa. Being the first all these may however appear to be cultural. Studies (see for example, Hofstede, 1994; Hasan and Ditsa, 1999) show that it is generally endemic in the West African culture to rush in for new technologies without much regard or adequate plan for maintenance, making these first, firsts becoming last in later years.

In line with the telecentre initiative, Ghana launched two telecentres, but on a much global scale. The first is the Kofi Annan Centre of Excellence on Information and Communication Technology or simple called Kofi Annan ICT Centre. This state-of the art centre established in December 2003 with the support of the Indian Government, has the objective of facilitating information flow both within and outside the country so that work processes become more efficient and less costly. Early indications are however that, this may be unachievable because of the cost of access which is too expensive to most people who need it.

The other telecentre-style initiative on a grand scale is the Ghana Technology Park (www.Ghanaweb.com, 2004). This initiative is in collaboration with the UN, the University City Science Centre in Philadelphia, Innovation Philadelphia and Ghana Cyber Group in New York.

The Technology Park is to be an upscale business and technology complex featuring units for large-scale business process outsourcing, conference and call centres, and other facilities to stimulate the growth of technology firms in Ghana. Much of the details on the Park can be found on (www.ghanacybergroup.com). In brief, the Park will have: high-tech serviced offices for rent; Voice over Internet Protocol (VoIP); 200 PC cybercafe; a 24-hour digital copy centre; a corporate wireless ISP; a digital lab for R&D; and outsourcing and call centres.

The description shows this to be a grand initiative, the funding for which Ghana won over Senegal, Cameroon, Kenya and the Malawi who also presented similar proposals to the UN funding.

The current Ghana Government as well as its predecessors appeared to be involved and taking the lead in these initiatives. However, the strategy to sustain and have these initiatives growing to matured stages to help bridge the "digital divide" appears to be lacking. Compared with South Africa, Ghana has little or no research strategy to investigate the success or failures of these projects. It remains however to be seen if these two initiatives described above will enable Ghana to incrementally minimize the "digital divide".

FORMULATING ICT STRATEGIES

Turning to an old Irish joke, the formulation of ICT strategies must start from "here!". ICTs are subject to the growth stage model of IT or DP as it was then. Formulating strategies for ICTs and using IT growth models, such as Sutherland and Galliers model (see Galliers and Sutherland, in Galliers, Leidner and Baker, 1999), to evaluate and maintain the ICTs growth is very necessary and essential for Africa. Applying Sutherland and Galliers model, for example, to the various ICT organizations in Africa would help identify the stages that the ICTs are in the organizations, and then strategies formulated for their growth to the matured stages. Applying the model would mean first identifying the right stages of each of the "Seven Ss" (Strategy, Structure, Systems, Staff, Style, Skills and Superordinate goals), and then formulating the right recommendations and strategies to move the identified stages to the matured stages. Of course, as the model states, one needs not work slavishly through all the elements of each stage. However, it necessary all prerequisites of the previous stages are satisfied in order to satisfactorily attain and maintain a stage.

Significant differences, however, exist in different firms. Strategy formulation for ICTs seems to be inherently more complex in some firms than others. The strategic modes for sectors (Delivery, Dependent, Drive and Delayed) will vary and so is the sector ICT management too (see Earl, 1989). For example, the strategic mode for the Delivery sector may be Infrastructure-led, whereas the strategic mode for the Dependent sector may be Business-led, while the strategic mode for the Drive sector may be Opportunity-led (Earl, 1989). This suggests that sector identification with the appropriate match with ICT strategy for a sector is also very important. Using McFarlan and McKenny's "Strategic Grid", for example, could also help position firms appropriately in Africa for the right ICT management strategies (see Earl, 1989).

CONCLUSION AND FURTHER SUGGESTIONS

This paper examined the trends and challenges facing African nations in this ICT era and offerred some views towards bridging the "digital divide" between Africa and the developed world. The paper suggested some frameworks for formulating ICT strategies to sustain the growth of ICTs in Africa. The following are further suggestions towards bridging the "digital divide":

- Africa countries must be willing to invest in ICT to bring about the much needed change;
- To avoid pitfalls, components of ICTs must be properly laid out to resolve all ambiguities;
- Training/awareness drive must be properly coordinated and implemented;
- Consultants of repute must be engaged from onset to ensure that international standards are conform to and enforced;
- The notion that once a computerization project starts it must produce result immediately should be discarded; and
- Attempt must not be made to solve all problems all at once: as doing so will almost likely result in project failures.

REFERENCES

Adewumi, S. and Okunoye, A. (2004). "The Triangular Challenges of MIS Implementation in African Countries: A Case Study of a Nigerian University", *Proceedings of IRMA 2004 International Conference*, New Orleans, USA.

Benjamin, P. (2000) *Telecentre 2000: Literature Review*. Online at http://www.communitysa.org.za/tele2000.htm.

Benjamin, P. (2001) *Telecentres in South Africa.*
Online at http://www.telecentres.am/references/info/jdc-benjamin.doc.

Benjamin, P. & Dahms, M. (1999) Socialise the Modem of Production – The Role of Telecentres in Development. In *Telecentre Evaluation, a Global Perspective*. IDRC, Ottawa.

Berman, B. J. (1992). The State, Computers, and African Development: The Information Non-Revolution. In Lewis, S. G. & Samoff, J. (1992) Eds., *Microcomputers in African Development: Critical Perspectives*. Westview Press, Colorado, 213-244.

Bridges.org (2001). *Spanning the Digital Divide: Understanding and Tackling the Issues*. A Report by Bridges.org. Online at www.bridges.org.

Brohman, J. (1996). *Popular Development: Rethinking the Theory and Practice of Development.* Blackwell Publishers, Oxford.

DuBois, F. (2004). "Globalization Risks and Information Management", *Journal of Global Information Management*, Vol. 12, No. 2, pp. i – iii.

Earl, M.J. (1989). *Management Strategies for Information Technology*, Prentice Hall.

Ernberg, J. (1996) *ITU: Empowering Communities in the Information Society - An International Perspective.* Empowering Communities in the Information Society Conference, South Africa, May 1996.

Fontaine, M. (1999) AMIC@S in Asuncion: Leapfrogging Development. *TechKnowLogia* (Nov / Dec 1999).

Galliers, R.D., Leidner, D.E. and Baker, B.S.H. (edn.) (1999**)** *Strategic Information Management,* Butterworth Heinemann Ltd.

Ghemawat, P. (2001). "Distance still matters: The hard reality of global expansion", *Harvard Business Review*, (September). Reprint #RO108K.

Hasan, H. and Ditsa, G. (1999). "Impact of Culture on the Adoption of IT: An Interpretive Study", *Journal of Global Information Management,* Vol. 7, No. 1, pp.5 – 15.

Heeks, R. (2002). *Working Paper No. 11: Failure, Success and Improvisation of Information Systems Projects in Developing Countries*. Development Informatics, Working Paper Series. Institute for Development Policy and Management, Manchester.

Hofstede, G. (1994). *Cultures and Organizations: Intercultural Cooperation and Its Importance for Survival, Software of the Mind,* McGraw-Hill.

Mayanja, M. (2001) *The African Community Telecentres: In Search of Sustainability*. ICT for Education Programme, World Bank Institute. Online at http://www.developmentgateway.org/download/165918/In_search_of_sust_telecenters_DG.doc.

Moyo, L. M. (1996). Information Technology Strategies for Africa's Survival in the Twenty-first Century: IT All Pervasive. *Information Technology for Development,* Vol. 7, pp. 17-27.

Morales-Gomez, D. and Melesse, M. (1998). Utilising Information and Communication Technologies for Development: The Social Dimensions. *Information Technology for Development,* Vol. 8, No.1, pp. 3-13.

OECD. (2001). "Understanding the Digital Divide." OECD (Organization for Economic Co-operation and Development).

Roman, R. & Colle, R. D. (2002) *Working Paper No. 10: Themes and Issues in Telecentre Sustainability*. Development Informatics, Working Paper Series. Institute for Development Policy and Management, Manchester.

Schumacher, E. F. (1999). *Small is Beautiful: A Study of Economics as if People Mattered*. Hartley & Marks Publishers Inc.

Trusler, J. (2004). *Searching for the Role of ICTs in Development: A Case Study of A Rural Multi-Purpose Community Centre in the Dwars River Valley, South Africa.* Unpublished dissertation, University of Cape Town.

Zachary, G. P. (2003), "Black Star: Ghana, Information Technology and Development in Africa", online at http://www.cspo.org/products/rocky/Rock-Vol1-5-Complete.PDF.