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From ICT towards information society

Policy strategies and concepts for employing ICT for reducing poverty

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Abstract

ICT is recognized as an important vehicle to address global development challenges. As a general purpose technology, ICT has the evident potential to improve the delivery of basic services, such as health, education and information, in under-served areas and regions, and thereby address many of the deprivation conditions that create and maintain poverty. Deservedly, policy frameworks and practices of harnessing knowledge, new technologies and ICT for the benefit of the world's poor are being re-considered in the developing countries, donor governments, as well as by academics and other stake-holders.

This paper approaches the possibilities offered by ICT in development specifically from the vantage point of the new ICT ecosystem, as proposed by Martin Fransman, and its underlying sectoral innovation system. While this may be un-orthodox and unaccustomed perspective in the context of development and poverty alleviation, it enhances our understanding how different stake-holder groups, even regions and countries, can relate and employ ICT.

Regions, countries, organizations, communities and people differ greatly in their capacity to create, adopt and use new technology. Economic, social, cultural and technological factors determine to a great degree how people can access and shape new technologies and their applications. These varying factors are well identified in literature on development of ICT in Sub-Saharan Africa, but less attention has been given to how hierarchically organized ICT ecosystem, consisting of technological, economic and social elements, shapes these opportunities.

This report offers a short theoretical and conceptual discussion of ICT strategies in the context of Sub-Saharan Africa, and investigates in more detail the Tanzanian case.

Contents

1. Foreword

This project was commissioned by the Finnish Ministry for Foreign Affairs to analyze on-going trends in employing information and communication technologies for development, as well as to introduce new perspectives to existing national ICT strategies. The concrete expectation with the project was to support the expansion of Finnish cooperation in the field of ICT and information society with the Tanzanian government.

The project was implemented during the summer 2009, and it involved short study visit to Dar es Salaam. Project report was finished the same fall. With the initiation of Finnish ICT programmes in Tanzania, I took up with the Ministry of Foreign Affairs the idea to publish the report in order to make it available to broader audience, and now, almost a year later, we have the report published.

The report is to be considered as think-piece, not offering exhaustive analysis or theory of information society, but as an attempt to foster dialogue among different stakeholders about broad and inclusive strategies to advance ICT and information society in the developing countries and with the development cooperation instruments.

The preparation and writing of the report would not have been possible without the kind help and support of several different people. I would especially like to thank Ministry of Foreign Affairs senior advisor Ilari Lindy, now of World Bank. Mr. Tomi Särkioja, senior advisor at the Finnish Embassy in Tanzania, was instrumental in advising me on African ICT developments and arranging the field visit. I also remain grateful for the hospitality of all the Tanzanian organizations and people, who took time to discuss with information society in Africa.

In Espoo 21st of February, 2011

Hannes Toivanen

2. Introduction and executive summary

Information and Communications Technologies (ICT) play an increasingly important role for development in Sub-Saharan Africa. Indeed, we have good reason to believe that the region as a whole, and in particular selected regions, is set to witness rapidly accelerating deployment of ICT across society and economy. This progress, underpinned by advances in key technological infrastructures, regulatory reforms and innovative uses of ICT, is triggering fundamental questions about the relationship between ICT and Sub-Saharan development challenges, such as: to what role will ICT play to address poverty? How well ICT is employed to deliver direct aid to the most needy? What impact will ICT have on building civil society? How, and through what processes, will ICT contribute to industrial and economic strength of the region and individual nations?

As truly ubiquitous technology, ICT has an impact on societies in multiple and extremely complex ways. Difficulties of monitoring, evaluating, and assessing the relationship between ICT and society are aggravated in the context of development and poverty, as pronounced regional and local differences establish highly fragmented landscape and thereby undermine efforts to apply single conceptual framework. The need and demand for improved understanding of the ICT, and indeed *Information Society*, in the broader socio-economic context of Sub-Saharan Africa is the basic point of departure of this study.

A credible ICT strategy, whether developed for corporate needs or government policies, must be based on clearly argued and concise conceptualization of the technology and its social and economic dimensions. In the case of ICT, there are several different alternatives, but this discussion in this paper is limited to the framework advanced under the concept *new ICT ecosystem*.

This paper approaches the possibilities offered by ICT in development specifically from the vantage point of the new ICT ecosystem and its underlying sectoral innovation system. While this may be un-orthodox and unaccustomed perspective in the context of development and poverty alleviation, it enhances our understanding how different stakeholder groups, even regions and countries, can relate and employ ICT.

Regions, countries, organizations, communities and people differ greatly in their capacity to create, adopt and use new technology. Economic, social, cultural and technological factors determine to a great degree how people can access and shape new technologies and their applications. These varying factors are well identified in literature on development of ICT in Sub-Saharan Africa, but less attention has been given to how hierarchically organized ICT ecosystem, consisting of technological, economic and social elements, shapes these opportunities. This is one central aim of this paper.

Comprehensive discussion of ICT and Information Society in the Sub-Saharan Africa in beyond the scope and limits of this paper, as they are towering and complex issues deserve broad based attention. Nevertheless, this paper focuses upon discussion of the theoretical and conceptual issues of ICT strategies in the context of Sub-Saharan Africa. The basic observations and conclusions can be summarized as follows:

– *Need for African model.* There are no off-the-shelf solutions for building information society in Sub-Saharan Africa or delivering on the promise of alleviating poverty with ICT. If there are individual prescriptions, best-practices or models, these are at the best on the level of project objectives and management, not on the scale of regions or nations. The imperative to develop truly "African model of Information Society" is decisive of the continent's digital future.

– *Success to build upon.* Sub-Saharan Africa has excelled over the past ten years in addressing the digital divide. Progress in building national, regional and international ICT infrastructure has been breathtaking, as well as capacity building in human resources and institutions. In most countries, also regulatory reforms have given birth to enabling environment that is conducive for ICT and its growth. Consequently, infrastructure, regulatory reforms, and capacity building have dominated policy strategies and provide the backdrop for next generation ICT strategies and developments.

– *Africa in the emerging global ICT ecosystem.* ICT and Information Society strategies are developed and implemented mostly without explicit conceptualization of what is the emerging global ICT ecosystem, within which Sub-Saharan nations are embracing and acting on ICT. Elaboration of the regional and international dimension of ICT and Information Society strategies in the context of emerging global ICT ecosystem is critical in order to identify tactics that secure the long-term sustainability and viability of ICT efforts in Sub-Saharan Africa.

– *Enhanced appreciation of users is critical for success.* Users, including people, communities, firms, organizations and the government, are the "last mile" of Information Society by actually implementing ICT and putting it actually to work. Despite of increasing awareness of their critical role, users appear to be ne-

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glected across the board in ICT and Information Society strategies and program planning. With advances in the quality and coverage of ICT infrastructure in Sub-Saharan Africa, the role of using and users is set to proliferate as critical success factor. Much more needs to be done to create solid understanding of the needs of regionally, socially and economically fragmented user groups and their integration in strategy and planning processes. Moreover, in the case of the poor, both in rural and urban setting, without Sub-Saharan effort to generate an understanding of user needs, no knowledge will be available at all.

− *Poverty alleviation and ICT.* Current understanding of how ICT contributes to economic growth is inadequate, and is especially so in the context of Sub-Saharan economies. The difficulties are magnified when it comes to the relationship between poverty alleviation and ICT, where the economic and social processes are highly distinct and specific. Without doubt ICT is somehow positively correlated with GDP growth at aggregate level, but in order to foster improved ICT policies, there is clear need to go beyond the assumption of ICT benefits trickling through the economy. Much more is needed to assess through what processes direct and indirect benefits of ICT unfold in Sub-Saharan economies, whether it is a case of capital intensive ICT infrastructure building, education of technologically advanced work force, erecting eServices for improved civil society, or employing ICT in support of pro-poor initiatives.

3. ICT and development

The significance of ICT for development is today well recognized, but our understanding of the actual socio-economic mechanics whereby ICT contributes to actual processes of development is relatively weak. This is largely because of two reasons: *First*, the process of development is so complex and heterogeneous, unfolding differently in different locales and contexts, that it makes it extremely difficult to arrive at simple prescriptions about ICT's role in it. *Secondly*, ICT and its uses in every-day-life are in state of constant flux and innovation, currently epitomized in changes brought by the Internet. This speed of change renders assessments of the role and use of ICT quickly obsolete. Technological innovation, expansion of infrastructure, diffusion of technology and new ways of use occur at such a rate that profound change is the permanent condition of ICT indeed.

Attempt to cast light on the relationship between ICT and development is catching momentum currently, however. Since 2004, OECD, UNCTAD, and ITU have advanced ambitious *Partnership on Measuring ICT for Development*, and without doubt the initiative embodies today best available and most comprehensive knowledge on the subject.[1] Yet, if one looks beyond mere indicators and comparative statistics, which typically offer a snapshot at highly aggregate levels, one cannot escape the impression that we are merely recognizing an important subject area and learning about its complexity. This point is not to diminish the importance of quantitative indicators and monitoring, but to emphasize the need to augment them with information that supports more directly formulation of ICT and Information Society strategies in support of development and poverty alleviation.[2]

As concluded in 2008 by the *Africa Partnership Forum* (APF)*,* there is a growing body of experience and literature that point out that *ICT for development* (ICT4D), as a

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[1] For documentation and full references concerning the *Partnership,* see *Guide to Measuring the Information Society.* OECD, Paris, 2009. 81-84. The *Partnership on Measuring ICT for Development* website is one of the best gateways for information on ICT4D. See http://www.itu.int/ITU-D/ict/partnership/.
[2] One can hardly underestimate the importance of country-level analysis for global awareness about Digital Divide or similar issue. See e.g. *Measuring the Information Society. The ICT Development Index.* International Telecommunication Union, Geneva, 2009.

truly horizontal and cross-cutting issue, requires deeper analysis.[3] Calling for knowledge and studies that support development, ICT and information society strategies, the International Institute for Communication and Development has argued that effective mobilization of ICT for development, especially for poverty reduction, requires closer analysis of the users and their interaction with information society technologies.[4]

ICT embodies a huge socio-technological ecosystem, which impacts nearly every pocket of society and economy, and therefore bears upon development very broadly too. Accurate estimate of ICT's contribution to economic growth and development is a subject of constant scholarly and political debate, but few doubt that it plays significant and even critical role. ICT industries represent significant part of most advanced economies in their own right, as do ICT investments in developing countries. ICT's critical role is even more clear when examined on regional or project level, when it is more easy to point out its plausible, direct effects. The challenge is to point out relevant and practical framework to assess ICT's role for development so that it contributes plausibly also to formulation of forward looking policies and guiding strategies.

Bearing in mind that poverty-alleviation is the most important goal of development in Sub-Saharan Africa, we can best analyze and conceptualize the contribution of ICT to development within two analytically and pragmatically distinct categories:

- **ICT and economic growth;** Meaning the direct and indirect aggregate contributions to economic development
- **ICT supporting development projects;** Meaning the direct impact of ICT in allowing more effective delivery and implementation of individual development projects.

While this categorization falls short of providing comprehensive framework to analyze how ICT contributes to structural change, and indeed modernization, throughout a society, they offer a convenient and practical approach to develop ICT and information society strategies. Adoption of ICT and information society technologies, or in other words going digital, is essentially about broad-ranging and deep-going structural societal changes, regardless of income or technological level of a society. Though this effect is pronounced in the context of development, implying increased complexity of effects of ICT. As noted by the *African Partnership Forum*, "The use of ICTs as a tool for economic growth and poverty reduction is a multidimensional challenge. It is therefore not sufficient to address it only in an economic or technical context."[5]

ICT's contribution to aggregate economic growth is most conveniently conceptualized as the increased productivity across the economy and its sectors, but this involves

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[3] *ICT in Africa. Boosting Economic Growth and Poverty Reduction.* APF, 07/2008.
[4] IICD, *ICTS for agricultural livelihoods. Impact and lessons learned from IICD supported activities.* IICD, 5.11.2007.
[5] *ICT in Africa,* 21.

naturally much more complex and subtle processes. The key issue for this theme is the international competitiveness of national economy and its industries. This encompasses such factors as the level of technological proficiency of companies, supply of skilled labor, R&D linkages between companies and research institutions, and more directly the level of computerization and use of ICT in business.[6]

Economic growth alleviates poverty or increases social equality only within certain policy regimes and institutional arrangements, and therefore it alone is hardly a sufficient proxy for ICT's contribution to development. ICT's role in national economy is crucial for the overall process of development, but it is very difficult to point out the actual processes and mechanics how this leads to alleviation of poverty and related societal challenges. To arrive that type of analyses, it is necessary to investigate micro economic processes and, more importantly, social outcomes of investments and programmes. The need for a particular class of studies is necessary, because processes of development are so idiosyncratic to time and place, as several studies in the early 2000s have argued.[7]

Poverty reduction through ICT is especially challenging, due to the particular situation of the poor, as APF has argued. They have low level skills, lack of physical assets, have limited access to financial services, suffer from rural isolation, and in addition these problems may be compounded by exclusion bad on gender, language etc. Thus, it is challenging to deploy ICT *with direct benefits or impacts on poverty reduction*, because the beneficiaries often lack capacity to take advantage of services or technologies. "ICT growth is only weakly correlated with poverty reduction," the APF study concludes.[8] However, as IICD study suggests, experience shows that ICT does have such direct benefits when used to advance pro-poor initiatives, though they may often come only with some lag.[9]

3.1 Delivering ICT4D

Another set of issues in ICT and development relates to the **implementation strategies**. It is crucial to make the distinction between building ICT infrastructure and information society. ICT infrastructure is the fundamental precondition for building information society capabilities and delivering pro-poor goals, but mobilization, application, and eventual benefits of the infrastructure are released through *information society activities*.

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[6] Rather good and recent overview of this theme is the African Partnership Forum report *ICT in Africa.*
[7] See e.g. Ian Pringle and Savithri Subramarian (eds), *Profiles and experiences in ICT innovation for poverty reduction.* Unesco 2004. http://unesdoc.unesco.org/images/0013/001381/138197e.pdf ; *Good Practice paper on ICTs for Economic Growth and Poverty Reduction.* OECD, Paris 2005; Harris, *Information and Communication Technologies for Poverty Alleviation* and literature references in these studies.
[8] *ICT in Africa,* 5.
[9] IICD, *ICTS for agricultural livelihoods.*

The critical effect of infrastructure has been illuminated in the recent Sub-Saharan internet experience. Paradoxically, Sub-Saharan Africa has exhibited some of the highest internet prices in the world. Despite of mushrooming demand for internet, lacking technological infrastructure has presented tremendous bottleneck for internet use and driven up prices. The situation is set to change rather rapidly, however. Transition from satellite based international internet connections to submarine cables within the next years, as well as establishment of national and regional back bones and networks, is set to have an impact on the affordability of internet. Until recently, insufficient international band-with as well as poor national infrastructures has allowed operators to charge excessive prices.[10]

Progress made in Sub-Saharan Africa on multiple ICT fronts are shifting the ICT focus of development community from building infrastructure to deliver on promises of poverty alleviation. While space does not allow to exhaustive list of infrastructure and technology developments in Africa, such a comprehensive review is offered in the *OECD African Economic Outlook 2009,* which details the recent advances.[11] In short, key enabling factors for ICT in Sub-Saharan Africa are:

- **Infrastructure** bottlenecks are easing. ICT is more comprehensively available in regions, international connectivity is improving, and reliability of ICT systems is also improving.

- **Affordability –** Prices of nearly all aspects of ICT are rapidly falling, allowing the "bottom of the pyramid" to access and use ICT. While hardware prices have continued to fall for a very long time, to certain degree because mass manufacturers are increasing targeting bottom-of-the-pyramid consumers, also pricing of connections and use are either declining or set to decline rapidly in Sub-Saharan Africa.

- **Applications** of ICT are increasingly available. Local and global innovation responds increasingly to demand for solutions and services. Of central importance, here too, is the introduction of mobile applications for finance, information and other services addressing specifically the needs of the poor.

- **Enabling environment** and necessary institutional set-up for ICT and Information Society is established in most countries and regions, fostering public and private investments, entrepreneurship, and, critically, innovation.

Combined, these factors allow for rapidly increasing diffusion and use on mass market scale in Sub-Saharan Africa, as noted recently even in a special issue of *The Econo-*

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[10] Good overview of the recent and anticipated developments in internet connectivity at international and regional level in Sub-Saharan Africa is offered in: *African Economic Outlook 2009,* 88-93.
[11] *African Economic Outlook 2009.*

3. ICT and development

mist.[12] All this has drawn attention of the development cooperation community to ICT and Information Society issues.

In the Sub-Saharan context, three separate strategic action lines may be considered in the context of implementing ICT for development, although many alternatives are possible too. Establishment of clear strategic action lines allows for better consideration of different stake-holder groups, consideration of region and sector specific characteristics, effective separation of long-term and short-term strategies, as well as division of labour between implementing parties. These could be presented as follows:

- **ICT as a tool for pro-poor initiatives**
    - Enhance availability of ICT
        - Falling prices.
    - Train personnel and users
    - Progress monitoring
    - Building awareness of critical issues.
        - Sanitation
        - Health
        - Education
        - Crisis management
        - Gender equality.
    - E.G. ICT for agricultural livelihoods.
        - Agriculture information systems
        - Price information systems
        - Increased market access
        - Increased production efficiency
        - ICT and empowerment.

- **Building Information Society Capacity**
    - Science, Technology and Innovation capacity building
        - Research and Development
        - National competence centres.
    - Human resources
        - Primary and secondary schools
        - Tertiary education
        - University education
        - *Brain gain* strategies.

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[12] "Mobile marvels. A Special Report on Telecoms in Emerging Markets," September 26th 2009, *The Economist.*

- o Private sector development
  - ▪ Tanzanian content providers
  - ▪ SME development
  - ▪ *eTourism.*
- o Agriculture information systems
- o Affordable communications
  - ▪ Mobile telephony and internet
  - ▪ Fixed lines
  - ▪ Computers etc.
  - ▪ Securing mass distribution.
- o *Digital literacy* -eServices for masses (education, mobile banking, public services, etc)
- o *Digital inclusion* – empowerment and community building.
  - ▪ Heritage management and preservation
  - ▪ Identity and language(s)
  - ▪ Culture
  - ▪ Civil society.

- **ICT and Governance**
  - o Government providing impetus for ICT development (public procurement)
  - o Building national capacities
    - ▪ E.g. national service centres.
  - o Improving efficiency in public services
  - o Creating scale economies in service delivery
  - o Building national knowledge base for policy monitoring and evaluation
    - ▪ Progress and monitoring systems
    - ▪ Special purpose databases
    - ▪ Enhancing the reliability and accuracy of policy planning cycles.
  - o Enhancing policy foresight and strategy process.
    - ▪ Open and participatory processes (e.g. internet based consultations)
    - ▪ Internet resources for government and regional officials (manuals & toolboxes)
    - ▪ Diffusing widely key documents and making knowledge available.

The presented category is not intended as exhaustive and final, but serves the purpose to illustrate the need for hierarchical approach when deploying ICT for poverty reduction and broader structural reforms of society. Suggested action lines differ greatly in terms of stake-holders, content, technological requirements, whether benefits address people directly or indirectly, and so forth. The major point of the proposal is that such a hierarchical approach is necessary to situate ICT credibly and effectively in the context of poverty reduction.

3.2 ICT Strategies in Sub-Saharan Africa

ICT has received increasing attention in development and development cooperation over the past decades. Beginning in the late 1990s, first generation of national and regional ICT strategies in Sub-Saharan Africa focused upon building necessary technological infrastructures and developing necessary capabilities, often in the context of the emerging Digital Divide, as well as formulation of comprehensive and coordinated national approaches to ICT. Indeed, technical and infrastructure-related aspects have for long dominated national ICT strategies as well as ICT's deployment in development cooperation.[13]

With above indicated leapfrogging in infrastructure, new set of expectations about impact and effects are emerging. Some of these expectations and promises about the contribution of ICT to development appear sometimes even excessive, as Roger W. Harris has concluded in his review of use of ICT for poverty alleviation. Nevertheless, there appears to be good time to consider the broader approach to ICT and Information Society in the context of development and Sub-Saharan Africa.[14]

There are plenty of regional, national and continental initiatives to improve the state of ICT in Africa. Perhaps the most up-to-date listing of ICT and STI-related major co-ordination efforts and initiatives in Africa is offered in the *OECD African Economic Outlook 2009*, which details impressive number of initiatives. Instead of reproducing those here, it may be sufficient to say that indeed ICT and Information Society are drawing increasingly attention in Africa. United Nations, World Bank, African Union, African Development Bank, European Commission and other donors are all introducing new, even rivalling, ICT related programmes and funding schemes. There is also on-going consideration of the best approaches to ICT4D.[15]

The over-aching movement is to make every effort not to see ICT as an insulated sector, and integrate it more deeply to on-going processes of development and cooperation. If ICT has been bearing something of a symbol of development, today the concern is mostly how it can be mobilized in support of development. As the *OECD African Economic Outlook 2009* special issue on ICT noted, development challenges set the context for defining objectives of ICT.

There are different approaches in how to mobilize ICT for development cooperation. Recently, majority of donor countries, such as Sweden or Britain, have chosen to embed ICT as cross-cutting technology into other development cooperation sectors, such as health or education. Some, like Finland, see a point of keeping the sector as specific

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[13] For an overview of national ICT strategies in developing countries, see: Angathevar Baskaran & Mammo Muchie (eds), *Bridging the Digital Divide: Innovation Systems for ICT in Brazil, China, India, Thailand, and Southern Africa.*
[14] Roger W. Harris, *Information and Communication Technologies. ePrimers for the Information Economy, Society and Polity.* UNDP-APDIP 2004. http://www.apdip.net/publications/iespprimers/eprimer-pov.pdf;
[15] *African Economic Outlook 2009.*

arena of action and maintain separate action lines. Each strategy has its own benefits and drawbacks. The first recognizes ICT as only means to deliver ends, whereas the latter one is often better suited to improve insufficient infrastructure and raise awareness of ICT's possibilities and special challenges.

Both approaches make explicit the need to start from the development challenges and deliver on them, despite of differences in positioning the place of ICT in relationship to other sectors of development cooperation.

These changes reflect another major transition beginning to take place in Africa. For more than a decade the Digital Divide framed ICT in Africa. Witnessing how the OECD countries leaped forward with new technologies, poor countries appeared to stay even further behind. Today, with Africa announcing major achievements in infrastructure and posting one of the world's highest ICT growth rates, this fear is diminishing. It is also direction attention to the effective implementation and deployment of ICT, that needs to be mobilized for genuine information society.

The need for national strategies that acknowledge sector specific conditions of ICT and Information Society is still valid in most Sub-Saharan countries. Without high level of political awareness of needs and possibilities in the arena of ICT, there cannot be improved conditions. Yet these strategies must increasingly reflect the transition into improved ICT infrastructure landscape, as well as recognize the need to lift regions, countries and communities into more active role within the ICT landscape.

This trend already picking up in various governments and donor communities, as is evident in work done by the Sangonet regional ICT discussion forum project. Its recent study, *Digital Inclusion in Mozambique* details how ICT is increasingly embedded in sectoral government policy strategies, as well as highlighted as distinctive area. Over-aching in the Mozambican public policy approach is to identify ways, in which ICT can meaningfully contribute to the central societal challenges, that is poverty and its different forms and implications. Similar trend is discussed in the case of Tanzania is discussed in depth below. The heightened awareness to address poverty through ICT policies is welcoming phenomenon, but it alone does not suffice.[16]

Although perhaps controversial, the impact of ICT and technology in alleviating poverty can be enhanced by making it sensible business. As high-income market segments across the globe are maturing, the poor appear to become the focal point of economic growth and business development. When large poor populations go can increase their modest incomes, the effects are significant in terms of people accessing and buying necessities they could not afford earlier. Communication and information are among the first items to be purchased by people escaping extreme poverty. Several leading compa-

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[16] Polly GasterGastor, Carlos Cumbana, Gertudes Macueve, L. Neves Cabral Domingos & Fransicso Mabila, *Digital Inclusion in Mozambique. A Challenge for All.* University Eduardo Mondlane, Maputo, July 2009.
http://www.ngopulse.org/files/FinalMozambiqueReport10July2009-English.pdf

nies and business strategists have identified this "bottom-of-the-pyramid"-market and launched products and innovations targeted specifically for it.[17]

Corporate innovation in products and services aimed specifically for the poor in developing countries is also set to have broad ranging effects on the lives and conditions of low-income people. While the idea of making profit from poverty, as CK Prahalad has controversially put it, may be disturbing, it also has the effect of mobilizing private sector research and development for issues that alleviate poverty. New models to foster and manage the private interest in "bottom-of-the-pyramid"-business are required however, as Reinie Biesenbach of the Global Research Alliance has pointed out. In order to create socially responsible and lasting impact, science, technology and innovation must be mobilized in cooperation of all stakeholders, including the users, public sector, NGOs and the government.[18]

ICT and development are already alone capricious concepts, not to mention when put together. When moving into more complicated world within both realms, the need for clarifying concepts and frameworks is obvious. In the case of ICT, any effective public or corporate strategy must depart from some assumptions about the nature of ICT and what it embodies. This paper attempts develop perspectives on this and thereby strengthen the ability of donors and Sub-Saharan countries to position themselves within the ever changing global ICT system, and to craft and deliver more effective ICT and Information Society strategies.

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[17] See e.g. C. K. Prahalad, *The Fortune at the Bottom of the Pyramid – Eradicationg Poverty Through Profits.* Wharton School Publishing 2005; William J Kramer, Julia Tran, Rob Katz, Courtland Walker, *The Next 4 Billion: Market Size and Business Strategy at the Base of the Pyramid.* World Resource Institute, March 2007. http://www.wri.org/publication/the-next-4-billion.

[18] *GRA 4000. Leveraging STI to Empower the Global Poor.* Global Research Alliance, Mimeo July 2009.

4. ICT ecosystem and innovation system

Attempts to define the system or regime embodied in and around ICT are easily dwarfed. Yet, a guiding framework, even an incomplete one, provides much needed structure in strategy planning and implementation and eventually enhances our ability to deliver expected objectives. Appropriate understanding of the potential of ICT in the context of developing countries requires also adequate conceptualization of ICT as a system.

By mapping and identifying the nature of emerging global digital space, Sub-Saharan African countries can better target their national policies and goals against the socio-technical infrastructure being built. In so doing, ICT and information society strategies should be planned and implemented against an analysis of the fit between national environments and the global sectoral system of ICT. Only careful consideration of local circumstances, ICT strategies can effectively deliver on expectations of sustainable long-term effects on social and economic development.

Drawing a body of literature on national and sectoral systems of innovation, the paper presents below a conceptualization of ICT as an ecosystem and innovation system in order to allow the development of targeted national policy strategies and goals in the context of ICT ecosystem in developing countries.[19]

ICT has assumed such a central role in economic and social development because of its pervasive character and enabling role. In short, the implementation and application of ICT facilitates change and productivity improvements across all layers of society and economy. In this sense, ICT pushes and necessitates *systemic change* in society and economy. Therefore, ICT should is best conceptualized as a system that is strongly embedded and connected to different parts of the society and economy. Martin Fransman, perhaps the leading scholar of the ICT sector, has made persuasively the case that "it is

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[19] See e.g. Faberberg et al, *The Oxford Handbook of Innovation.* Oxford University Press 2004; Fabergerg & Verspagen, "Innovation studies – The emerging structure of a new scientific field," *Research Policy*, *Volume 38, Issue 2*, *March 2009*, *Pages 218-233;* Franco Malerba (ed), *Sectoral Systems of Innovation. Concepts, Issues and Analyses of Six Major Sectors in Europe.* Cambridge University Press 2004; Richard R. Nelson (ed), *National Innovation Systems: A Comparative Analysis.* New York: Oxford University Press 1993; Bengt-Åke Lundvall (ed), *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning.* London : Pinter Publishers 1992.

fruitful to understand the ICT sector as an ecosystem. Ecosystem refers to a number of organisms that interact within an environment."[20]

Although ICT as a sectoral or ecosystem is throughout globalized, it assumes different forms in different regions and nations. Particularly in the context of development it is important to emphasize that regional and national factors shape the way ICT is created and applied, giving rise to distinct and unique regional systems. The regional differences are compounded in the context of development in Sub-Saharan Africa. Poverty and its symptoms complicate the straightforward application of policy , business and innovation concepts that have been created in the context of advanced industrialized nations.

4.1 Sectoral Innovation System and developing countries

Innovation takes place in different environments. The sectoral innovation system framework departs from the basic assumption that industrial sectors, despite of often blurred and overlapped boundaries, have distinct characteristics, dynamics, and actors. This implies that sector specific co-evolution of institutions, organizations, business and knowledge characterize innovation driven industries and business. Moreover, effective public policies and strategies must be construed from the basis of credible recognition of such sector specific factors and adapted to specific.[21]

A wide variety of firm, industry and region specific factors, such as capabilities, learning dynamics, competitive strategies and organizational structure encompass distinct processes of globalization. These include firm's learning and capabilities, sector's competitive structure (including relationships with competitors, users, suppliers, financial institutions, etc), institutional framework and political economy (including trade agreements, antitrust, IPR, etc), and most importantly the nature of related and underlying scientific and technological knowledge. Every industrial sector has on a global scale its own character and evolutionary dynamics.[22]

Second fundamental perspective of the sectoral systems of innovation is that it has a dynamic perspective and takes a *process view*, as Malerba has pointed out. Because the approach necessitates very intimate understanding of industries and regions, it yields very sensitive and accurate understanding of global interplay of actors and institutions. The fundamental building blocks of the sectoral system of innovation are:[23]

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[20] Martin Fransman, *The New ICT Ecosystem. Implications for Europe.* Kokoro 2007.

[21] Franco Malerba (ed), *Sectoral Systems of Innovation. Concepts, Issues and Analyses of Six Major Sectors in Europe.* Cambridge University Press 2004.

[22] Franco Malebra, Sectoral system of innovation: Basic concepts. In: Malerba (ed), *Sectoral Systems of Innovation*, 9-41.

[23] Franco Malebra, Sectoral system of innovation: Basic concepts. In: Malerba (ed), *Sectoral Systems of Innovation*, 9-41.

- *Knowledge and technologies;* The underlying knowledge and technology of a given sector is highly specialized. This affects strongly the nature, boundaries and organization of the sector, and naturally also the nature of competitive process. In the case of ICT, the role of knowledge and technology cannot be easily underestimated, as frontier research has pivotal role for advancing new applications or providing competitive advantage. This aspect also covers the processes of learning, emphasizing that dynamics of learning are often sector specific.

- *Actors and networks;* The nature, size and organization of firms is specific to industrial sectors, and so the networks that firms create among themselves or with other relevant actors, such as trade unions, labour unions, research organizations, professional societies, etc. For example, the basic dynamics of interaction between large and small firms is one of such distinct network features, or the network dynamics between government, NGOs and firms.

- *Institutions;* The broad definition of institutions include norms, routines, beliefs, rules, laws and standards, covering the whole spectrum of rules governing behaviour if organizations and people. While most fundamental institutions are often rooted in broader context, say nation or culture, than just a sector, this aspect has also validity.

Any comparison of ICT in Sub-Saharan Africa and, say, Europe would have to acknowledge strong asymmetries in these categories, and also if one would be to compare Sub-Saharan nations among themselves.

The sectoral systems of innovation is part of conventional approach to innovation and ICT, but surprisingly rarely it is applied in the context of developing countries, as Franco Malerba and Sunil Manil have recently noted. A series of studies have demonstrated that developing countries often develop highly distinctive sectoral systems, yet we still lack comprehensive assessment what are the implications when the over-aching objective of the national policy agenda is poverty alleviation in Sub-Saharan Africa.[24]

Considering that ICT is expected to contribute to the easing of all forms of poverty and related symptoms in Sub-Saharan Africa, credible regional and national strategies should be paying more analysis to relevant sectoral systems and their characteristics.

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[24] Franco Malerba ja Sunil Manil, *Introduction*, in: Malerba and Manil, (eds), *Sectoral Systems of Innovation in Developing Countries: Actors, Structure and Evolution.* Edward Elgard 2009, 4.

4.2 The New ICT Ecosystem

Perhaps one of the most potential theoretical concepts developed to analyze and advance ICT and information society is the concept of *The New ICT Ecosystem*, pioneered by Martin Fransman. Going to the technical, economic and social analysis of relationships within the sectoral system of ICT, Fransman argues that each actor, whether a person, firm or an entire nation, assumes a position and unique relationships in hierarchically organized ecosystem. Anyone desiring to create and implement effective strategy within the system must consider whether relationships with other actors will be competitive or symbiotic.[25]
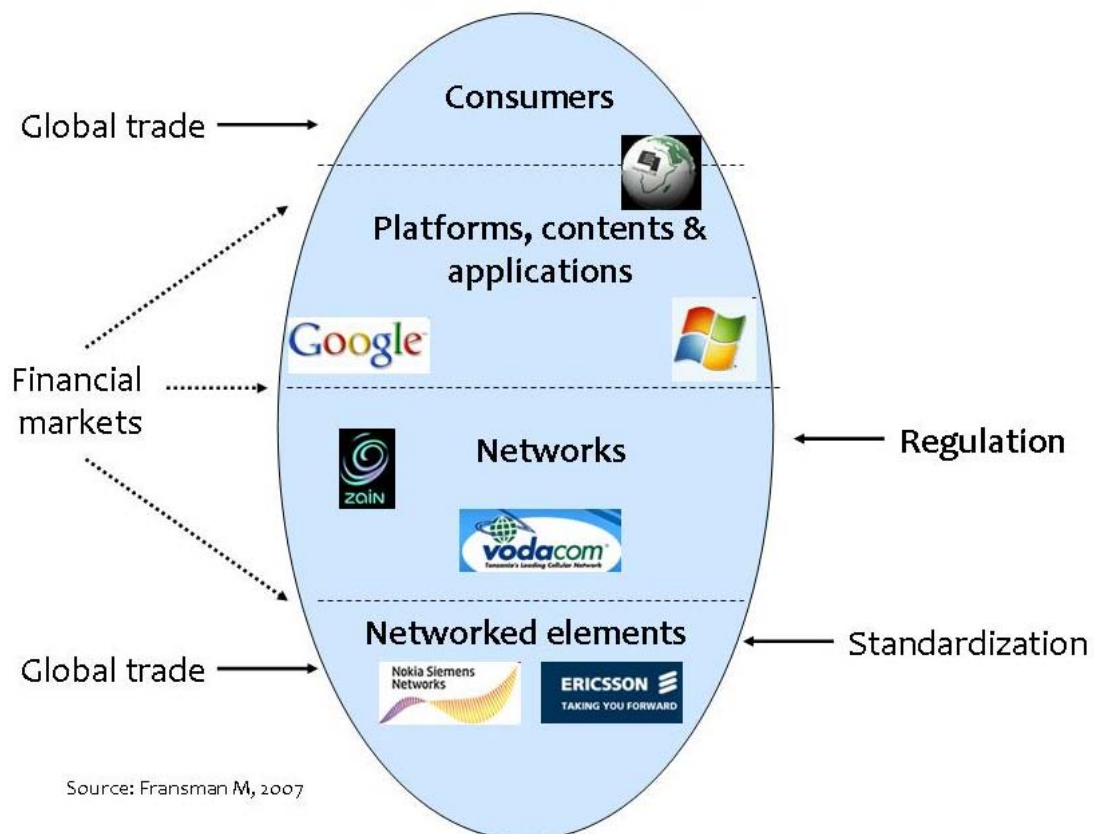
Figure 1. The ICT ecosystem.

The New ICT Ecosystem, pictured below, refers to the system covering ICT or information society technologies characterized by the digital converge spearheaded by the Internet. It is *new* because of the changes leveraged by internet, which is increasingly interconnecting all forms of digital communication and data storing. It is also an attempt

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[25] Hereafter I follow largely Martin Fransman, *The New ICT Ecosystem*, unless otherwise cited.

to come in terms of the incessant change and transformation of ICT, which renders many established classifications and frameworks obsolete. For example, telecommunications, information technology and Internet/media are often simultaneously and distinctly applied categories, but basically they refer to processes and actors enveloped in one broader process of global change.

Fransman stresses that the system is both technical and economic, but we may add that it encompasses importantly also social and cultural aspects. The Internet has complicated greatly our ability to use any of the existing categories of classifications of ICT neatly or with precisely defined application. As defined by Fransman, *the New ICT Ecosystem* is an emerging, relatively loose, open and qualitative framework to think and act about individual technologies or social and economic issues. It aims to offer a conceptual vehicle to analyze and strategize about unfolding change in the digital landscape and support decision making in R&D organizations, firms and government.

Although originally built upon originally technical layer model, the *New ICT Ecosystem* model includes social, economic and technological aspects and describes how they relate to each other. It is modular, hierarchically-layered system that consists of four layers, which are over-lapping and inter-dependent and are:

1. *Networked elements* (including switches, routers, servers, PCs, phones, etc)
2. *Converged Communication and Content Distribution Networks* (Including mobile, fibre, copper, cable, satellite)
3. *Platforms, Content and Applications* (including Internet content & Application Providers, such as eFulusi mobile banking)
4. *Final Consumers.*

Layer 1. Networked elements. According to Fransman, the fundamental characteristic of the New ICT ecosystem is the increasing tendency of all components to be integrated into networks over time. This is best illustrated by the Internet and the resulting digital convergence, which network increasingly all types of services and hardware. The layer includes in addition to all the hardware components also the necessary software.

Layer 2. Network operating includes telecom operators, cable TV and satellite operators, as well as broadcasting operators. They are basically integrated in the *layer 1*, although originally separated, these two layers are increasingly interconnected since the 1990s. Today we face increasing multi-channel or multi-network operators, who employ several channels to provide services.

Layer 3. Platforms, Content and Applications. Platforms refer to technologies and products, upon which contents and applications are provided. For example, PC operating systems, such MS Windows or Linux, or other similar technical open platforms that can host a variety of services and applications. These can also include such generic service

providers as Google, Youtube or the like. Content and applications refer to final products, such as dedicated service websites, mobile phone services and the like.

Layer 4. Final Consumers. These include both individual people, organizations, such as firms and associations, and naturally government and its different branches.

While the layer model attempts to describe the hierarchical organization of social, economic and technological elements, it does not make justice to the central role of innovation and it's dynamic in ICT. Innovation lies at the very heart of the New ICT Ecosystem, driving constant and relentless change and transformation.

In order to bridge technological and social-economic development in a meaningful and practical way, this paper considers ICT policies and strategies by applying the concept of ICT ecosystem.

4.3 Innovation in the New ICT Ecosystem

The New ICT Ecosystem is essentially an innovation system. Creation of new products, new processes, new forms of organization and new markets move the ecosystem and its elements, as well as deliver on expectations about ICT in economy and society. ICT has assumed such a critical role in economic and social development, because it is recognized as a vehicle of continuous change. Indeed, incessant innovation is the central character of the ICT ecosystem. In many respects, the ICT ecosystem can also be conceptualized as an innovation system encompassing interactive learning and innovation processes.

Learning, by definition, is a concept anchored to the existing capabilities of individuals, organizations and society, and stipulates a continuous process of gradual build-up of improved capabilities. Innovation and change in the ICT ecosystem can be best characterized as a co-evolutionary process. This means, that all actors and elements of the ecosystem interact with each others within the same environment, and, because of their inter-dependency, evolve over parallel paths.[26]

Fransman points out that innovation in the ICT ecosystem occurs through interaction of the different elements, and through very specific symbiotic relationships:

1. **Relationship between network element providers and network operators**
   Involves close cooperation and mutual dependence. Currently, one of the central issues in ICT is impending stress on this symbiosis, as some of the network element providers (such as Nokia) are attempting to capture business from operators, and vice-versa (e.g. Google).

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[26] See e.g. Johann Peter Murmann, *Knowledge and Competitive Advantage: The Coevolution of Firms, Technology, and National Institutions.* Cambridge: Cambridge University Press 2003.

2. **Relationship between network operators and content and applications providers**
   For example is for example the relationship between network 3rd generation mobile phone operators and possible application providers, say Apple and its application providers.

3. **Relationship between content and applications providers and final consumers**
   This relationship has been fundamentally transformed by the introduction of the Web.2.0, which builds upon new forms of interaction between users and their decisive role in innovation processes and content creation. Examples include sites such as Youtube or Facebook. Another aspect is the continuous involvement of users to improve beta-versions of services and applications. It is important to note that final users do not have the same type of innovation capabilities as, say, network element providers, but users have very intimate insights into nature of demand and needs.

4. **Relationship between network element providers and final consumers**
   These relationships are often black boxed in the relationship 5, but it is becoming increasingly visible in the internet reality. Mobile telephony network providers, especially in poor rural areas have an increasing interest to learn about this relationship.

5. **Relationships between network operators and final consumers**
   This has been traditionally fixed voice service to final consumers, but is assuming increasingly new forms. Today, these include a wide array of mobile phone services, internet access.

The symbiotic relationships encompass the interactions between different actors of the ICT ecosystem, and importantly facilitate accumulation of experience, learning and knowledge, as well as capacity to implement them.

The relationships are dynamic and vary greatly. Indeed, the processes are specific for each ecosystem, although they share four basic dimensions, which Fransman characterizes as follows:

A. Purchase-Sales (financial flow)
B. Input-Output (material flow)
C. Information flow
D. Input Flow into the Innovation Process.

These relationships embody the implementation of new technology and accompanying organizational change, and facilitate change in the system.

If the layer-model attempts to demonstrate that change in the new ICT ecosystem requires co-evolution of two or more elements, the symbiotic relationships point out that innovation dynamics within the system requires co-creation and cooperation of different type of actors. Change and impact of ICT cannot be adequately dealt without an extended discussion of final users, which follows below.

4.4 Users – The last mile of the information society

Whether we discuss direct or indirect effects of ICT, the majority of them materialize through the productivity improving effects of enhanced use of ICT across the economy. The actual use, or more accurately *mobilization*, of ICT by people in their day-to-day working life is what creates the economic and social impact of ICT. In an allegory to the building of internet infrastructure, **the use of ICT is equal to the concept of *"the last mile of broadband"*.** Without the last mile of broadband, which connects users, whether people, firms or other organizations, to the internet, the whole global infrastructure is useless and worthless.

As the pioneer of user-centred innovation concept, Eric von Hippel, has so adequately put, the users and user communities are the key for successful implementation of innovations. When assessing the impact of new technologies and ICT, users hold such a central place, because they capture directly the major share of the productivity improvements gained through new ways of doing things. Naturally, these effects are spread across the whole community of users and most visible at some aggregate level.[27]

Most importantly, users have critical role when it comes to the creation and implementation of new technologies. Eventually, they make the final decision about the adoption of new technologies and how they are used, often requiring suppliers to readjust their original designs and ideas to fit the real life demands of users. The feed-back loop between user experience and design is certainly the most critical aspect of successful innovation, and this holds true especially in the context of ICT and information society.

The role of users is pronounced when it comes to the new social technologies and ICT: The Internet, mobile telephony, Short Message System, mobile banking, or the Facebook, owe their success to snowballing adoption, as well as active shaping of these technologies and applications by users and user communities. As exemplified in the bestseller *Wikinomics*, users active and early contributions to the development of new technologies, applications, products and services is facilitated by ICT and improves often the success of final products.[28]

Fransman too emphasises the role of users in the new ICT ecosystem. In addition to consuming bulk of the output produced by the ICT system, users have say over how the system should work. Not only they shape through market selection processes which technologies or services survive, but they also influence heavily the political climate shaping enabling environment. One needs only to think about copyright issues or IPR debates to buttress this point. Fransman points out 7 different roles for final consumers:

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[27] Eric von Hippel, *Democratizing Innovation.* MIT Press 2005.
[28] Don Tapscott and Anthony D. William, *Wikinomics. How Mass Collaboration Changes Everything.* Penguin Books 2006.

1. As *sources of revenue*
2. as *user-feed-back providers*
3. as *sources of knowledge* (e.g. open source software, Wikipedia)
4. as *sources of information* (e.g. Web 2.0, beta-products)
5. as *content creators* (e.g. Youtube)
6. as *conversers (*e.g. social networking, blogging)
7. as *activist citizens*.

The multiplying roles of users are because of their decisive role to extract real effects and benefits from investments into ICT and information society technologies. The proliferating role of users is especially due to Internet, which incorporates final users as never before into the innovation and production processes of technologies, products and services. Their important role underlines the fact that companies and governments have often missed the real demand, or identified wrongly user needs or preferences. The corrective measure has then been provided by users. Thus, increasingly equipment and service providers try to integrate user-experience research as early as possible in innovation and product planning processes.

Users understand the need and purpose for new technologies, but often lack competencies, skills and resources to develop adequate solutions. These problems are compounded in the case of the poor in developing and least developed countries. In those cases, the poor are deprived of access, assets, means and knowledge necessary to consider different technological alternatives or to acquire solutions.

Yet the inclusion of users in this context has been identified as critical success factor, as the report *"ICTs for Agricultural Livelihoods"* by International Institute for Communication and Development (IICD) analyses. One of its key conclusions is to make serious effort ensure that the content is relevant for the intended user groups and beneficiaries. This can be secured only by applying a integrated project planning method, which documents the real needs of the people, as well as their capacity to use and implement different technologies.[29]

The inclusion of users for the preparation and planning of pro-poor ICT projects is not limited to conventional analysis of user needs or co-creation, but represent a particular challenge for project planning and strategy. As a discussion paper by Reinie Biesenbach et al puts it, technologies must be assessed and chosen according to their relevance to the poor and potential contribution to pro-poor growth.[30]

Especially when deploying ICT for reducing poverty, approach to project planning and implementation must pay attention to the principles of bottom-up and community

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[29] IICT, *ICTS for agricultural livelihoods.*
[30] *GRA 4000. Leveraging STI to Empower the Global Poor.* Global Research Alliance, Mimeo July 2009; *Alleviating Global Deprivation through Science, Technology and Innovation. A Summary of recent work by Reinie Biesenbach, Cynthia Malan and Harry Swart.* Mimeo September 2009.

involvement. Typically this is embodied in "learning by doing" project implementation, where risks are managed by gradually building proven and tested practices and elements. At the first states, the projects must provide space for exploration and experimentation, and thus create solid knowledge of proven implementation tactics and practices, as well as about the nature of local demand.

Application and implementation of ICT in the reduction of poverty requires careful consideration of local conditions and demand. This does not have to lead to fragmented approach, but does create pressures to produce credible master strategy for ICT deployment and effective coordination and progress monitoring of grass-root implementation activities.

One of its central points for public policy making is essentially that ICT is beneficial only if it is in effective use, often only enabled through the engagement of users and user-communities. It also makes the point that too much of ICT policies are formulated at the supply-side policies and too little attention is paid on the demand side, considering that users are final beneficiaries.

5. Case: ICT in Tanzania

Tanzania has identified ICT as one of the key areas, where science, technology and innovations are to contribute to the broader development of the society and address pressing social problems. Taking aim at the Millennium Development Goals, government of Tanzania has spearheaded several important reforms on ICT in an attempt to accelerate adoption and diffusion of new technologies. These reforms range from regulatory framework to privatisation, to increased higher education and research, as well as to broad based adoption of ICT and information society technologies across the society. Most importantly, government's all encompassing *National Strategy for Growth and Reduction of Poverty* provides the framework for ICT strategies and implementation.[31] The 2003 *National Information and Communications Technologies Policy* stated as its vision "to become a hub of ICT Infrastructure and ICT solutions that enhance sustainable socio-economic development and accelerated poverty reduction both nationally and globally."[32]

   As such, Tanzania offers a prime example of the achievements and challenges that ICT has to contribute to poverty alleviation and broader processes of development. For this paper, a short field mission was conducted to assess the present status of Tanzanian ICT and Information Society developments, as well as to solicit perspectives and opinions through interviews. This paper does not attempt to reproduce statistical information or produce exhaustive review of ICT in Tanzania, as many recent existing reports do this sufficiently. For example, Tanzanian ICT developments are best presented in the OECD African Economic Outlook, conveniently available in the Internet.[33] Also, the ITU *ICT Development Index* provides comprehensive assessment and benchmarking of Tanzanian ICT developments.[34]

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[31] The United Republic of Tanzania, *National Strategy for Growth and Reduction of Poverty.* Vice President's Office, June 2005.
[32] The United Republic of Tanzania, Ministry of Communications and Transport, *National Information and Communications Technology Policy*, March 2003.
[33] http://www.africaneconomicoutlook.org/en/countries/east-africa/tanzania/
[34] ITU, *The ICT Development Index* 2009.

Table 1. Fixed and mobile telephony in Tanzania 2000–2009.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	June 09
Fixed Network Subscriptions	173,591	177,802	161,590	147,006	148,360	154,420	151,644	163,269	123,809	179,849
Mobile Network Subscriptions	126,646	275,560	606,859	1,295,000	1,942,000	3,389,787	5,614,922	8,322,857	13,006,793	14,723,175
Total Subscriptions	300,237	453,362	768,449	1,442,006	2,090,360	3,544,207	5,766,566	8,486,126	13,130,602	14,903,024
Teledensity (Penetrations)	1%	1%	2%	4%	6%	10%	15%	21%	32%	36%

Source: Tanzanian telecommunications regulatory authority.

Nothing captures the depth and rate of change of ICT in Tanzania better than statistics on mobile and fixed telephony in the country presented in table below. Evidently, leap-frogging growth rates demonstrate of sea-changing transformation of the ICT landscape, as the number of mobile phone subscriptions is approaching 15 million in 2009 in a country of approximately 40 million inhabitants. With total telephony penetration rate closing towards 36% of the population, one can conclude that the grass-root level of communication has been revolutionized in Tanzania within the last 10 years. This is amplified by the fact that during the last years, increasing number of mobile application services, such as eBanking, agricultural information and micropayments, has become available for citizens to take care of day-to-day activities in business and private life. It is indicative of the importance of mobile telephony that mobile phone operators provided in 2008 about 8% of government tax revenue, according to OECD.[35]

This success, however, is contrasted with the persistent reality of the *digital divide*, best illustrated by the availability of Internet in Tanzania. In 2008, Internet users amounted to only 1% of the population or about 400 000 people. A host of other challenges remain. About 75 % of the population lives in low-density areas, where technical and economic feasibility of fixed lines are limited. Similarly, in the absence of submarine fibre connection until the summer 2009, all international voice and data communication was routed via satellite, severely limiting connectivity and driving prices high. Clearly, the most impressive ICT progress is made in the mass-adoption of mobile phone, whereas other ICT sectors continue to be challenges.[36]

Political coordination of ICT and Information Society development is gaining momentum in Tanzania. Especially important recent developments have been the estab-

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[35] *African Economic Outlook 2009.*
[36] Suhail Sheriff, Tanzanian Internet Service Providers Association, http://www.tispa.or.tz.

lishment of the Ministry of Science, Technology and Communications, as well as the planning of the eGovernment Agency, which have continued the new and successful ICT policies inaugurated in the early 2000s. Also the regulatory agencies have been better aligned and set to their respective functions in the ICT sector. Taken together, these developments do support the building of enhanced enabling environment for ICT in Tanzania, but the arrangement as a whole is too young to make conclusive observations. Nevertheless, improvement of high level political and government coordination continues to be of the highest relevance for the success of ICT and information society in Tanzania.[37]

Another aspect of Tanzanian ICT landscape is the fact that progress is uneven, and severe bottlenecks for broad-based success continue to exist. As of today, these include:

- **Infrastructure.** *Insufficient coverage, high price and reliability problems undermine the implementation of ICT in Tanzania.*

  o *Impact on access and affordability.* Of critical importance is the fact that insufficient or lacking infrastructure tend to increase the price of connections and undermine therefore the use of ICT by the poorest

  o *Impact on trust.* Institutions provide and maintain reliability and security should be strengthened in order to enhance public trust to ICT and Information Society

  o *Impact on use.* Continuous and secure supply of electricity is still wide spread challenge across Tanzania. This undermines expansion of wireless base station network, use critical internet applications and services, and in general the willingness to use ICT devices with grid supplied power.

- **Finance.** *Scarcity of public and private funding continues to be major obstacle for ICT development. An important aspect is that ICT investments must be weighted against other pressing priorities of Tanzanian society.*

  o Public funding and donor funding appear to drive ICT investments

  o Lack of private ICT investments reflects cautionary attitude or expectations

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[37] For an overview of ICT regulation, see Annemij van Gor and Carleen Matiland, *The regulatory Design Problem Revisited: Tanzania's Pioneering Position in Africa.* Paper submitted for the 35th Research Conference on Communication, Information and internet Policy (TPRC) in Arlington, Virginia, September 28–30, 2007. MOLLEL paper here too.

- o The pressure to demonstrate real poverty alleviating effects of ICT are high, as Tanzania must balance investments in education, health, agriculture, etc with ICT.

- **Human capital.** *Skilled work force is the most importance source of self-reliance and innovation also in the area of ICT, and critical for Tanzania to occupy more layers and areas of the ICT ecosystem.*

  - o Training and education at all level is impending the supply of skilled users, as well as work force. However, any plans to scale up the supply of skilled ICT work force should be balanced with employment opportunities.

  - o From Brain Drain to Brain Gain – There is significant number of Tanzanians working and studying ICT abroad and more should be done to mobilize this talent for Tanzanian development.

As is evident in government strategies, policy makers are well aware of the critical issues and struggle to address them. A specific challenge for Tanzania is to address existing challenges and bottlenecks, as well as monitor new emerging issues requiring attention while the national ICT environment continues to take shape.

When assessing risks for Tanzanian developments, the major issue is to secure that the cross-cutting nature of ICT is truly realized. Like in other countries, ICT threatens to continue to be an insulated phenomenon without desired cross-cutting effects. The need to broaden the application and use of ICT in the society is imperative to deliver on expectations about poverty reduction and economic growth. This includes increased availability of mobile services, enhanced computerization of the society, increased human resources, adoption of ICT in manufacturing, eGovernment, and so forth. Identified lines of action necessary to broaden and reach the impact of ICT in the society may include:

- Continuing to expand and upgrade the existing ICT infrastructure (national and international)

- Improving the enabling environment and governance

- Addressing security problems that undermine implementation of mass-market information society services (eBanking, eIdentity, etc.)

- Addressing reliability problems, especially power outages, for ICT system

- Increasing training, higher education and research in ICT and Information Society

- Increasing awareness of the role of ICT and Information Society for poverty reduction

− Increasing the use of ICT in support of direct poverty reduction actions.

In short, although Tanzania is evidently making great progress in building ICT infrastructure, relevant specialized institutional set-up is essential to create an enabling environment. Critical issues that remain are the general awareness of ICT issues, the broadening of use and implementation of ICT, the role of users, and especially the Need for concrete demonstrations of ICT's impact on the poor, both in the rural and urban context.

In order to offer alternative perspectives on these issues requiring attention, I will try to situate Tanzania within the *new ICT ecosystem* introduced above.

5.1 Tanzania in the ICT layer-model

From the Tanzanian strategic perspective, it is critical to recognize that different layers and actors of the ICT ecosystem require different types of policy strategies. In order to encourage economic growth and poverty reduction, it is necessary to map the different key stake holders, capabilities, and required actions at different layers of the ICT system.

What is Tanzania's standing the layer-model proposed by Martin Fransman and introduced above? Some factors allow us to position country as an actor in the model, as well as conceptualize where it can and should be moving. In the brief exercise that follows, I will summarize stylized facts about Tanzanian ICT capabilities and innovation in an effort to situate the country in the conceptual framework of the *New ICT Ecosystem.* The analysis largely excludes existing future plans and tries to lay down critical existing factors. The central stylized facts are:

− Tanzania does not have local hardware manufacturing or assembly plants in the telecommunications sector

− There is limited local software and IT system development. Especially important is the Computer Centre at the University of Dar es Salaam, which supplies especially government software systems

− Mobile telephony is the Information Society technology of choice for vast majority of Tanzanians

− Mobile network providers and operators, as well as service providers, such as banks etc, are actively innovating for the Tanzanian market

− Internet readiness is currently weak but set to improve within the coming years. The country is transition from satellite based international Internet connection to sub-marine cable (EASSY), and the building of inter-regional fixed fibre

network is decided. Combined, these will enhance the Internet readiness of the country significantly

− Training, education and research capacity has been established (Dodoma University, University of Dar es Salaam, Dar es Salaam Institute of Technology, Tumaini University). Planned increases of higher education appear ambitious; Investments in higher education and research in ICT have been relatively modest but set to grow in the future as well. There are training institutions for ICT specialists and users

− The knowledge base on users is relatively weak and their and the involvement of users in ICT strategies and programming is weak too. This is particularly true of the rural and urban poor.

Table 2. Tanzanian and foreign strengths in the different ICT layers.

Element	Foreign supply	Domestic supply	Key action
Networked elements	Strong	Weak	Knowledge and technology transfer, Capacity building
Converged Communication and Content Distribution Networks	Medium	Medium	Building national infrastructure, Regulatory framework
Platforms, Content and Applications	Medium	Weak	Capacity building; private sector development, eGovernance initiatives
Final Consumers	Weak	Weak	Activating grass root innovation

Another way to look at the strengths and weaknesses of the Tanzanian ICT system is to investigate who supplies its capabilities, as is done in the table 2 below. Here one is directed to analyze where the necessary capabilities for innovation and implementation are located. As is evident, much of the technological infrastructure is imported and there are scarce estimates about how they create so called spill-over effects in Tanzanian society and economy.

The table discusses also possibilities to enhance the situation in the near and long term. In the context of Tanzania, it is critical to identify what type of strategies and goals are necessary to pursue in the different elements and relationships of the described system. The different layers have also potentially very different impact mechanisms on Tanzanian society. Capabilities in the first two layers are likely to contribute indirectly to economic growth, whereas the two latter categories offer possibilities to address directly problems of poverty.

Obviously, building capacity in network elements is obligatory for any country that wants to pursue ICT. It takes always patient and long-term investments in higher education and research, but is a critical aspect of building capacity. More rapid actions and results are possible with actions addressing the role of local content and service development, and the role of users. In the context of poverty alleviation, it is important to highlight the fact that much of the near term potential lies in the area and relationships located in:

- *Platforms, Content and Applications* (including Internet content & Application Providers, such as eFulusi mobile banking)
- *Final Consumers.*

It is within these categories and symbiotic relationships of the *new ICT ecosystem* that much of the real use and productive effects are to materialize in Tanzania. Local content and application development has a key role in addressing needs that are specific and unique to Tanzania. This type of fragmentation of demand is typical also in advanced markets, but even more so in regionally, economically, culturally and socially diverse Tanzania.

Moreover, the role of final consumers is decisive in collecting information of the true needs and possibilities of ICT in the daily lives of Tanzanians. Only by finding ways to involve escalating number of different stake-holder groups to identify and specify issues needing ICT-based solutions, we can expect truly local information society dynamics to take off.

Content and application development, as well as involvement of users present relatively easy and inexpensive method to improve the effectiveness and focus of information society policies and their impact on Tanzania.

6. Conclusions and recommendations

Poverty alleviation and development constitute the centre piece of ICT and information society in Sub-Saharan Africa. This paper has discussed in limited length how ICT's possible role can and should be strengthened in the future in delivering on those expectations.

Throughout the paper, three major issues have been examined from different vantage points. Concerning them the essential argument can be boiled down as follows:

- **Sub-Saharan ICT is embedded in the new global ICT system**. There needs to be enhanced awareness of what type of ICT or information society models are advanced in Sub-Saharan countries and how countries position themselves within the global ICT system. National strategies and programmes must forge truly "African model" that provide a working fit between the global system and local need and take actual advantage of national capabilities and strengths.

- **The critical role of users.** Much more needs to be done to understand diverse user needs in Sub-Saharan Africa and for the integration of users in innovation and policy planning processes. The lack of knowledge about users and their sporadic involvement in innovation and policy planning constitutes one of the major risks for the success of ICT and information Society in Sub-Saharan Africa.

- **Too little is known about how ICT alleviates poverty.** Evidence about direct and indirect benefits of ICT in poverty alleviation remains scant. This constitutes a challenge for both broad national based national ICT strategies as well as attempts to mobilize ICT directly in pro-poor initiatives. Much more needs to be done to collect information and develop conceptual understanding about the relationship between ICT and poverty in Sub-Saharan Africa. Enhanced understanding of the subject is bound to strengthen the effectiveness ICT strategies and programmes.

By no way these three issues represent a comprehensive approach to ICT and Information Society in Sub-Saharan Africa. They are identified and discuss more corrective

measures and in an attempt to augment existing practices, not in an attempt to criticize or replace existing strategies or policy planning processes.

In addition to the above discussed three major issues, four other issues deserve a more full treatment in terms of conclusions:

- **National ICT and Information Society Strategies must be positioned against the emerging global ICT ecosystem**. Information and Communication Technologies encompass extremely complex and broad array of technologies, bodies of specialized knowledge, applications, stake-holders, applications and users. Countries wishing to navigate successfully in the emerging global digital landscape must forge clear and concise strategies and plans of action. Critically, such strategies and plans must be framed within a conceptual framework of ICT in order to identify and specify in concrete terms objectives, implementation tactics, and eventually criteria for success.

- Development and poverty alleviation remain the most important context for ICT and Information Society in the Sub-Saharan Africa, yet this paper has argued that it is also necessary to position country strategies within a theory of ICT. The New ICT Ecosystem, as pioneered by Martin Fransman, embodies a hierarchically organized model of ICT and an understanding how innovation unfolds in the system. It offers one possibility to position and guide strategic planning of public policies, as does the concept of sectoral systems of innovation.

- **Balancing ICT infrastructure with information society.** Sub-Saharan Africa's recent success in building ICT infrastructures, human resource development, and regulatory reforms is breathtaking, but further actions is required to harvest the real benefits. The infrastructures and enabling environment must be mobilized as functioning information society. High level policy strategy processes and planning cycles must embrace increasingly the questions and problems specific to information society development, while continuing to strengthen the infrastructure and enabling environment.

- **Users are critical for transition to Information Society.** Weakness, if not indeed lack, of our knowledge about users and user needs in Sub-Saharan is serious threat to future ICT and Information Society strategies and their implementation. There is clear need to organize coordinated effort to generate empirical evidence about expectations, capabilities and direct needs of use in different regions, social and economic classes. Of heightened importance is enhanced understanding of the potential of ICT for the rural and urban poor.

- Without advanced ex-ante investigation of the user needs and readiness in areas with distinct regional, social, economic and cultural features, donor or central government driven ICT and information society programmes run the risk of un-

derestimating the critical role of users for delivering real economic and social impacts.

– **Policy capacity.** Governments play central roles for the way ICT will unfold in Sub-Saharan countries. Therefore, all effort should be done to provide further support and capacity building in all policy planning, monitoring, implementation and evaluation processes that bear upon ICT. Especially critical is to enhance ex-ante type of foresight activities, which allow for enhanced scenario building and credible comparison of different policy options.

Management of ICT in society is based on reliable knowledge about ICT infrastructure and especially use. There should be serious attempt to:

Policy strategies and processes for delivering change (Policy planning tools)

– Enabling government leadership and coordination
  - Increasing awareness and understanding about the ICT and IS as highly cross-cutting and interconnected system
  - Promote conceptual thinking and capabilities
  - Highlighting the critical role of users for ICT and Information Society.

– Monitoring & evaluation systems
  - Need for new indicators that fit Sub-Saharan environment
  - Establishing national knowledge bases
  - Sample type surveys to build time series
  - Need to collect systemically information and knowledge about ICT in support of pro-poor initiatives.

– Strategy building and foresight processes
  - Foresight increasingly important in the area of ICT, because of the rapid technological change and the rate of innovation in services
  - Combine technology foresight with social, economic and political foresight
  - Support increased awareness of ICT and IS issues among key decision makers and stake-holders
  - Peer-to-peer learning & benchmarking nationally and within Sub-Saharan Africa and internationally
  - Development of clearly argued policy options with ex-ante cost/benefit assessments for decision making
  - Building ICT/IS strategy portfolio: Balancing high-technology and low-cost driven ICT/IS strategies: Building global excellence as a long-term project and concentration on few institutions vs. providing ICT services for the low-income groups.

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Appendix 1: List of interviews, acknowledgements and disclaimer

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<u>List of Interviews:</u>

1. Geoffrey Kalokola, Deputy Director,
   University Computer Center, University of Dar es Salaam
2. Hasa Mlawa, Professor of Technology Management,
   University of Dar es Salaam
3. Anthony Maduekwe, Programme Specialist (Science), UNESCO
4. Charles Y. Senkondo, Executive Director, Tanzania Global Develoment Centre
5. Omar Mzee, Programme Officer ICT and LVI, Embassy of Sweden
6. David Sawe, independent consultant / Board Chairman, Kazzar Ltd.
7. Dylan Lennox, Managing Executive – New Technologies, Vocacom
8. Emmanuel E Runyoro, Head- Management of Information Systems, Ministry of Communications, Science and Technology
9. Richard J. Masika, Vice Principal and Director of Studies, Dar es Salaam Institute of Technology.

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