An investigation into the connections between new ICTs, universities, and poverty reduction. A comparative study of SIDA-SAREC ICT projects at universities in Tanzania and Nicaragua

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3.1 A note on history - Nicaragua ................................................................. 29
3.2 A note on history - Tanzania ................................................................. 30
3.3 Socio-economic indicators - comparison ............................................. 31

4 SIDA DEVELOPMENT OBJECTIVES .................................................. 32
4.1 Guiding objectives - SIDA ................................................................. 32
4.2 Summary of country strategy for development cooperation with Tanzania ................................................................. 33

5 ICT - SIDA STRATEGY AND COUNTRY REPORTS ........................... 40
5.1 SIDA’s IT strategy ................................................................. 40
5.2 ICT in Tanzania ................................................................. 41
5.3 ICT in Nicaragua ................................................................. 42
5.4 ICT statistics ................................................................. 43
5.5 Comparison and analysis ................................................................. 43

6 SIDA/SAREC AND UNIVERSITIES ............................................ 44
6.1 What is SAREC? ................................................................. 45
6.2 SAREC and the public universities of Nicaragua .................................. 45
6.3 SAREC and the universities in Tanzania ............................................ 48
6.4 Comparison and analysis ................................................................. 50
7 ANALYSIS AND CONCLUSIONS

7.1 SIDA development objectives and ICT initiatives
In what ways can the ICT projects meet the development goals of SIDA? How do the stakeholders perceive that increased ICT use at universities can contribute to poverty reduction?

7.2 SIDA and ICT in a National System of Innovation
How do SIDA’s investments in ICT at universities theoretically fit into a NSI?

7.3 Increased ICT use at universities and poverty reduction
Can these ICT investments translate into poverty reduction, how, and over what time period?

7.4 Concluding reflections
ABSTRACT

There has been an increased focus on ICT-related projects in development cooperation in the last decade based on the assumption that ICTs expands opportunities for economic growth as well as for poverty reduction. This is also the case with the Swedish International Development Agency (SIDA). I wanted to better understand the reasoning behind the increased focus on ICT.

Specifically I have chosen to look at SIDA’s policies and projects with universities in Tanzania and Nicaragua to understand how different stakeholders perceive that increased ICT use at universities can affect poverty reduction.

Some questions guiding my research are: In what ways can these ICT investments meet the development goals of SIDA, and might do these ICT investments theoretically fit into a national system of innovation?
1 INTRODUCTION AND PURPOSE

1.1 Knowledge and information and communication technology (ICT)

In addition to informing the choices we make in our personal lives – knowledge is a resource, a fundamental driving force in increasing opportunities for wealth creation and innovation in an economy. It has become increasingly important for improving the productivity and global competitiveness of a country\(^1\). Technologies that help improve and increase the access to information are for this reason of high value in today's economies. Lacking access to information and knowledge limits choice.

There has been an increased focus on ICT-related projects in international development cooperation in the last decade based on the assumption that ICTs expand opportunities for poverty reduction. This is also the conviction of the Swedish International Development Agency (SIDA). I wanted to better understand the reasoning behind this increased focus on ICT. This thesis investigates the relationship between international development cooperation, increased use of new ICTs at universities, and poverty reduction. By new ICTs in this context I primarily mean technologies surrounding internet access and use of computer networks.

ICT has the potential to empower people on individual, national, regional and global levels. It has been observed that countries with comprehensive informational infrastructure that use innovative information technology applications have advantages in achieving sustained economic growth and social

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development\textsuperscript{2}. Apart from improving options in business management, the efficiency and transparency of social services and the public sector in general is often enhanced\textsuperscript{3}. People’s access to education, health, government and financial services can be improved with the use of ICTs\textsuperscript{4}.

This is not to say that it should be expected that current ICT situations in economically wealthier countries can, or should be, replicated and function in the same way in less developed economies. The context of countries with less developed economies is different and unique to one another as well as to the wealthier economies. Apart from the fact that few countries presently use resources sustainably - the things that improve quality of life for people are obviously not always related to an increase in private economic wealth.

**1.2 Purpose**

I want to understand how different stakeholders perceive that increased ICT use at universities can affect poverty reduction. Specifically I have chosen to look at SIDA’s policies and projects with universities in Tanzania and Nicaragua. The stakeholders in this case are SIDA/SAREC, the universities in Nicaragua and Tanzania, and the partner universities in Sweden.

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\textsuperscript{2} Ibid.  
\textsuperscript{3} Ibid.  
organizations in an economy. This interactive learning process is believed to improve innovative capacities in a system.

SIDA’s main objective in development cooperation with both Nicaragua and Tanzania is poverty reduction. ICT investments are part of SIDA’s development cooperation in both Tanzania and Nicaragua. The development cooperation policies of SIDA support the establishment of key organizations and institutions as well as creating dynamic links between them. SIDA can in this way be seen as contributing to building and strengthening national systems of innovation in Tanzania and Nicaragua.

These are questions guiding my research:
- In what ways can the ICT projects meet the development goals of SIDA?
- How do the different stakeholders perceive that increased ICT use at universities can contribute poverty reduction?
- Can these investments translate into poverty reduction, how, and over what time period?

Furthermore, it is of theoretical interest to explore how SIDA's investments in new ICTs at universities could be seen to fit into a national system of innovation. In the theory and methods chapter I present an analytical model that will help explore this.

Whilst my focus is primarily on poverty reduction rather than economic growth, they are of course connected in several ways. According to Segura-Bonilla and Johnson "one may say that the system of innovation approach is a way of analysing innovations – their character, their causes and how they affect economic growth and development – in the learning economy."

1.3 ICTs and poverty reduction

There can be many (both economic and non-economic) benefits of increased ICT use in general if one assumes that increased ICT use means that people can and do access more information that can and does lead to new knowledge. The United Nations Development Programme (UNDP) states:

"ICTs allow faster delivery and a more adapted content of technical assistance in a variety of sectors - ranging from long-distance education, telemedicine, environmental management, to strengthening of participatory approaches and the creation of new livelihoods. ICTs can involve more people, hitherto unreached or underserviced, and accomplish a deeper geographic penetration, especially to rural areas, than is the case with traditional means and modalities. ICTs allow access to information sources worldwide, promote networking, transcending borders, languages and cultures, foster empowerment of communities, women, youth and socially disadvantaged groups, and help spread knowledge about “best practices” and experience. ICTs are indispensable to realise the global information society and the global knowledge society."

One might question how useful the internet is to for example the rural poor in developing countries compared to how useful more ‘traditional’ communication technologies such as telephones, televisions, and radios are, not to mention access to arable land, education, and healthcare. Given the state of education systems and literacy rates in many developing countries – for many individuals internet access or use is not a reasonable priority.

This does not mean, however, that new technologies cannot be of use in these contexts – but it points to the need for development that is suited to the needs of, and resources available to, each country and its

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different sectors or regions. Internet cafés or similar concepts can for example provide services to many people at a relatively cheap price. These types of centres can also have training facilities as well as intermediaries who assist in finding relevant information for people. There are several ways that new ICTs can come to the benefit of disadvantaged groups.

An example of a project with aims to benefit the poor in India through the increased use of ICTs:

*Supported with the help of the World Bank’s Information for Development (InfoDev) programme, and other volunteers of Honey Bee network, the Knowledge Network for Augmenting Grassroots Innovations (KnowNet-Grin) was designed to utilize the power of ICTs to expedite the feedback process throughout the Honey Bee Network, while making information more easily accessible to remote villages via the Internet. KnowNet-Grin comprises multimedia nodes connected through a wide area network (WAN), initially encompassing the Gujarat, Tamil Nadu and Karnataka regions. Discussions are currently underway to expand the network to other regions of the country. Intended to operationalize the electronic exchange of information among grassroots innovators, KnowNet-Grin helps to create opportunities for entrepreneurship and socio-economic advancement for marginalized communities. It seeks to help would-be innovators overcome caste, gender and literacy barriers by democratizing knowledge among all members of society, thereby spawning grassroots innovations throughout the country. KnowNet-Grin is still in the beta stage at the IIMA.

Goals and challenges
While the project designers, which include, inter alia, SRISTI, GIAN, NIF and IIMA, have laid out a variety of goals for KnowNet-Grin, of which the following warrant specific mention:

- The creation of an electronic network of innovators linked by village-based kiosks;
- Encourage innovators to share ideas;
- Reduce the feedback loop between users and innovators;
- Bridge the gap between formal and informal innovation;
- Provide a virtual platform for building a value chain of research and development support.

Despite its vision, the project faces many challenges. From identifying ways to make the Network relevant to the largely illiterate rural population to the lack of incentives to participate in new knowledge creation and the inadequate number of women and other marginalized groups involved in grassroots innovation, KnowNet-Grin faces an uphill battle as it seeks to establish close contacts between innovators, investors and entrepreneurs. However, continued research in the areas of local language standardization, universal interfaces for village kiosks and multimedia-based education promises to strengthen the sustainability of KnowNet-Grin. In phase two, the project hopes to expand the Network to Africa and South America, eventually seeding all markets of the world with Honey Bee kiosks.* Fig 1.3

The project described above aims to improve the innovative capacity of rural areas by democratizing knowledge through the use of ICTs. Furthermore, the project seeks to foster knowledge production by establishing links between various stakeholders – people, organizations and institutions.

1.4 A note on terminology
For simplicity's sake I use the concept of ‘less developed/developing’ or ‘developed’ country - and what I mean with that is less (or more) economically developed. The terms are based on economic indicators. Economic indicators can and do of course say a great deal about quality of life – but they do not present the complete context, hence it is in my opinion that one assumes too much or too little when using the terms ‘less developed/developing’ or ‘developed’ country.

1.5 On the contents of chapters
Chapter two presents the Systems of Innovation framework, sets SIDA's development cooperation policies into a historical context. Research methods are also explained in this chapter.

Nicaragua and Tanzania country profiles follow in chapter three – providing a short history of the countries as well as a glimpse of the political and economic status quo. It provides background information that helps in understanding the unique contexts that frame the development problems facing each country.
Chapter four contains a presentation of SIDA’s development objectives in general as well as summaries of the country strategies for Nicaragua and Tanzania. This chapter further informs the reader about the context which the university ICT projects inhabit.

Building on chapter four – chapter five briefly deals with explaining the current ICT situation in each country. Chapter six explains the role of SAREC at SIDA, and presents in detail the University ICT projects in both countries.

Chapter seven contains analysis and conclusions.

2 Theory and methods

One of the goals of SIDA is to engage in development cooperation that supports a path towards stronger economic independence, and they do this by supporting a wide variety of organisations and institutions. The Systems of Innovation approach is of interest in this thesis because it provides a good base from which to analyze SIDA’s information and communication technology (ICT) investments in Nicaragua and Tanzania.

I will start by using the work of some of the leading authors in the area of Systems of Innovation to paint a general picture of this framework. I will use the work of Bengt Åke Lundvall, Susana Borrás, Christopher Freeman, Charles Edquist, Steven Kline and Nathan Rosenberg, Joseph Schumpeter, Richard Nelson and Sidney Winter.

A brief overview of development theory will follow, using a book by Stefan De Vylder, with which I aim to contextualize SIDA’s methods and objectives into a historical perspective. Given the length of the thesis, my intention is not to go into minute details, but to cover general points.

Following the theory section is a discussion about methods, after which I introduce my analytical model.

2.1 Defining Systems of Innovation

Systems of Innovation (SI) is a concept that has been developed relatively recently (beginning in the late 1980's) with founding work by Freeman (1987), Lundvall (1992) and Nelson (1993). It is not a tightly knit theory - it is referred to as a framework or an approach. The SI framework sees processes of innovation as characterized by interactive learning. It deals with exploring factors that function in dynamic interdependence to promote innovation on different levels (national, regional or sectoral for example). Its development was influenced by different innovation theories (like interactive learning theories and evolutionary theories).

One definition of a System of Innovation is “all important economic, social, political, organizational, and other factors that influence the development, diffusion and use of innovations.” The framework is about the determinants of innovation, and the function of a system of innovation can be to bring about production,

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diffusion and use of innovations. These innovations can be of various kinds (process or product, incremental or radical).

**How did it develop?**

SI grew out of an increasing demand to better understand the economics of growth and the driving forces behind technological change and other innovative activity. A number of innovation theorists mean that it is inappropriate to think of innovation as being a result of mainly profit maximizing behaviour. Many of the actors involved in processes of innovation do not have profit maximization as a primary goal, such as governmental or private non-profit organizations like universities and public research laboratories.

**Technical change and economic growth**

Technical change has been associated with economic growth for a very long time, but explanations of exactly how this technical change occurs has been less clear. Technical changes are innovations, and innovations can loosely be seen as new combinations of already existing things. How technical change is accounted for varies extensively from theory to theory.

Lundvall and Borrás (in a report on the globalising learning economy and innovation policy) argue that neoclassical theories and worldviews are inadequate for understanding and explaining technical change and innovation and hence also for formulating appropriate innovation policy.

Neoclassical theories about economic growth have, until relatively recently, treated technology as an exogenous variable (“variables for which the values are determined outside the model but which influence the model”). Lundvall and Borrás state that neoclassical models (Like Heckscher-Olin models for foreign trade) treat technology as if it came out of nowhere, and furthermore claim that everyone has equal access to it. They state that if this were the case – if all relevant technical knowledge were a public good, then there would be little incentive for anyone in the private sector to innovate. They maintain that a vast amount of the information relevant to development is “neither completely private not the opposite, and that most information needs to be worked on in order to become useful.”

“A major reason why the neoclassical vision of the world is inadequate in the globalising learning economy is that the formation of, and access to, tacit and shared knowledge has now become the key to economic success. The process of interactive learning will not take place in pure markets where individually optimising agents meet: there will be no general equilibrium and the ability to learn is not the same across individuals and organisations. The learning process is socially embedded and organisational forms and institutional set-ups are crucial to the outcome of interactions.”

New growth theories include changes in how technology is treated in neoclassical theory – one being that technology is not exogenous anymore, though knowledge and information are treated as synonymous and “firms are still assumed to be homogenous optimising units and the model is focused on defining a unique equilibrium path of economic growth.” Lundvall and Borrás believe that the evolutionary and systemic

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13 Ibid. P9  
14 Ibid. P6  
15 Ibid. P7  
17 Ibid. P43  
20 Ibid. P45  
21 Ibid. P47  
22 Ibid. Pp50-51
approach to innovation provides a better, and more realistic, framework for understanding the connections between technology and economic growth as well as the potential of policy action23.

**Innovation as an evolutionary process**

According to Nelson and Winter innovation should be understood as an evolutionary process24. Components of evolutionary theories of technical change tend to include:

- The existence and reproduction of entities/genotypes or a certain set up of technologies and organizational forms
- Mechanisms that introduce novelties in the system (creating diversity) such as random elements, but also predictable novelties. In biology these novelties are mutations, and in our context they are innovations
- Mechanisms exist which select among the system’s entities, increasing the relative importance of some while diminishing that of others. This selection process reduces diversity and the mechanism might be called ‘natural selection’ or ‘market selection’. Together there selection mechanisms make up a system of filtering that functions in different stages and eventually leads to for instance new technologies or new organizational forms25

“The new technologies that are developed are only superior in a relative sense, not optimal in an absolute sense, and the system never reaches a state of equilibrium. Technological change is an open-ended and path-dependent process where no optimal solution to a technical problem can be identified.26”

Though evolutionary and neoclassical economics are different and have fundamental areas of disagreement, they are interdependent and can also be complementary. Both the neoclassical and the evolutionary approach are essentially concerned with being able to better understand and describe the dynamic economic reality that we exist in – so as to be able to better predict the future. Generally it is of interest how economic activity is coordinated, how the price of labour and rent of land are explained, and how economic dynamics (specifically growth) function27. The theoretical and behavioural assumptions guiding each approach are quite different, however, and this has significant effect on the outcome of analysis.

Neoclassical assumptions about individual behaviour include that by striving for one’s own personal advantage – one fosters the wellbeing of society. Furthermore – individuals have stable and predictable preferences, possess perfect information and know all consequences of their actions. We act with full rationality, consciously opting for the best means by which to reach our goals28.

In contrast, the evolutionary perspective of individual behaviour assumes that there are many situations where striving for personal advantage can be disadvantageous to society. There is uncertainty rather than perfect information - individuals do not necessarily have stable preferences over time, and we do not know of all the consequences of our actions. We act in bounded rationality because there are limits to our capacity to gathering and processing information – we rely heavily on routines, and are dependent on the system we are a part of29.

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23 Ibid. Pp54-55
25 Ibid. P6
26 Ibid.
28 Sellenthin, M., Class notes for lecture, "Evolutionary Economics," Linköping University, ESST Masters Program 2004, Pp2-3
29 Ibid.
What is an innovation?
Innovations: “New creations of economic significance normally carried out by firms (sometimes individuals). They may be brand new, but are most often new combinations of existing elements.”30 This definition stems from Joseph Schumpeter’s theories in the 1930’s.31

The evolutionary approach to economics has part of its roots in the writings of Schumpeter (The theory of Economic Development, 1911/1934). He stated that economic development results from carrying out of new combinations of things that already exist - in other words, by finding new ways of combining the economic system’s productive capacities.32 Economic development in his definition referred to innovation, and covered the entire process from the immature invention phase to the commercial exploitation phase to the diffusion phase where competitors start to use the invention.33

Schumpeter questioned static methods of analysis (like equilibrium analysis), claiming that they failed to explain the very discontinuous, dynamic and non-linear nature of business cycles.34 Furthermore, he rejected the concept of rational behaviour based on perfect information - and maintained that people rely on routines for decision-making.35 He implied that the impact of technical change and innovation was grossly underestimated in then contemporary theory of economic development.36

The innovation process
Firms or organizations do not innovate in isolation. Innovation processes are “.characterized by complex feedback mechanisms and interactive relations involving science, technology, learning, production, policy and demand.”37 The innovating firms and organizations include both those motivated by profit-maximization and those that are non-profit.38 Also affecting innovation processes are institutions that provide incentives as well as constraints for innovation (laws, technical standards, social and cultural norms, health regulations).39

Some empirical facts that are helpful in understanding innovation processes include:

• Innovations are based on interactive learning between organisations
• Firms do not innovate in isolation
• Innovation processes are evolutionary
• Institutions are crucial and shape (as well as shaped by) actions of organisation and relations between them40

Defining the components of a system of innovation
Systems consist of two kinds of entities - components, and relations between these. The system needs a reason for existing, and it should be distinguishable from its environment in the sense that it should have identifiable boundaries.41

32 Ibid. P68
33 Ibid. P66
34 Ibid. P62
35 Ibid. P80
36 Ibid. P63
38 Ibid. P2
39 Ibid.
41 Ibid. P4
There is nothing particularly controversial about this model, though one can always debate about the location of boundaries. What is difficult in any system, including a system of innovation, is defining what the components are and can be, and the potential relations between them.

- **Organizations/actors**: formal and consciously created structures with an explicit purpose, for example companies, universities, venture capital organizations, and public innovation policy agencies⁴².
- **Institutions**: “sets of common habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals, groups and organizations⁴³.”

Other authors have different definitions. For Nelson and Rosenberg, institutions are other forms of organizations, and to Lundvall it just means “rules of the game⁴⁴. All the author’s definitions could be considered vague, especially considering the fact that they are talking about the same framework - but they still usefully convey the general idea.

According to Edquist, the learning processes that are seen as the base required for innovation development are not only a result of market-based interaction - collaboration outside market transactions is important. Relations and interactions (conflict as well as cooperation) between organizations and institutions shape and influence their development. Organizations can create institutions, and institutions can be the basis for creating organizations⁴⁵. Edquist divides innovations into categories - I have used his diagram ⁴⁶ as base for my own (below).

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**Footnotes:**

⁴² Ibid. P5
⁴³ Ibid.
⁴⁴ Ibid.
⁴⁵ Ibid. P6
⁴⁶ Ibid. Pp7&11

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What goes on inside the system?
According to Edquist there has been too little work done on what goes on in the system but he summarizes the findings of Xielin Liu and Steven White (2000) to explain what activities are fundamental in a system of innovation:

- research (basic, developmental, engineering)
- implementation (manufacturing)
- end-use (customers of the product or process output)
- linkage (bringing together complementary knowledge), and
- education

According to Johnson and Jacobsson (2000) specific innovation systems can be described or analyzed in terms of certain functions being served, for example to create new knowledge, human capital and labour markets, legitimize technology and firms, enhance networks, and supply resources. Fischer divides the main building blocks of a system of innovation into sectoral subsystems. I have used his article to reproduce the diagram below.
When Edquist discusses main components of systems of innovation – he talks about organizations and institutions and the relations between them. He also mentions Lundvall’s ‘universals’ which are production structure and institutional set-up; Carlsson and Stankiewicz’s network of agents, economic/industrial area, institutional infrastructure, technological activities; and Nelson and Rosenberg’s institutions and mechanisms and technical innovation. Subsystems include production systems, marketing systems and financial systems. He is trying to fit in all levels of SI in one theoretical framework, which is a considerable challenge, and not so easy to understand as a reader. Fischer’s diagrams above bring the message home in a sense.

Weakness of the SI framework

Weaknesses of SI pointed out include inconsistency in terminology, unclear functional boundaries of the systems, and loosely defined relations between variables. To give a specific example, the term ‘institution’ is used differently by different authors, sometimes meaning organisational actors, sometimes rules and conventions, and sometimes both. An increase in specificity is demanded by many of the authors in the area. Other weaknesses identifies include the lack of attention to the role of individual learning through education as well as the theoretical role of the state.

In my opinion, the loose framework status can be seen as either a weakness or strength depending on what one wants to use it for. I believe that it can be positive (in its loose state) because countries, industries or regions have different types of organisations and institutions – meaning that their composition, interaction and dynamics will be different. It leaves things open to interpretation a bit more. Having said that - more specificity could be a good thing, especially regarding defining potential relationships between variables and standard concept definitions.

On the matter of definitions and boundaries of SI - Lundvall and Borrás have stated:

“Determining in detail which subsystems and social institutions should be included, or excluded, in the analysis of the system is a task involving historical analysis as well as theoretical considerations… a definition of the system of innovation must be kept open and flexible regarding which subsystems should be included and which processes should be studied."\(^{52}\)

I agree with them, but there probably are areas that could benefit from more specific definitions without threatening the overall flexibility of the approach.

What is the link between research, invention, innovation, and production?

The traditional model for this relationship is linear, and illustrated below.

Linear Model:

<table>
<thead>
<tr>
<th>RESEARCH</th>
<th>DEVELOPMENT</th>
<th>PRODUCTION</th>
<th>MARKETING</th>
</tr>
</thead>
</table>

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Fig 2.4

According to Kline and Rosenberg (1986) the linear model misrepresents the links between the stages. One reason being that there are no feedback paths indicated in the model. With perfect information, this linear model could be the realistic. Kline and Rosenberg maintain that the idea that innovation is just applied science has been widely spread – but that in fact scientific research at any time represents only a small portion of the accumulated knowledge available for innovation processes. So innovation is not necessarily, and most often not – a result of research alone.

Kline and Rosenberg’s model for the relationship is chain-linked. I have replicated the main part of this model below - it is meant to show the paths through which information and cooperation flows, and how the link between science and innovation is not linear. Science is a resource that is consulted and used when needed along the development process, and is seldom the initiating factor in an innovation process.

![Diagram of Kline and Rosenberg's model](image)

**Legend:**
- **C** = central chain of innovation
- **f** = feedback loops
- **F** = particularly important feedback
- **K to R (simplified in my version)** = Links through knowledge to research and return paths. If problem solved at K, link to R not not activated. Return from research is problematic – therefore dashed line (not shown here, see original model).
- **D** = Direct link to and from research from problems in invention and design
- **I** = Support of scientific research by instruments, machines, tools and technological procedures.
- **S** = Support of research in sciences underlying product area to gain information directly and by monitoring outside work. The information obtained can apply anywhere along chain.

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54 Ibid. P290
55 Ibid. P291
56 Ibid. P290
57 Ibid.
Innovation policy

According to Edquist, innovation policy is: “...public action that influences technical change and other kinds of innovations. It includes elements of research and development policy, technology policy, infrastructure policy, regional policy and educational policy.”

Policies are (in theory at least) implemented only when the market mechanism fails in some ways with the objectives in question (which produces a ‘problem’) and only when the state and its public agencies have what it takes to solve the problem. They are meant to function as a complement markets and firms.

Of course how one defines market system failures (‘problems’) depends on many things (like whether policymakers are evolutionary economists or neoclassical ones!) which will affect what they consider ‘solutions’. It might therefore be problematic for the state and its agencies to know/decide what kind of policy will help solve the problem.

Edquist mentions a couple of mechanisms of policy-making – imitation (copying other countries), and lobbying (special interests groups can lobby for policy design that benefits them). There is also the possibility of making an analysis from scratch to come up with a policy adapted for that time and problem, but often it is a combination of two or more of these.

Lundvall calls for a new policy paradigm that takes into consideration the ‘globalising learning economy’ and the interactive and systemic nature of innovation processes. This paradigm takes into account new and more broad type of failures like technological and systemic lock-ins, and trade-offs in areas such as exploitation/exploration, diversity/homogeneity, and integration/flexibility.

2.2 Previous research in the field of SI, developing countries and ICTs

Research on Systems of Innovation and developing countries

There are quite a few articles, papers or reports dealing directly with systems of innovation in developing countries, but less than I had anticipated. Authors I have found include: Melo, A., Gu, L., Arocena, R., Sutz, J., Kumar, V., Oyelaran-Oyeyinka, B., Barclay, L.A., Segura-Bonilla, O., and Milford R.V. I will go over some ideas from a few of the authors above – first on SI and developing countries in general, then on Africa and Latin America in particular.

Olman Segura-Bonilla and Björn Johnson state (in “Innovation Systems and Developing Countries: Experiences from the SUDECSA project”) that there are some difficult contradictions in the globalising learning economy: “On the one hand, short-term economic calculations and speedy processes of decision-making are getting more and more important. On the other hand, competition depends more and more on dynamic efficiency rooted in knowledge or knowledge related sources with long term characteristics.”

They underline the importance of knowledge for development and comment specifically on the difficulty of ‘transferring’ knowledge, given the fact that knowledge is context-dependent (though to differing degrees of...

59 Ibid.
60 Ibid. Pp19-20
62 Ibid.
course). They maintain that when conceptualizing innovation systems of the South it is appropriate to focus on a broader approach, where innovations are seen to be rooted in “everyday activities in firms and in the competencies and capabilities of ordinary people” rather than on the innovation capacity of individual firms and organisations.

Segura-Bonilla and Johnson state that one of the weaknesses of Systems of Innovation in relation to developing countries is that it does not adequately address the role of politics and power – underestimating conflicts surrounding income and influence.

Arocena and Sutz (“Inequality and innovation as seen from the South”) maintain that the NSI framework is useful for considering development problems. They also stress the destructive paths of innovation processes and point at how inequality is maintained through a monopoly on knowledge resources and innovation capabilities:

“The concentration of knowledge resources and innovative capabilities in some groups and regions leads to the self reproduction of social asymmetries. Production grows and diversifies as does inequality. Innovation implies “creative destruction” as Joseph Schumpeter put it, but for many people what is lost is more important than what is gained. In the natural and social environments in which they live, what prevails is destructive innovation”. With regard to products, machines, jobs, and skills, “creation” for some people often means “destruction” for others.

Arocena and Sutz maintain that context is crucial – that though the institutions and policy instruments might seem the same from country to country - they function differently in developing countries than they do in more developed countries. Social asymmetries tend to be maintained rather than broken because of the ability of the rich and powerful to keep resources under their control. The ‘South’ cannot simply copy the ‘North’ – context matters.

Arocena and Sutz maintain that global trends are not indicating a closing of the gap between North and South – pointing at the need for alternative policies. Furthermore, learning, knowledge and innovation are central, and there is a need for revitalization in development thinking.

**Latin America**

Alberto Melo, (“The Innovation Systems of Latin America and the Caribbean”) states in the introduction that “knowledge-driven innovation has become a decisive factor in the competitiveness of both nations and firms.” This report is very general, considering it is covering a large amount of countries.

Melo maintains that there exist major differences between the innovation systems of developing countries to those of the more developed countries – both quantitative and qualitative. He points to the fact that the less developed countries tend to have fewer and less developed institutions, and that fewer people (in relation to total population) are involved in innovative activity than in more developed countries. Investment in research and development (R&D) as a percentage of GDP is also significantly lower. According to Melo, the countries that only relatively recently received political independence have “handicapped systems
of innovation” in relation to the politically and economically more developed countries. Segura-Bonilla and Johnson maintain that the majority of Central American innovation systems are fragmented.

New innovation policy trends in the region assume that intervention from the government is needed due to the existence of market failures when it comes to i) the gathering and dissemination of information; ii) the initial introduction of new technologies, and iii) the financing of research and development. Melo maintains that many governments in the region are increasingly using the “systemic concept of innovation as a social practice conducted by a variety of actors” and that policy makers are “employing the conceptual tools of the national innovation systems approach to think about strategic, institutional and policy issues.”

Melo finds the region to be progressing in absolute terms, but that it is also falling behind in relative terms. He also maintains that the systems of innovation vary greatly from country to country in the region.

Melo concludes that good innovation policies are positive and necessary, but that the success of these policies depends on effective governance, administrative capabilities and a favourable institutional environment.

**Africa**

There was no similar assessment of Africa’s systems of innovation. What I could find was a report written by Banji Oyelaran-Oyeyinka and Lou Anne Barclay - “Systems of Innovation and Human Capital in African Development,” and a report by Mambo Tabu Masinda (“National Systems of Innovation: Implications on Science and Technology Policy in Sub-Saharan Africa.” These reports are also very general.

Oyelaran-Oyeyinka and Barclay propose that the emergent systems of innovation in Africa are conditioned by its history and that “Africa’s present underdeveloped system of innovation in part has its roots in both the past and present poor pattern of human capital formation.”

They hypothesize that poor human capital formation could partially explain the “lack of dynamism of the region’s systems of innovation, institutions that underlie the adoption, diffusion and adaptation of innovations.” Furthermore, they maintain that the state and its institutions determine whether systems of innovation are dynamic or non-dynamic. They suggest that “the colonial origin, and pattern of schools enrolment at the primary, secondary and tertiary levels gave for to the current low technological base of African industry.”

Masinda acknowledges that exchange and circulation of resources between knowledge providers and users is crucial in the process of innovation, and investigates the possible policy implications of the NSI concept in Africa.

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73 Ibid. P13
76 Ibid. P47
77 Ibid. P17
78 Ibid. P40-41
79 Ibid. P58
81 Ibid. P43
82 Ibid.
Sub-Saharan Africa. The author identifies some systemic weaknesses in Sub-Saharan NSIs and provides some propositions for policymakers in the region.

He concludes that learning is an interdependent process and hence relies on consistent distribution of resources in order for an NSI to become more solid. “The distribution power of a NSI is its capacity to develop efficient mechanisms to promote the circulation of resources and its ability to access and diffuse available resources.” For an NSI to be efficient, it has to have capacity to transfer resources produced by providers to customers.

Masinda states that industrialized countries have resources to develop industries that are high-tech because they have accumulated high levels of knowledge over time, with incomes to match. In contrast, less developed economies should focus on innovation first and foremost as a “process of adoption, absorption and diffusion of traditional available technology.”

Research on the connections between ICT, poverty reduction and development

On this more specific topic - there has been lots of work produced in the last four to six years. The materials one can find on the topic are often connected to organisations working with development cooperation in one form or another. There are articles, reports, policy documents, conference abstracts, and information/newsletters on WebPages. Naturally I have not been able to exhaustively read all the material available, but some of the people who have written on the topic are: Flor, A.G., Johnson, B., Sabater, C., Kenny, C., Rana, S., Sharma, A.B., Wilson, M., Rydhagen, B., Wicander, G., Ballantyne, P., Finquelievich, S., Hanna, N.K., Cecchini, S., Ekenberg, L., Lundvall, B.A., Gregersen, B., Trojer, L., Vargas, M.A., Scott, C., Arocena, R., Nwaobi, G.C., Ernberg, J., Okon, J.E., and Navas, J.

All of the authors that I have come across agree on that ICTs do, and can, empower poor people. Their opinions vary, however, when it comes to which ICTs should be pursued where, how and why. I will go over some ideas from a few of the authors above.

Merridy Wilson (in the paper “Understanding the International ICT and Development Discourse: Assumptions and Implications”) states that international public ICT and development discourse supports the dichotomy between developed and developing countries – which then extends and produces the category of ‘information-poor’ versus ‘information-rich’ people. Wilson means that this needs to be problematized, not because ICTs do not work well in development, but because the dominating discourse supports a dichotomy relation that reflects a much too simplistic model of development based on ‘catch-up’, ‘leapfrogging’ and progress towards a pre-determined ideal represented by Western standards.

Charles Kenny (in the paper “The Costs and Benefits of ICTs for Direct Poverty Alleviation”) maintains that ICTs are powerful tools for empowerment and income generation in less developed countries but that the cost effectiveness varies from ICT to ICT. He concludes that there is a higher cost-benefit ratio of spreading telephony and radio than internet to the remote areas – that the newer ICTs (like the internet)
can only have indirect effects on poverty alleviation in the short-term. This, he means, is because there are less expensive ways of conveying relevant information.\textsuperscript{89}

Kenny argues that "traditional ICTs can act as a sustainable intermediary for the poor to indirectly access the power of the internet"\textsuperscript{90} and gives the example of radio stations in Sri Lanka using radio as an interface connecting people in rural areas to the internet. In a daily hour-long show – the announcer and other staff takes information requests from listeners and act as local interpreters of the information.

Birgitta Rydhagen and Lena Trojer (in their paper "ICT and the role of universities – a techno-political and postcolonial challenge") maintain that when it comes to ICTs – there is a need to develop contextually relevant and appropriate technological solutions. They give the example of prepaid mobile telephony in Tanzania as a system working well for a large portion of the population who could otherwise not afford a telephone.\textsuperscript{91}

Susana Finquelievich (in “ICTs and Poverty Reduction in Latin America and the Caribbean (LAC)”) states that there has been too little research done on the connection between ICTs and poverty reduction, whether ICTs allow leaps in less developed countries, which institutions are required for certain policies to work successfully, how various social actors can participate in this process and which policies are needed to support the creation of a more equitable society.\textsuperscript{92}

According to Finquelievich - strategies and policies relating to ICT tend to emphasize connectivity and e-governance more than empowerment and poverty reduction. The governments in question are generally not working to lowering costs of access. There are gaps between social an economic policy. She also identifies a lack of coordination of strategies and policies relating to ICTs between countries and regions in LAC, as well as between actors nationally.\textsuperscript{93}

2.3 Development theories
According to Stefan de Vylder (author of The Driving Forces of Development), there have been two dominant schools of thought in development studies the second half of the 20\textsuperscript{th} century – represented by the structuralists and the liberals.\textsuperscript{94}

The liberal school
The liberal theories on development (based on theories by for example John Maynard Keynes, Robert Solow, and Walt Rostow) have been generally anti-socialist and have upheld the efficiency of the market economy, free trade, savings and capital accumulation as a means to develop.\textsuperscript{95}

The liberals have tended to identify ‘gaps’ in less developed economies, in other words - something missing which impedes development – be it foreign currency, modern technology, an educated workforce, infrastructure or administrative capacity. According to this school of thought, rich countries help the poor countries accelerate development through for instance increasing trade, investment, aid, credits, by sending

\textsuperscript{89} Ibid. P2&23
\textsuperscript{90} Ibid. P23
\textsuperscript{91} Rydhagen, B., & Trojer, L., “ICT and the role of universities – a technopolitical view and postcolonial challenge,” Blekinge Institute of Technology, \url{http://www.luth.se/depts/arb/genus_tekn/manus_BRY_LTR.pdf}, P1
\textsuperscript{92} Finquelievich, S., “ICTs and Poverty Reduction in Latin America and the Caribbean,” University of Buenos Aires, \url{http://www.ssrc.org/programs/ilit/publications/civsocandgov/susana_finquelievich.pdf}, p4
\textsuperscript{93} Ibid. Pp5-6
\textsuperscript{94} Ibid. P4
\textsuperscript{95} De Vylder, S., The Driving Forces of Development (Utvecklingens Drivkrafter), Stockholm, Forum Syds förlag, 2002, P25
\textsuperscript{96} Ibid. Pp23-25
experts or eliminating bottlenecks. These theories often included references to terms like ‘traditional’, ‘static’ or ‘archaic’ institutions that needed to be ‘modernized’. Newer liberal theories have a different language but some of the basic assumptions are still there; the rich countries supply something which is ‘missing’ – be it capital, technical and administrative knowledge, etc.

The structural school

The concept of structuralists comes from a school of thought which originated in Latin America in the 1950’s. The structuralists were a group of economists (often represented by Raúl Prèbisch from Argentina) in Latin America who all questioned certain liberal development assumptions – such as the idolizing of foreign trade.

They maintained that in fact the prospects of export success for countries producing raw materials was not good, that terms of trade would worsen and manufactured goods would take over the market. Dependence on raw materials was not seen as a good thing, fluctuation of prices on a world market was much higher than with manufactured goods, and low production costs only benefited the rich countries that already had competitive advantage and could control prices. Furthermore, dependence on raw materials exports would not be conducive to increases in education, technology or links to a wider economy in the poor countries. Terms often used by the structuralists were ‘cumulative processes’ and ‘evil circles’.

Coupled with the critique of dependence on raw materials came recommendations for rapid industrialization. ‘Import substitution’ was held up as the solution, referring to the process by which dependence on imported goods is diminished through improving and building up national production and manufacturing. This process was implemented in many countries in the 1950’s and 60’s.

The dependency school

The abovementioned schools had plenty of critique from both sides of the political spectrum, but it was not until the 1960’s that a clear alternative theory had become established. With founding work by among others Maurice Dobb, Paul Baran and Andre Gunder Frank – the ‘Dependency school’ formed.

The dependency school maintained that the less developed economies problems stemmed from colonialism and a much too extensive integration in the world economy. The solution was not to further integrate with the more ‘developed’ countries, but to diminish the strength of ongoing exploitation mechanisms. ‘Underdevelopment’ was defined as a ‘process’ as opposed to a ‘stage.’ Development in the rich countries and underdevelopment in the poor countries were directly related according to this school. The term “self-reliance” is often used in connection to the dependency school, as well as the terms ‘center’ versus ‘periphery’.

Alternative ideas

In the mid 1970’s – critics of the dependency school said that the focus on external relations was occurring at the expense of focus on internal production- and class relations. It was also the case that the reality in developing countries did not reflect the kind of development that dependency theory predicted.
Alternatives opinions to those of the liberals, the structuralists and the Marxists grew during the 1970’s, placing emphasis on terms like ‘decentralization’, ‘small scale’, ‘popular participation’, and ‘sustainable’. Marxists and liberals are accused of being economistic and technocratic, focusing too much on the ‘developed’ countries. Among the critics were E.F. Schumacher, Johan Galtung and Ivan Illich105.

The return of liberal theories

Though many parts of all the schools of thought have survived and become part of common sense in development theory – the 1980’s and 90’s saw discussions on development theory take a strong liberal turn (called the ‘Washington Consensus’ - given the location of both IMF’s and the World Bank’s head offices) with import ‘substitution’ for example being replaced by ‘export promotion’. This was partly in response to the enormous amount of debt that many developing countries had accumulated106. ‘Structural adjustment’ became a well-known term for the kinds of changes that developing countries had to enact in order to survive and be able to pay their debts, the results of which have been recognized as bad in a majority of cases107.

Today

According to De Vylder the politics on development theory have followed a pendulum pattern, but that there since the early 1990’s might be a move away from the economistic focus to a more multi-dimensional approach – with for example more importance being attached to institutions. The World Bank and the UN Development Program gave out reports holding up terms such as ‘good governance’, ‘sustainability’, ‘transparency’, ‘partnership’, and ‘accountability’ which then began being used more108. Development started becoming more ‘human’ - income and material standard of life became only one of many important components such as health, education and gender equality109.

Despite many positive changes, many things still have not changed in depth. To give an example, the IMF started calling its structural adjustment programs ‘Poverty Reduction and Growth Facility’ instead, but the programs themselves did not change much110.

According to De Vylder, today there is relative consensus about the fact that there are no easy solutions; that the goal of development is social development; that poverty is a multi-dimensional phenomenon; that markets are needed but they do not solve every problem; that isolation is not a solution; that foreign trade is mostly good; education is good (not the least for women); that social capital (good health, education) is more important than machines; that institutions matter; that corruption is very bad; savings and investments are necessary; and that good conflict resolution capabilities are important111.

Among issues still hotly debated are: the balance between state and market; the danger of inflation; whether free trade is actually good for the poorest countries; the belief in regional trade blocks; the effects of globalization; pinned versus floating exchange rates versus a middle way; the importance of external versus internal factors in an economy; the importance of political factors; the importance of cultural factors in development; the way out of debt; the question of conditions imposed in exchange for loans or bilateral aid; and the role of climate in development; how serious the environmental problems are and what the solutions are112.

105 Ibid.
106 Ibid. Pp32-33
107 Ibid.
108 Ibid. Pp39-40
109 Ibid. P41
110 Ibid. P43
111 Ibid. Pp47-48
112 Ibid. Pp48-50
To summarize the development of development theories – I have copied and translated a diagram of the history of schools of thought from De Vylder’s book\textsuperscript{113} below.

![Diagram of the history of schools of thought](image)

**Fig. 2.6**

### 2.4 Methods

This is a cross-case analysis investigation of mainly qualitative and experimental kind. I have investigated the relationships between increased use of new ICTs at universities and poverty reduction in the context of developing countries (Tanzania and Nicaragua). I have used literature search, textual/document analysis and interviews.

A qualitative study is an… “umbrella term with numerous variations…data are collected through interviews, observations, or document analysis. Findings are a mix of description and analysis – an analysis that uses concepts from the theoretical framework of the study.”\textsuperscript{114}

In this part I will explain how the topic came to be, present the cases, go through methods used and give an account of how I worked with each method.

**How the topic came to be**

The reason I chose to write about poverty reduction and development cooperation is because I have a strong interest in development studies and international relations. My interest in ICT got stronger when I took courses in the history and philosophy of science and technology (during my undergraduate degree) as well as during the ESST masters program. It made sense to fuse these interests and look at it using Swedish development cooperation because I am interested in working with similar issues and wanted to learn more about SIDA’s methods and objectives.

I thought it would be interesting to compare a country in Latin America with a country in Africa because I wanted to learn more about how different historical contexts might relate to current development problems. I

\textsuperscript{113} Ibid. P51
\textsuperscript{114} Merriam, S.B., *Qualitative Research and Case Study Applications in Education*, San Fransisco, Jossey Bass Publishers,1998, pp10-11
chose Tanzania and Nicaragua because SIDA has a long development cooperation history with both countries so there is a large amount of documentation available. Added to that, I learned that ICT initiatives were being undertaken at universities in both countries - something that seemed to add up a potentially good comparative analysis. I also have a personal interest in the countries after having lived there for most of my life.

Why Systems of Innovation? I felt from the beginning that its framework would be good for analyzing development issues, given for example the multidimensional complexity of something like poverty and poverty reduction. Systems of Innovation is broad and loose, it seemed accommodating for the type of study I wanted to do – where many factors are involved. It seemed like it provided a good way to keep all these factors in perspective.

**Cases**

“A case study design is employed to gain an in-depth understanding of the situation and meaning for those involved. The interest is in process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation. A cross-case analysis is:

> “a qualitative, inductive, multi-case study that seeks to build abstractions across cases...the researcher attempts to “build a general explanation that fits each of the individual cases, even though the cases will vary in their details”...the researcher attempts to see “processes and outcomes that occur across many cases, to understand how they are qualified by local conditions.”

Though there was plenty of information available on both countries – I found it easier to get a picture of what is going on in Nicaragua.

The project in Nicaragua involves four universities and appears to be more well-documented than the project at University of Dar Es Salaam. Both projects have websites that have not been recently updated, however the Nicaragua website is more extensive and clear in terms of project description and scope.

Apart from being presented in different ways in the material I have looked at, the projects are of different nature and format to one another. The scope of the specific SIDA/SAREC ICT project in Tanzania is connected to postgraduate research in IT and security and less with infrastructure or policy. The project in Nicaragua is broader, and more focused on infrastructure and policy. Both projects include partnerships with universities in Sweden.

**Material**

*Document analysis*

The purpose of this thesis is to explore different stakeholder’s perceptions of the potential connection between increased ICT use at universities and poverty reduction. Document analysis is the main method used, because documents like development policies, country reports and strategies contain a vast amount of relevant information in terms of the topic area.

I started by reading SIDA policies (such as general development objectives policy, country strategies, country ICT reports, and IT strategy) and from there I went on to read specific information about the projects via websites and documents such as applications, policies, interim reports and updates.

In addition to this I did research on more perspectives on ICT and development from other sources. I have read many reports and policy documents by other organisations engaged in development cooperation of

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115 Ibid. P18
116 Ibid. P195
various and different kinds (like the World Bank, the International Monetary Fund, The United Nations and branches, the Inter-American development bank, and many smaller organisations) as well as academic papers.

**Interviews**

I chose to do interviews because they would enable me to get feedback from stakeholders on the projects and their relation to the policies.

My original intention was to at least interview one representative from each of the partner institutions in Sweden, one representative from each of the partner institutions in Nicaragua and Tanzania, and one representative from SIDA/SAREC. Aside from that I was hoping to interview a government representative from both Nicaragua and Tanzania. I soon realized that this ambition demanded a longer term research effort given the fact that it was very difficult to get in touch with these people, and also that it might mean I would accumulate too much material.

I would have liked to have had more interviews to be able to better contrast with the document analysis, but time and geographical distance limited me.

It took a while to figure out who I should be talking to – especially at the partner institutions in Sweden. It was hard to know whether I was asking the right questions in the beginning (when I was searching for people to interview) because I did not know enough about each case yet.

I spoke to several people on the phone, and sent numerous emails before I had made my way to people currently involved in the projects. I got contacts at each participating institution - but interviewed only two people due to either getting no response or lack of time on my part. I ended up doing one interview by email and one by email and phone.

For the Nicaragua case I interviewed the inter-university committee coordinator Leonel Plazaola Prado of the National Engineering University (UNI) in Managua. For the Tanzania case I interviewed Rodolfo Candia from the Royal Technical Institute (KTH) in Stockholm, who is responsible for the cooperation between SAREC and UDSM concerning PhD training in the field of ICT.

**Method of analysis**

In presenting the material in the thesis that I have (and the way that I have done it) – a form of analysis has taken place. My aim with choosing the material that I did was to present a summary of each document's most important parts in relation to the research questions and purpose of the chapter in question.

My analysis is in that sense constant - with emphasis on the last two chapters.

**A note on statistics**

Some statistics were hard to come by. Information on the state of ICT infrastructure in less developed countries was incomplete and figures may not be accurately representing the status quo. It is still hard to get a clear picture of how many people can and do access the internet for example, but one can nonetheless get a general idea of the trends.

Another issue I encountered was that the GDP or GNI per capita in each country varied significantly depending on what source I used, and I could not figure out why this was. That is, GDP per capita for Nicaragua and Tanzania in the UN statistics differed significantly from GDP per capita for Nicaragua and Tanzania in the SIDA statistics, and so on. It was not clear to me how they could have gotten such different results. Also, the GDP or GNI per capita in Nicaragua is higher than in Tanzania (which I expected), but the difference was more than I expected. This could be partly because income inequality in Nicaragua is higher.
than in Tanzania, or because the poor population in Tanzania is much larger in relation to the rich population than in Nicaragua. I am not sure. The point is that the interpretation of these figures is difficult. Lack of figures from informal economic activity also distorts GNI figures.

2.5 Analytical model

The function of a system of innovation could be for example to create new knowledge, human capital and labour markets, legitimize technology and firms, enhance networks, or to supply resources.

By making ‘poverty reduction’ the function of the national system of innovation in a developing country one can look at the components from a perspective that highlights how they each might affect poverty reduction.

How increased use of new ICTs at universities affects poverty reduction depends on the interactions with other components in the system. The achievement and sustainability of goals tied to cooperation between the universities and an organization like SIDA depends on support from government, a favourable national policy environment, a relatively stable economy and relevant infrastructure to name a few factors.

In the circle to the right I have identified some of the significant ‘components’ interacting in a national system of innovation with the function of poverty reduction.

According to this - how well the function is fulfilled depends on the emphasis that each actor puts on poverty reduction, and how much each actor cooperates with other components in the system.

My findings will be limited to those reflected in the policies and interviews related to the ICT projects, which represent only a small number of relevant actors in the systems of innovation in question.
3 Country Profiles

In this chapter I will present a short historical context for each country, and then use a table containing general socio-economic indicators to summarize and contrast what the statistics might indicate.

This is important partly because history and institutions are central in the Systems of Innovation framework, and also because it will make it easier to understand the development problems that each country faces at the present time.

3.1 A note on history - Nicaragua

Before the Spanish took control over large parts of Central America in the 16th century, indigenous Indians from what is now Mexico lived in the area. In 1821 Nicaragua gained its independence from Spain, but power struggles have been plenty since then, both internally and across borders. To limit the focus, however, I look at more recent transitions.

The past 15 years have been very dramatic for Nicaragua. The country has transitioned from four decades of dictatorship to a multi-party democracy via revolution, civil war, and plenty of economic turmoil and social misery.

The dictatorship, headed by the Somoza family, lasted from 1937 to 1979. Despite for example lack of accountability of government, the total lack of democratic political activities, and extremely unequal land ownership – per capita income was on a steady rise from the early 1960’s up until the mid-1970’s. However, general discontent over the governance system eventually lead to the loss of legitimacy and credibility of the Somoza family117.

The government’s response to the 1972 earthquake that killed over 10,000 people made this distrust grow significantly. Much of the international relief aid went into the pockets of the government118. This discontentment resulted in a civil war and revolution lead by Daniel Ortega and the Sandinista National Liberation Front (FSLN- Frente Sandinista de Liberación Nacional) in 1979119.

The FSLN consequently spent a decade trying to govern Nicaragua according to a state-run economy model - the state was to have ownership of the means of production and aim at replacing the market. The fact that Somoza’s government previously held in essence all land and means of production made this transition easier. Properties and banks became nationalized and government controlled foreign trade and access to credit120.

The economic situation was dire after the civil war – and the Sandinista regime could not recover this loss. Instead it got worse for various reasons. An armed resistance movement emerged (CONTRAS), covertly financed by the United States – requiring the government to spend significant resources on fighting it121. Furthermore, a U.S. embargo lead to a loss of traditional markets. The centralized planning system was under these circumstances not efficiently allocating resources – leading to for example destruction of incentives and a drop in production levels in all sectors except government. During this time there was a tremendous ‘brain drain’ that occurred as well122.

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121 History of Nicaragua, Think Quest Website, http://library.thinkquest.org/17749/mainhistory.html
Democratic elections were held in February 1990 and a 14-party opposition coalition defeated the Sandinistas. Though developments have been positive on many fronts since then - corruption, poverty and inequality remain large problems.

Economically and socially the Nicaraguan people have been in a state of intense fluctuation and transition for a long time. Nicaragua is the poorest country in Central America, and one of the world’s most indebted. It also has one of the highest income inequalities in the world.

3.2 A note on history - Tanzania

Similar to Nicaragua, Tanzania too has had a history of colonialism and authoritarian rule and recently transitioned to a multi-party democracy.

The Portuguese ruled the area that is now called Tanzania (until 1964 known as Tanganyika) from the 15th century, until the Arabs took control in the 18th century. Germany controlled parts of East Africa including Tanzania from the mid 19th century until after World War I – when the British took their place.

Independence from Great Britain was granted in 1961 – with radical socialist Julius Nyerere soon thereafter becoming president. The states of Tanganyika and the island of Zanzibar were merged in 1964 to create the United Republic of Tanzania.

Similar to the centralizing efforts undertaken by the Sandinistas in Nicaragua – Nyerere created reforms which (backed by the Chinese) nationalized the economy and rental properties. He introduced a tax system that aimed to redistribute wealth from the better-off to the poor. Tanzania entered in an economic alliance with Kenya and Uganda that lasted over ten years but which ended in a war due to political differences in the late 1970s.

Nyerere stepped down as president in 1985. His vice president, Ali Hassan Mwinyi, took his place, running an unopposed election. Not long after Mwinyi took office - plans were announced to study the benefits of instituting a multiparty democracy. In Oct. 1995 the country's first multiparty elections since independence took place, and were won by Benjamin William Mkapa.

Mkapa has made efforts to increase economic productivity while dealing with problems of pollution and deforestation. Problems with conflicts in bordering nations (specifically Rwanda) have also created difficult situations for both refugees seeking asylum and Tanzania who have had to receive them in large numbers.

There have been political and economic setbacks, and long-standing tribal frictions still exist. Tragedies like the bombing of the U.S. embassy in Dar es Salaam by terrorists in 1998 have been devastating. Despite general approval of a multi-party government - the breakdown of a single-party system has loosened old bonds that previously tied the nation together. There is concern among the people that conflicts can develop on account of religion or ethnic differences in addition to the potential differences between people on the mainland and people on the islands.

In October 2000, Mkapa was re-elected.

123 Tanzania history, Lonely Planet http://www.lonelyplanet.com/destinations/africa/tanzania/history.htm
127 Ibid.
3.3 Socio-economic indicators - comparison

Most of the following figures are from 2002 (and onwards), with the exception of a few that are from 2000 and 2001. The figures for this table have been gathered from the UNDP, the World Bank, SIDA, UNESCO and the IMF.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>NICARAGUA</th>
<th>TANZANIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>5.3 million</td>
<td>35.2 million</td>
</tr>
<tr>
<td>Area</td>
<td>130,000 km²</td>
<td>945,000 km²</td>
</tr>
<tr>
<td>Political system</td>
<td>Multi-party democracy</td>
<td>Multi-party democracy</td>
</tr>
<tr>
<td>Rural population</td>
<td>44%</td>
<td>76%</td>
</tr>
<tr>
<td>Life expectancy at birth</td>
<td>69 years</td>
<td>44 years</td>
</tr>
<tr>
<td>Total literacy rate (% of ages 15 and above)</td>
<td>76.7%</td>
<td>77.1%</td>
</tr>
<tr>
<td>Infant mortality rate (per 1000 live births)</td>
<td>32</td>
<td>104</td>
</tr>
<tr>
<td>Total primary completion rate (%age group)</td>
<td>74.7%</td>
<td>57.7%</td>
</tr>
<tr>
<td>Population living below US$2 a day (%)</td>
<td>79.9%</td>
<td>59.7%</td>
</tr>
<tr>
<td>% of population living with HIV/AIDS</td>
<td>0.2%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Human development index ranking</td>
<td>118</td>
<td>160</td>
</tr>
<tr>
<td>% of population under the age of 15</td>
<td>41.9%</td>
<td>45.6%</td>
</tr>
<tr>
<td>Major industries</td>
<td>Coffee, seafood, sugar, meat, bananas, food processing, chemicals, metal products, textiles, clothing, petroleum refining and distribution, beverages, footwear</td>
<td>Tobacco, sugar, sisal, diamond and gold mining, oil refining, cement, tourism</td>
</tr>
</tbody>
</table>

Table 3.1

An obvious difference here is that Nicaragua is much smaller when it comes to both area and population. Despite the difference in rural population percentage, both countries depend heavily on agriculture.

Life expectancy at birth being much lower in Tanzania partially has to do with the lack of appropriate healthcare (affecting the rural part of the population most). Access to health services is limited. According to World Bank figures for example – there is no data available on the number of births attended by skilled health staff, but infant mortality is a lot higher in Tanzania than in Nicaragua. HIV/AIDS is also a much larger problem in Tanzania. With 7.8% of the population living with AIDS it is a health crisis which also has begun to affect life expectancy significantly.

It is clear that Nicaragua has better social and economic indicators, with human development index ranking of 118 compared to Tanzania’s ranking of 160. Different sources state different figures, however, especially when it comes to GNI per capita (the figures above are from the World Bank). Tanzania is, by almost all statistics that I have looked at, economically poorer than Nicaragua - but there are some exceptions and contradictions. When looking at the percentage of the population living under $2 per day, Nicaragua’s poor seem to be economically significantly worse off. More people finish primary school in Nicaragua than in Tanzania, but the literacy rate is virtually the same in both countries. Later on, when I discuss readiness for
the networked world, we see that Tanzania generally gets a better ranking. This is interesting because of what it might indicate in terms of how ICT and poverty reduction might be linked in relation to other social and economic indicators.

The figures above indicate that even though the two countries have many development problems in common – they are facing different challenges on many levels.

### 4 SIDA Development Objectives

The following summaries of SIDA’s country development strategies in Tanzania and Nicaragua add more depth and meaning to the statistics presented in the country profiles. It is also important for understanding SIDA’s priorities and objectives in the SAREC ICT projects. Following the summaries I will briefly contrast the country strategies.

I will begin with a brief outline of the general objectives that guide the work of SIDA. I want to reiterate that my intention is to analyze the potential impact of the ICT projects on poverty reduction. To do this I want to understand the policies that exist as guidance for supporting these projects. Questions of the extent to which the policies are reflected in the projects will be further pursued in the conclusions chapter.

#### 4.1 Guiding objectives - SIDA

Under general framework and goals, SIDA states that its main objective for development cooperation is to assist in creating conditions that can enable poor people to improve their lives. Poverty is seen as context-specific, multi-dimensional and dynamic – hence any action taken against it must take these complexities into consideration.

In 2003 the Swedish government suggested that global development be viewed in the following perspective:

“Development is about giving people power over their own lives. This empowerment cannot be achieved without democracy and a society which gives its citizens the right to influence decisions about their own future. There must be a respect for human rights, equality between women and men, access to education, healthcare and, not the least, peace and security.

Because development is generated by people in their own societies, Sweden aims to help poorer countries implement their own processes. One way to do this is to ensure that what we do in one context agrees with our actions in other areas. Trade, agriculture, the environment and security are examples of policies which must all be put in the same direction and reinforce each other.

The goals of Swedish development cooperation:

- **Economic Growth.** To contribute to an increased production of goods and services
- **Economic and Social Equality.** To help reduce the gap between rich and poor and ensure the satisfaction of everyone’s basic needs
- **Economic and political independence.** To help countries to national self determination
- **Democratic development.** To contribute to people being able to exercise greater influence over development at the local, regional and national
- **Environmental care.** To contribute to the sustainable use of natural resources and protection of the environment

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129 Ibid. P12
• Gender equality. To promote equality between women and men\textsuperscript{130}

SIDA’s efforts are meant to assist in creating conditions for long term sustainable development. The intention and expectation according to the policies is that development assistance will in the long run not be needed\textsuperscript{131}. The development of knowledge is said to be the most important working method, across all operational programmes\textsuperscript{132}.

To assist in the creation of conditions for sustainable development, SIDA supports:

• Peace and stability as the most fundamental condition: Democracy, solution of conflicts, humanitarian assistance, reconstruction, mine clearance.
• Political conditions: Strong national and local democratic institutions, freedom of association, free mass media, cultural diversity and equality between the sexes.
• Institutional conditions: Efficient public administration, active civil society, fair and equitable legislation and a competent and independent legal system.
• Economic conditions: Macro-economic stability, manageable debt burden, efficient finance and credit systems. Markets with unambiguous rules.
• Physical conditions: Expansion, operation and maintenance of infrastructure. Water supply and urban development.
• Human conditions: Knowledge – from elementary school to research, public health including clean water and sanitation, human rights.
• Environmental conditions: Sustainable use of natural resources: land, air, water, biodiversity.\textsuperscript{133}

4.2 Summary of country strategy for development cooperation with Tanzania

The document I have looked at is the Country Strategy for Development Cooperation – Tanzania from the Swedish Ministry of Foreign Affairs which is effective from January 2001 to December 2005.

Poverty reduction is the general objective in the strategy. The document outlines recommendations, plans and directions for continued development cooperation. It summarizes the projects that Sweden is involved with, their timelines and the development goals they fill - as well as the future changes in focus of development cooperation with Tanzania.

The current situation in Tanzania

Despite improvements in both the political system and the economic climate – severe poverty remains a big problem in Tanzania; poor people need more opportunities to influence their own futures. More than half the population lives in poverty, and the most vulnerable groups according to this report are farmers that live where the natural conditions are poor, landless households, female-headed households, young people and people who live in urban areas and are dependent on informal sector activities. They are also the groups that are most affected by corruption of government officials, HIV/AIDS, the effects of environmental damage as well as un- and under-employment\textsuperscript{134}.

It is a problem that the government fails to implement consistently the international conventions that have been ratified (on for example the rights of the child). Conclusions about what life is like for poor people in Tanzania include that they have little or no financial, legal or social security. Whilst marginalized like this – their participation in processes that could improve their lives remains extremely limited. The

\textsuperscript{130} The Swedish International Development Agency “Sida Looks Forward – Sida’s programme for global development” Elanders Novum AB, 1997, Pp6-7
\textsuperscript{131} Ibid. P9
\textsuperscript{132} Ibid. P19
\textsuperscript{133} Ibid. Pp18-19
Macroeconomic improvements need to be translated into measures that empower the poor in order for poverty reduction efforts to work in the long-term\textsuperscript{135}.

Tanzania has as a goal to eliminate absolute poverty by 2025, and the government looks to the private sector to provide the high growth rates needed for this to be possible, specifically agriculture, mining and tourism. Some of the constraints for this growth include poor infrastructure and high cost of utility services, a weak legal and institutional framework, weak governance structure, a complicated tax system, corruption and inefficient bureaucracy\textsuperscript{136}.

Whilst structural changes have been and are taking place in government – there are problems with for example implementation of policies, administrative routines and management\textsuperscript{137}.

The report identifies hierarchical structures as a serious obstacle to solving those problems, structures which favour top-down decision making dominated by males - authoritarian structures which are enforced in the education system\textsuperscript{138}.

In a summary of threats to development the report lists the unstable political situation in Zanzibar, political conflicts close to Tanzania's borders, the spread of HIV/AIDS (with an estimated 1.5 to 3 million people infected at present), corruption standing in the way of effective mobilization of resources, and environmental degradation (problems with desertification, deforestation, urban settlements, and coastal and marine areas)\textsuperscript{139}.

Efforts to combat all of these threats are under way – but if Tanzania is to meet their vision of eliminating absolute poverty by 2025 – more needs to happen with the government reform programs. Two strategy papers exist to make this vision a reality: the Tanzania Assistance Strategy (TAS) and the Poverty Reduction Strategy Paper (PRSP). The first document establishes that poverty reduction is the main problem to address, and the second document outlines a medium-term plan for actions to be taken\textsuperscript{140}.

**Swedish development cooperation with Tanzania**

The main priority for Swedish development cooperation in Tanzania is in line with TAS and PRSP - to engage in efforts on the government level, the civil society level, and the private sector level that will reduce poverty. A consequence of reduced poverty is expected to eventually be less dependence on foreign assistance\textsuperscript{141}.

Cooperation will focus on three areas that are mutually reinforcing: pro-poor growth, human resource development and democratic development. The intention is to assist in consolidating the macroeconomic

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\textsuperscript{135} Ibid. Pp3-4
\textsuperscript{136} Ibid. Pp4-5
\textsuperscript{137} Ibid. P5
\textsuperscript{138} Ibid.
\textsuperscript{139} Ibid. P6
\textsuperscript{140} Ibid. P14
\textsuperscript{141} Ibid. Pp15-16
and structural reforms in order to strengthen the new institutions that will be conducive to poverty reduction and economic growth\textsuperscript{142}.

The report states that the situation for cooperation has improved significantly in recent years. Efforts have been made on the part of Tanzanian government to rationalize and coordinate previously disconnected donor programs and projects together with development cooperation partners to achieve better results\textsuperscript{143}.

Sweden supports a range of projects and investments that have relevance for poverty reduction. Some of the efforts that have or have had direct relevance include the land management program (LAMP), the health through sanitation and water project (HESAWA), energy, humanitarian support, education, and NGO support (focus on direct capacity building)\textsuperscript{144}.

With regards to policy and institutions – work that is relevant for poverty reduction in a more indirect way includes that with economic reforms (for example for better managing donor funds, accounting, debt, and revenue collection), policy dialogue, human rights and democracy, research (helping to create links between researchers, govt institutions and enterprises), culture and media, and institutional development within telecommunications\textsuperscript{145}.

The report states that the focus of development cooperation will be intensified by increasing synergy effects between district level programs, by further engaging in cooperation with other like-minded donors on various levels, by strengthening links between components significant of democratic governance of sector-based programs (education, land management, public administration and public financial management), and by making efforts to create synergetic links between agriculture, rural infrastructure and private sector development\textsuperscript{146}.

\textbf{4.3 Summary of country strategy for development cooperation with Nicaragua}

The document reviewed is \textit{Country program for Swedish Support 2003-2005–Nicaragua} from SIDA. The report is in line with the Swedish regional strategy for development cooperation with Central America for the period 2001-2005. It has been developed by the Swedish Embassy together with representatives of Swedish NGOs and other donors in Nicaragua. The report discusses the current situation in Nicaragua as well as ongoing and potential future projects.

Poverty reduction is the overall objective, and of particular relevance to the region are efforts to promote economic and social equality.

\textbf{The current situation in Nicaragua}

The political situation in the country has been, and remains, unstable. The current government, however, has made significant improvements to the political system in many areas. The future looks more positive than it did with the last president’s government – during which time growth and development was heavily impeded due to corruption and political conflict.

The new government has as its economic priority to create better conditions for growth by fighting corruption, increasing competitiveness, attempting judicial system reforms and working with IMF and the World Bank. They have made significant progress in the fight against corruption – something which makes increased donor support to government institutions more relevant\textsuperscript{147}.

\textsuperscript{142} Ibid.
\textsuperscript{143} Ibid. P8
\textsuperscript{144} Ibid. P9
\textsuperscript{145} Ibid. Pp9-11
\textsuperscript{146} Ibid. P18
Another positive development is that the government wants to increase the coordination of donor efforts. This is important given the country's high dependence on foreign aid (and many different donors), assistance which amounts to 34% of Central Government Expenditure and 14% of GDP. Such coordination could enable a more efficient use of resources as well as make increased donor support more likely\footnote{148 I. P4}.

At the end of 2002 the government made an agreement with IMF which provided some foundations for macroeconomic stability and conditions for renewed economic growth as well as paving way for reductions in Nicaragua's external debt. The report states that it is uncertain whether the poor will benefit from this agreement in the short term, but that their situation would probably worsen without it. Sweden has given considerable budget support for the economic reforms suggested in the agreement because Nicaragua has a good poverty reduction strategy, and the reforms will be conducive to reduction in economic inequality and poverty\footnote{149 Ibid. Pp3&10}.

SIDA analyses poverty from three perspectives; as lacking resources, lacking power and lacking security. These three perspectives overlap but provide helpful boundaries.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Fig42.png}
\caption{Lacking resources}
\end{figure}

\textbf{Lacking resources}

When compared to other countries in the region Nicaragua has a lower per capita income, but nonetheless has similar levels of social indicators (like education and health). The government, however, spends less on education and health on average than the rest of Latin America\footnote{150 Ibid. P5}.

Despite some improvements, income inequality in Nicaragua is among of the highest in the world. This is a common problem in Latin America, and according to the report such unequal distribution limits economic growth. In addition to this, the poor often do not feel the benefits when there is economic growth in this situation. Statistics on poverty reflect an improvement in living conditions in the last ten years along with GDP growth, but given a high population growth – the total number of poor have increased\footnote{151 Ibid. Pp4-5}. So even though people are not as poor, there are more people living in poverty.

Some positive conditions for growth for the poor have recently been reduced by for instance international market changes affecting the price of coffee and by economic mismanagement on the part of the previous government. The focus of investments is mainly the capital of Managua, yet two thirds of the poor people in Nicaragua live in rural areas. Urban-focused development marginalizes the already disadvantaged rural population. Added to this, the fact that the government needs significant funds to service internal debts means that fewer funds are available for much needed public investments such as rural infrastructure\footnote{152 Ibid. P5}.

Other resources that this report identifies as key in creating better conditions for growth are a well-developed port and a better telecommunications system. The price of energy is seen as too high, and corrupt practices are a barrier in trade and production – removing incentives\footnote{153 Ibid.}.
Lacking power

Low income often reduces the amount of options one has and so affects the amount of power a person can have. If institutions do not exist to allow people’s needs to get fairly voiced, then most people in the system have had/have incentives to engage in corrupt behaviour to either maintain or change their situations. The institutions that exist to handle conflict and bring justice to people have been weak; the judicial system favours the rich. The current government has made judicial sector reform a priority\textsuperscript{154}.

The centralized structure of government restricts process by which civil society can be voiced. Rarely do ‘general consultations’ directly involve the poor, the structure is top-down and hierarchical. This, combined with a culture of male dominance, marginalizes women. The government has not highly prioritized gender equality. Children’s rights are under-emphasized in government as well as society in general. The fact that children are the majority of the population also adds to the very serious need for change. Other groups with less power are the population on Nicaragua’s East coast, and people that are handicapped. The report identifies a clear correlation between gender inequality, male dominance, drinking habits, domestic violence, lack of power and access to resources\textsuperscript{155}.

Lacking security

Physical security is threatened not only because of lack of resources, but because of the high potential for natural disasters in Nicaragua. These risks include volcanic eruptions, earthquakes, forest fires, drought and tropical storms. The effects of such disasters are made much worse by for example inappropriate building norms and low enforcement of planning and risk-assessments\textsuperscript{156}.

The report identifies that sustainable use of resources is partly dependent on land ownership. Without the kind of minimal guarantees that land ownership can offer, poor people are more likely to deplete natural resources unsustainably just to survive. More information regarding sustainable farming would also improve conditions. Knowledge about sanitation techniques and access to clean water is also a problem for the poor\textsuperscript{157}.

The history of conflicts that Nicaragua has had have always affected the poor the most, and though the civil war is over – the risk for violence still exists as a type of reaction to the high income inequality for example. As a positive development the report mentions that the national army and police have slowly become more focused on protecting general human rights and ensuring security, suggesting a potential reduction in the risks that poor people have. Nicaragua spends less on police and army than surrounding countries such as Honduras and Guatemala – yet is a much safer place\textsuperscript{158}.

Poverty reduction strategy

Nicaragua has a poverty reduction strategy but lacks parliament support and funds to fully implement it. There is high internal debt and a large government budget deficit – a situation which could be improved with a better tax system. Getting tax measures approved by parliament is currently a difficult process\textsuperscript{159}. The poverty reduction strategy spans five years (2001-2005) and focuses on rural economic growth, human capital investment, a social safety net for the poorest and improved governance. Themes that encompass the strategy are ecological vulnerability, social inequality and decentralization. Each of the objectives has indicators that are to be followed up in order to measure progress towards established targets. Examples of targets are: reducing extreme poverty by 17.5%, increasing net enrolment in primary education by 11.2%.

\textsuperscript{154} Ibid.
\textsuperscript{155} Ibid. Pp6-7
\textsuperscript{156} Ibid. P6
\textsuperscript{157} Ibid. P7
\textsuperscript{158} Ibid.
\textsuperscript{159} Ibid. P4
and adopting and implementing a national plan for sustainable development\textsuperscript{160}. Given negative developments in the economy during 2001 and 2002 – the targets will probably have to be re-evaluated.

**Swedish development cooperation with Nicaragua**

The corruption and mismanagement problems in the previous government lead to a move away from cooperation with government institutions, but according to the report - the focus of Swedish cooperation has never rested heavily on government before either – so the change in strategy was not drastic. Most of the support goes to projects that are geared to poverty reducing efforts, decentralization, democracy, justice, good governance, respect for human rights, and to independent institutions such as the police\textsuperscript{161}.

Some of the projects SIDA is involved with: supporting decentralizing reforms in the health sector, supporting regional and local institutions on the Atlantic Coast, support in and for reforms in funds for smaller infrastructure works (via FISE), the production programme for small and medium farmers (via FONDEAGRO) and support to local infrastructure (via PRODEL). SIDA also provides support to Swedish NGO’s like Forum Syd in their work with gender equality. Election observation is another form of support\textsuperscript{162}.

The report states that current government provides a good basis for further development cooperation with Nicaragua, despite the recent setbacks. Areas to increase support towards include gender inequality, children’s rights, communication aspects and environmental sustainability. The success of the ongoing projects and continued support depend on political and institutional stability as well as a good policy environment. Natural disasters obviously change conditions as well\textsuperscript{163}.

**4.4 Comparison and analysis**

Nicaragua and Tanzania both have a large percent of their population living in poverty that are disconnected from many of the processes that influence the direction their lives can take. The initiatives of SIDA in these countries are guided by the assumption that reducing the amount of people in poverty (through various strategies) will enable individuals and groups to achieve a better quality of life as well as contribute more to economic development.

Poverty in general is seen as the overriding obstacle to development in both countries. ‘Poverty’ is a very general term for something which by its definition affects the majority of people on earth – so it does not say very much. The context of each country is obviously unique, and there are complex problems of varying size that require different solutions depending on this context. Despite this – there are several problems of similar kind. Both governments lack funds for provision of basic services because of the need for internal and external debt-servicing for example. The two countries have many similar ‘threats’ to development (as defined by SIDA) in common. I will highlight some of the similarities and differences to illustrate this.

The Nicaragua strategy places economic and social equality in focus, because it has among the highest income inequality in the world. In Tanzania the inequality is not as extreme, but HIV/AIDS is a big problem – affecting up to ten percent of the population (now significantly lowering the life expectancy rate). It is nowhere near as bad as in some other African countries (Botswana and Zimbabwe for example) where over 30% of the adult population lives with HIV/AIDS, but it has been increasing. In contrast, only 0.2% of the Nicaraguan population lives with HIV/AIDS\textsuperscript{164}.

\textsuperscript{160} Ibid. P7
\textsuperscript{161} Ibid. P8
\textsuperscript{162} Ibid. P9
\textsuperscript{163} Ibid. Pp10-11
\textsuperscript{164} The United Nations Educational, Scientific and Cultural Organization Website, Nicaragua statistics, www.unesco.org
The majority of the poor population in both countries live in rural areas. Both the urban and the rural poor are marginalized, but their situations can of course vary depending on their location in terms of access to health care, infrastructure of different kinds, education and land for example. Regardless of this, the country strategies indicate that both rural and urban poor are disadvantaged financially, socially and legally because they have fewer resources and fewer opportunities to access relevant information to change their situation.

Both countries have committed to poverty reduction strategies that outline goals as well as concrete measures for achieving them, indicating government commitment to the idea that poverty reduction measures are good for the economy as well as for the individual poor. In both country strategies, however, there are expressions of doubt voiced concerning the interest of government. PRSPs have in practice replaced Structural Adjustment Programmes as the basis for getting access to lending and aid grants from international donors. A report by Diana Sanchez and Katherine Cash (“Reducing Poverty or Repeating Mistakes”) criticizes PRSPs. ‘National ownership’ is one of the fundamental elements of PRSPs, and for the PRSPs to be nationally owned they need to be developed with “broad based participation from civil society.”

My thoughts regarding the poverty reduction strategies are that the benefits for already established businesses in the private sector will be higher than for the poor in the short run – something which might compromise the potentially positive long term effects of other poverty reducing efforts (in for example education). Despite still being sceptical about the effects of the PRSPs (in relation to the goals stipulated) I think they are an action which in addition to putting poverty even more firmly in the political spotlight also carries significant positive symbolic value.

The SIDA strategy for Nicaragua does not put so much emphasis on assistance to the primary or secondary education system because there are other donors that focus specifically on this. SIDA chooses to focus on tertiary education in this instance, working together with universities on various system reforms (including the improvement of use of new ICTs). In Tanzania SIDA has been, and is, more directly involved with education overall - and specifically with improving primary level education by cooperating with the responsible ministries. There is also cooperation on the tertiary level, where there is a strong ICT component.

In both strategies there are references to creating further synergies with other like-minded donor programs in the countries, in order to make better use of the resources available. There is also a willingness on the part of both governments to coordinate donor programs in order to make foreign aid and development cooperation more efficient.

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167 Ibid.
Both strategies include support to NGOs in the work to spread knowledge about human rights, gender issues and democratic culture.

Some of the constraints for private sector growth identified by the reports (for both countries) include poor infrastructure, high cost of utility services, a weak legal and institutional framework, weak governance structure, a complicated tax system, corruption and inefficient bureaucracy. Complex and/or weak institutions (for example tax or legal systems) create disincentives for compliance, creating a favourable environment for corruption\textsuperscript{170}. Without enough resources to invest in compliance measures – corruption is harder to counteract. Anti-corruption measures have been taken in both countries and are a priority in both strategies.

Lack of access to information, new democratic institutions with hierarchical and centralized organization, a complex tax system and a biased justice system are some of the things that make it hard for poor people in both Tanzania and Nicaragua. Using environmental resources sustainably is also a challenge both countries face. Both strategies place great importance on the growth of the private sector\textsuperscript{171} as well as the support to institutions and processes that promote democratic participation.

5 ICT - SIDA Strategy and Country Reports

In the previous chapters I have painted a picture of the current situations in Tanzania and Nicaragua. This chapter will show what the ICT situation is like in each country. This will help in understanding the contexts in which the SIDA/SAREC projects operate.

To begin with I will outline the basic aims and objectives stated in the IT strategy that SIDA has developed. This is followed by brief ICT report summaries, ICT statistics and comparison and analysis.

5.1 SIDA’s IT strategy

SIDA recently created a new secretariat dedicated to information technology\textsuperscript{172}. This reflects an increasing emphasis on the importance of ICT in development cooperation. The vision in their IT strategy states that SIDA supports a rapid integration of IT in partner countries in order to increase communication and knowledge exchange within the countries as well as globally\textsuperscript{173}.

ICT is defined by SIDA in this strategy as mainly referring to networked computers; as the method and technology for communication between individuals and organisations with the help of computer systems. This is also what I mean with ‘new ICTs.’ Furthermore, the IT strategy maintains that ICT can be seen from two perspectives – that of technology and that of application. Given the fact that technology develops so quickly there is often focus on the technological aspects, but SIDA’s main interest is with forms of application that contribute towards the objectives of development cooperation\textsuperscript{174}.

The way that SIDA enacts this strategy is mainly through research cooperation (managed by SAREC) and focuses mainly on establishing connectivity at cooperation partner institutions. More details about this follow in the next chapter.

\textsuperscript{170} SIDA, "Country Strategy for Development Cooperation –Tanzania,“ 2000, P19
\textsuperscript{171} Ibid. P22
\textsuperscript{172} SIDA Website, “Sidas ICT sekretariat jobbar för IT inom alla områden” http://www.sida.se/Sida/jsp/polopoly.jsp?d=444&a=16100
\textsuperscript{173} SIDA, "Strategy for IT in Development Cooperation“ ("Strategi för IT I biståndet"), 1999, P7
\textsuperscript{174} Ibid. P5
There is, again, mention of the debate over whether the increase of ICTs in developing countries can actually reduce the information gap and improve conditions for the poor or whether it will continue to increase inequality by creating more gaps both nationally and internationally. The challenge is then consciously foster forms of application that benefit and empower the poor in order to counteract further inequality\textsuperscript{175}. A sustainable and more economically viable type of access to connectivity in many developing countries at this stage is access on a collective level. The IT strategy compares this to transportation, where establishing a public transportation system to begin with is a more useful, sustainable and economically viable option than trying to establish a situation where everybody can own a car\textsuperscript{176}.

The strategy maintains that widespread economic benefits from new ICTs in developing countries are likely to come in the medium to long term rather than the short term. It is generally known that new ICTs increase globalisation (with both positive and negative effects).

SIDA divides up the issue of connectivity into three development perspectives. On the macro-level is the availability of the larger physical infrastructure (like a well developed telecommunications net) and for this to exist the political, economic and legal environment have to be relatively stable (the prerequisites for ICT development). On the meso-level comes connectivity for government, institutions and business, in addition to access to computers, internal networks, adequate software systems and technical maintenance. Last but not least - the micro-level, which refers to individual access possibilities. Most of the efforts by SIDA are geared towards the meso- and micro-levels at this stage\textsuperscript{177}.

5.2 ICT in Tanzania

The source of the information in this summary of findings is a report by Miller Esselaar and Associates, commissioned by SIDA – “A Country ICT Survey for Tanzania” from 2001\textsuperscript{178}.

- The use of ICT in Tanzania is increasing relatively quickly when compared to other countries in the region. One reason for this might be that the government has made considerable effort to liberalise economic policy in recent years.
- The regulatory structure pertaining to telecommunications services is complex and is lacking in the area of enforcement.
- Among factors that may hamper the ‘ICT industry’ are that it is difficult to import goods and to obtain finance and credit. There is some evidence to the contrary, however, as a large number of internet cafés have started up in recent years, and must have gotten past these obstacles.
- The existence of affordable access at internet cafés has increased number of users significantly recently, but very few individual internet connections exist.
- There is low awareness of how ICT could improve productivity in government.
- The ICT infrastructure has improved network speed and quality but statistics remain unreliable.
- Hardware and software of all kinds are imported, resulting in near impossible prices for individuals and very expensive for businesses.
- Relatively little relevant local content exists. There are many websites – but they contain mainly advertising and are in English.
- A sufficient quantity of ICT engineers/technicians exist that have suitable skills, but expertise and experience required for more advanced ICT tasks is lacking.

\textsuperscript{175} Ibid. P6&8
\textsuperscript{176} Ibid. P16
\textsuperscript{177} Ibid. P17
• The public sector (government, parastatals, and universities for example) is the major user of ICT.
• Lack of coordination of ICT-related efforts is a problem. With a national overarching policy – efforts would be more coordinated and efficient than at present (this type of policy now exists).

5.3 ICT in Nicaragua

The source of the information in this summary of findings is a report by 7Cs WorldBridge AB, commissioned by SIDA – “Information and Communication Technology in Nicaragua”179 from 2002 as well as the Global Information Technology report 2001 – 2002180.

• Almost all government entities use ICTs extensively, and the government is aware of the potential benefits that ICT could have on development in general. Most of the ICT initiatives, however, are funded by international development agencies.
• The National Commission for Science and Technology (CONICYT) is responsible for developing policies and strategies related to ICT but it is a slow process. No national standards or guidelines exist for hardware and software. Policies related to data security and integrity are yet to be developed. With a national overarching policy – efforts would be more coordinated and efficient than at present.
• The available telecommunications infrastructure is insufficient to satisfy demand. Internet Service Providers often oversell the bandwidth in order to keep the costs at an acceptable level, which results in much slower transmission speeds and unreliable, overcrowded connections.
• Plans for increased telecommunications infrastructure are limited to existing networks and to expand only into areas that are densely populated. Rural areas remain under-serviced, though telecom operators could relatively easily spread coverage by tapping into the construction of new electrical power supply networks which include installation of fibre optic cables.
• ENITEL (The National Telecommunication Company) monopolizes fixed-line telephony until 2005, but there is free competition in the markets for mobile cellular telephone, data transmission and Internet Services.
• Given the monopoly that ENITEL has – it is difficult for other operators to combine telecom services (like fixed line telephony and internet access), which has reduced incentives to extend network infrastructure.
• In addition to the fact that very few people can afford their own telephone, access to telephone lines is to a large degree limited to densely populated areas (the Pacific Rim and nearby regions).
• Internet cafés have been growing in numbers, improving access to internet in cities. Projects for the installation of telecentres are several, but the efforts are fragmented – coordination would enable more efficient use of resources. The telecenters generally need to be more economically viable in order to survive.
• Direct benefit from access to ICT is still limited, given the fact that more than 50% of the population is functionally illiterate – but with the use of intermediaries (information workers, teachers, lawyers, rural community radio stations) the access to information can benefit more people.
• The existing Nicaraguan online content is limited and mostly of use to government.
• A sufficient quantity of ICT engineers/technicians graduate from universities and technical training centres – but almost no qualified ICT technicians exist in rural areas. Expertise and experience required for more advanced ICT tasks is lacking all around.

5.4 ICT statistics
The following figures come from The World Bank and the International Telecommunication Union.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>NICARAGUA</th>
<th>TANZANIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>National ICT Policy</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Main telephone lines per 100 inhabitants (2003)</td>
<td>3.2</td>
<td>0.42</td>
</tr>
<tr>
<td>Cellular phone subscribers per 100 inhabitants (2003)</td>
<td>3.78</td>
<td>2.52</td>
</tr>
<tr>
<td>Internet hosts per 10,000 inhabitants (2003)</td>
<td>12.84</td>
<td>1.57</td>
</tr>
<tr>
<td>Personal computers per 1000 inhabitants (2003)</td>
<td>27.9</td>
<td>4.2</td>
</tr>
<tr>
<td>Percent of PCs connected to the internet (2001)</td>
<td>2.62%</td>
<td>N/A</td>
</tr>
<tr>
<td>Internet users per 10,000 inhabitants (2003)</td>
<td>167.6</td>
<td>70.8</td>
</tr>
<tr>
<td>Radios per 1000 people (2001)</td>
<td>270</td>
<td>406</td>
</tr>
<tr>
<td>Television sets per 1000 people (2001)</td>
<td>69</td>
<td>42</td>
</tr>
<tr>
<td>Daily newspapers per 1000 people (2001)</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td>The Networked Readiness Index (NRI) (2001)</td>
<td>2.56 (rank 94/102)</td>
<td>3.09 (rank 71/102)</td>
</tr>
<tr>
<td>Digital Access Index (DAI)</td>
<td>0.19</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Table 5.1

5.5 Comparison and analysis
Both reports indicate that the telecommunications regulation structure is in some way hindering the development of ICT-related services. Hardware and software are mostly imported, and hence very expensive for businesses – and even more so for individuals.

The statistics indicate that the ICT infrastructure seems to be better in Tanzania in terms of network speed, but Nicaragua has many more internet hosts per capita. There are also considerably more of the other ICTs per capita in Nicaragua than in Tanzania – for example PCs and TVs. When it comes to radios and cellular phones, however, the numbers are closer.

The number of internet cafés has increased in both countries, increasing the number of internet users – though unfortunately the user statistics are unreliable at this stage. Lack of relevant online content is a problem in both countries.

Both Tanzania and Nicaragua ‘produce’ a sufficient number of ICT engineer/technician graduates – but both countries lack graduates with sufficient expertise and management skills.

The Digital Access Index
The Digital Access Index (DAI) measures the overall ability of individuals in a country to access and use Information and Communication Technology. It consists of eight variables organized into five categories.
Countries are classified into one of four digital access categories: high, upper, medium and low – on a scale ranging from 0-1, with the lowest index currently being held by Niger (0.04) and the highest index currently belonging to Sweden (with 0.85). Tanzania and Nicaragua both come under the ‘low’ digital access category. According to this index – Tanzania is slightly worse off in terms of overall ability of individuals in a country to access and use ICTs when compared to Nicaragua.

The networked readiness index

This index is composed of measurements of network use and enabling factors. Network use is derived from variables related to the quantity and quality of ICT use, and enabling factors come from (among other things) measurements of access, hardware and software, policies, economic environment, social capital, and general infrastructure.

A contradiction?

Alexander G. Flor, in his paper “ICT and Poverty – The Indisputable Link”, identifies a link between the value of ICT indicators and the poverty index: “The higher the human poverty index, the lower the number of ISPS, telephone lines, PCs and TV sets per 1000 persons. The human development index of Tanzania is lower than that of Nicaragua, as are the number of ISPs, telephone lines, PCs and TV sets per 1000 persons – yet in terms of Networked Readiness - Tanzania is better ranked than Nicaragua.

This might to a certain extent reflect the differences in the policy environment. Tanzania has a more extensive ICT policy, and it has been in existence for longer than the one that Nicaragua has now. This difference of course also depends on the way the indexes are measured – and though I cannot go further into it here - it is an interesting topic to explore further because of the implications that it might have on the potential relationships between socio-economic indicators.

6 SIDA/SAREC and universities

Having presented parts of the national social, economic and political situations of Tanzania and Nicaragua - the focus in this chapter narrows in on the university ICT projects. By having read chapters three to five one should find it easier to understand the context in which the SIDA/SAREC ICT projects sit.

6.1 What is SAREC?

The Department for Research Cooperation (SAREC) is a sector department of SIDA dedicated to supplying support to partner country research. It also supports research that is important for the development of the partner countries. Support is given to research councils, universities and research institutions, including for regional research networks and for international research programmes in order to create better research environments (including in the area of ICT infrastructure) and strengthen research capacity in a number of ways. The research supported falls under one or more of the prioritized themes: sustainable use of resources, health, technology or the political, economic and social dimensions of development\textsuperscript{184}.

SAREC maintains that it is important to support the building up of solid research environments in developing countries because in addition to improving local knowledge production - it can improve access to, and use of, internationally available knowledge. According to SAREC – the goal with this cooperation is a situation where the universities have gained credibility for sustainably managing all the aspects that go into research activity\textsuperscript{185}.

Various methods for providing research support exist, from direct funding to universities, to support for joint research projects, to methods focused on research training like the most used in SAREC - the so-called sandwich model. In contrast with traditional scholarships - researchers (doctoral students) in a sandwich model program are active at their home institutions but spend short periods of time abroad doing research at a partner institution. This is combined with support for research facilities. Ownership of the research project is with the home institution (to avoid excessive direction by the partner institution), and the students have supervisors from both institutions\textsuperscript{186}.

6.2 SAREC and the public universities of Nicaragua

The public universities in Nicaragua have a longstanding research cooperation relationship with SAREC (since 1981). The objective with this cooperation is to contribute to the modernisation of higher education institutions through strengthening research as well as research infrastructure.

Areas that have been (and continue to be) supported are: agriculture, health, engineering and environmental sciences. The following universities are the institutions supported: National University of Agriculture (UNA), National Autonomous University of Nicaragua (UNAN León), National Autonomous University of Nicaragua (UNAN Managua), and National University of Engineering (UNI). Partner institutions in Sweden are: Lund University (LU), Royal Institute of Technology (KTH), Swedish University of Agricultural Sciences (SLU), Karolinska Institute (KI), Umeå University (UMU), Swedish Institute for Infectious Disease Control (SMI) and Huddinge University Hospital (HS)\textsuperscript{187}.

According to an evaluation of SAREC’s research cooperation with Nicaragua, outcomes from the last 20 years have been successful when measured against goals stipulated\textsuperscript{188}. Outcomes from cooperation between the four public universities and SAREC include (as of 2002):

- 3 (plus 9 predicted for the end of 2003) doctors, 32 masters and 9 licentiate theses were produced
- Faculty members involved have trained a significant number of undergraduate students in research
- Research laboratories have been built and equipped at all four universities

\textsuperscript{184} SIDA, Department for Research Cooperation, SAREC, “Research Co-operation – I. An Outline of Policy, Programmes and Practice,” 2000, P15
\textsuperscript{185} SAREC Website, “About the Department for Research Cooperation” http://www.sida.se/Sida.jsp?d=2322&a=19667
\textsuperscript{186} SIDA, Department for Research Cooperation, SAREC, “Research Co-operation – I. An Outline of Policy, Programmes and Practice,” 2000, P29
\textsuperscript{187} SIDA fact sheet, Research Co-operation Nicaragua- Sweden, http://www.sida.se/content/1/c6/02/34/55/nicaragua.pdf, P2
The establishment of research councils
Capacity building of Swedish counterparts: more than 20 masters Swedish masters students did dissertations (1994-2001)
Access to computer facilities is better and libraries have been improved - as has research management\(^\text{189}\).

Although the research cooperation with Nicaragua is extensive (including split PhD programs related to ICT), I will be focusing on an inter-university project that deals with ICT - the “Proyecto TIC Nicaragua” (Nicaragua ICT project).

The Nicaragua ICT project
In 1999/2000 SAREC and the cooperation partners (the four public universities mentioned in the previous section) set out to explore the possibilities for a project aimed at improving the ICT infrastructure, ICT capacity and supplying full internet connectivity at all four universities. Universities are seen as change agents and improvements to the ICT infrastructure are oriented towards stimulating free democratic information flows\(^\text{190}\).

A survey was conducted by Delft University of Technology (DUT, the Netherlands) in 2000 to scan the current ICT situation at the four public universities in Nicaragua in order to be able to establish priorities for the SAREC ICT project. The collection of data was to reflect both technical and human infrastructure at faculties and departments of each university.

The DUT/SIDA survey
Through a questionnaire developed by DUT (together with SIDA) the following information was extracted: institutional data, strategic management/identification of priority areas, and inventory of existing ICT infrastructure - technical and human. Depending on the area in question, top management or administrative staff answered. The DUT consultants also held workshops at the beginning and end of the survey discussing goals, objectives, methods and results. Visits were also made to the four public universities in Nicaragua\(^\text{191}\).

The survey found that the importance of ICT was recognized on all levels of the universities organisation, including top management, lecturers, researchers and administration. Of particular importance was access to the internet for the students, but also the further integration of ICT in academic and professional programs. Setting up advanced management information systems was seen as important for improving institutional performance in administration and management.

Significant efforts to set up networking facilities, e-mail, and internet services had been made at every university, but due to financial limitations development was restricted and both student- and staff/PC ratio remained very low.

Some obstacles were identified. Expertise, ownership and control mechanisms in the area of ICT were very decentralized and scattered, implying that changes would also alter current management and control structures. The complex character of internal organisation in general at the universities was seen as potentially complicating the implementation of organisation-wide management information system. In addition to this, managerial expertise was found lacking, and there was uncertainty and lack of confidence

\(^\text{189}\) Ibid. Pp30-32
\(^\text{190}\) The Nicaragua ICT project Website, http://www.tic-nicaragua.edu.ni/index_eng.htm (TIC-Nicaragua)
in the possibility of successfully implementing major innovations like this (organizationally and financially)\textsuperscript{192}.

Another obstacle at the time was that commercial internet service providers were responsible for providing access to internet, and capacities were congested, making connection unreliable at best. This implied that the universities would not gain from upgrading link capacities to the local ISP\textsuperscript{193}.

Based on the results from this survey, recommendations were made to SIDA/SAREC. Recognizing the relatively equal stages of development of the universities and their strong commitment – it was advised that all universities were to be considered equally for receiving assistance. Priority areas recommended addressing the need to establish more adequate coordination mechanisms for controlling isolated ICT initiatives and the need to investigate more adequate solutions for providing high capacity bandwidth\textsuperscript{194}.

DUT consultants proposed that two projects be enacted – one on information policy development for each university, and one on finding alternative data communication and connectivity between campuses as well as high capacity internet access to and between universities. The policies would provide guidance in the work with ICT and information resources development as well as serving as an instrument to attracting financial support for its implementation. After completion of this first phase, a base would be established for further efforts with focus on infrastructure, training and information systems\textsuperscript{195}.

SAREC committed funds for the projects in the preparatory phase and assigned Lund University in Sweden to be the partner university in this project.

**Putting the recommendations to work**

The universities cooperate on this project with each other and with SAREC through representatives in an inter-university committee.

The universities created a joint vision:

“To involve the public universities in a wide, reliable and stable information and communications network to be used for global communications purposes as well as the improvement of communications and exchange of information and knowledge between local and international institutions.”\textsuperscript{196}

Expected results from phase one (2000-2001) activities were: “

- an updated ICT diagnosis of each university
- ICT project policies for each university
- ICT master plans for implementing ICT policies at each university
- a preliminary plan for common internet communications node
- a complete project proposal for ASDI/SAREC for the period 2002-2004\textsuperscript{197}”

Together with the Lund University committee, the Nicaraguan inter-university committee produced these documents, which were used by SAREC to explore and evaluate further potential projects to support and fund\textsuperscript{198}.

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\textsuperscript{192} Ibid.
\textsuperscript{193} Ibid.
\textsuperscript{194} Ibid.
\textsuperscript{195} Ibid.
\textsuperscript{196} The Nicaragua ICT project Website, Introduction, \url{http://www.tic-nicaragua.edu.ni/ictproject.htm}
\textsuperscript{197} Ibid.
\textsuperscript{198} Ibid.
Phase two

Since then phase two activities have started, with three subprojects: ICT infrastructure, ICT training and human resource development and university information systems (UIS). The objectives have grown more specific at this stage, and are now:

- To improve the ICT infrastructure and internet connectivity service, in order to attain for each and all universities viable communication and an ecologically sound, reliable and high capacity network which may be used in data transmission, internet, navigation of the universities databases and voice-over IP.
- To improve the ICT human resource capacity (training and formal studies on ICT in Nicaragua)
- To improve the information systems (library, academic and administrative management)\(^{199}\)

Under the subproject of infrastructure the goal is to provide each university with a local LAN and backbone infrastructure. The training subproject aims at providing continuous qualification in the use of ICTs in order to improve teaching, learning and administration through a combination of courses abroad and nationally. In the UIS subproject the goal is to evaluate new technologies, products and standards that could lower the universities costs as well as improve productivity. Another project is to develop relevant local content, including to incorporate for example new teaching and learning techniques, electronic publication and distance education\(^{200}\).

Each subproject at each university has project coordinators, and activities are under way\(^{201}\).

6.3 SAREC and the universities in Tanzania

As with Nicaragua, SAREC has a relatively long history with Tanzania – starting in 1976. At this time the cooperation is directed at strengthening the research environment (including research training and development of information and communication technology and libraries) at University of Dar es Salaam (UDSM) and the Muhimbili College of Health Sciences (MUCHS). In the period of 1998 to 2003 – money donated by SAREC totalled USD 27.9 million\(^{202}\).

Funds are used for activities that promote research, reform and management programmes as well as research collaboration that involve universities in Sweden\(^{203}\). Partner institutions in Sweden are: Karolinska Institute (KI), Royal Institute of Technology (KTH), Swedish Institute for Infectious Disease Control, Swedish Environmental Research Group, Stockholm University (SU), Umeå University (UMU), and Uppsala University (UU).

Here too, the cooperation covers many areas of research like HIV/AIDS (being the largest research programme), science and technology, the sustainable use of marine resources, engineering and management. According to a self assessment by SAREC, the cooperation has contributed “to produce research results of relevance to Tanzania” with the examples of “electric power distribution, environmental consequences of gold mining and farming; coastal management, entrepreneurship, HIV/AIDS and reproductive health.”\(^{204}\)

\(^{199}\) Plazaola, L., “ICT Development for the Public universities of Nicaragua, Annual Progress Report” (April 2004), P2
\(^{200}\) Ibid. P3
\(^{201}\) Ibid. Pp8-9
The focus in this case is on the cooperation which has to do with ICT, and the project in question is a sandwich PhD programme at UDSM in collaboration with the Royal Institute of Technology (KTH) and Stockholm University (SU).

The collaboration between UDSM, KTH, SU and SAREC

The software development unit at the Department of Computer and Systems Sciences (DSV) is a joint institution of KTH and SU, and is responsible for a coordinating and administering a ‘split’ PhD program (sandwich model) with UDSM. DSV is responsible for a programme dedicated to the promotion of ICTs in the context of international development. Within this programme there are projects with six developing countries, all of which are partially or entirely funded by SIDA and the European Union.

Activities, scope and methods of implementation vary from project to project, but aspects of ICT development that are in focus are: technical infrastructure, ICT policies and organization development and human resource development. The general objectives of the projects are: “

- To enhance information technology at the partner universities
- To provide a reliable and economical connection to the internet at partner universities, thus facilitating the access to information and networking necessary for the research community
- To integrate IT as a natural and important part of the Swedish cooperation programs with universities in the partner countries

The scope of the project at UDSM from the point of view of DSV is the enhancement of ICT through competence development of ICT professionals and to a lesser extent – consulting for the development of ICT-infrastructure. The cooperation between UDSM and KTH/SU does not include work on ICT policy and organization development.

The split PhD program currently involves seven students from UDSM who study roughly half of the year at DSV, with the capacity objective being for the students to reach the level of PhD or licentiate in the area of computer science. Areas of research are currently: “

- Development of software engineering and maintenance models
- Implementation and use of intrusion detection systems
- Explicit goal representation as a means for flexible process modelling and enactment
- Computer and communication security
- Formal verification of conceptual schemata
- IT security education for a secure society
- Capability maturity model (CMM) development of technical infrastructure

Aside from the part that DSV plays in this ICT-focused cooperation – SAREC funds reforms aimed at improving teaching, research and social services at UDSM with the help of ICT.

Other SAREC-funded ICT projects at UDSM

UDSM has had an ICT policy and master plan since 1995, and has become one of the leading African universities in the application of ICT. Though the student- and staff per computer ratio still needs significant

205 Department of Computer and Systems Science, KTH website, http://www.dsv.su.se/research/sida
206 Ibid.
207 Department of Computer and Systems Science, KTH website, ICT in Academic Development at University of Dar Es Salaam http://www.dsv.su.se/research/sida/tanz.shtml
improvement – the availability of internet technology and university information systems has already had a major and positive effect on the universities activities.\(^{208}\)

SAREC is currently financing the completion and upgrading of UDSM ICT infrastructure (sub-project one, below) as well as a contents development project (sub-project two, below). The focus is on extension and upgrading of facilities (increasing bandwidth, acquiring more computers) and services through exploring and developing more ICT based content related to the education programs, like long distance learning projects and electronic publication possibilities for example.

The objectives for sub-project one: “

- To provide students with access points to the network in faculties and libraries
- To provide the academic/technical staff with access points to the network in laboratories and offices
- To upgrade the international link to the internet
- To upgrade (increase the bandwidth); the specifications and quality of the existing ICT infrastructure
- To establish a backbone network infrastructure at UCLAS and MUCHS\(^{209}\)”

The UDSM computing centre and library are in charge of executing this project, and they have formed a project committee consisting of two members from the main campus and two from each of the constituent colleges. A similar committee has also been formed at college level. The role of these committees is to make sure that the project is completed on time and within the budget.

The objectives for sub-project two: “

- To develop at UDSM a competent group of staff and provide adequate facilities for contents development
- To develop at UDSM two ICT based educational programs being examples for further development\(^{210}\)”

Expected outputs from this project included to have a group of 6 experts on ICT based contents development, a room/lab for training specifically for this purpose, and two examples of ICT based educational programs.

External consultants are used in these projects (from SIDA and elsewhere) for providing support in the implementation of the various objectives. In sub-project two, DSV provides technical assistance and advisory support.

6.4 Comparison and analysis

Project structure and scope - Tanzania

From this material one can see that the scope of SAREC’s ICT projects in the two countries varies greatly. In Tanzania the efforts supported by SAREC are focused on one university – UDSM. The SAREC projects supporting ICT development at UDSM appear to be more split than in the case of Nicaragua, though this

\(^{208}\) SIDA-SAREC ICT Cooperation, University of Dar Es Salaam Website, Contents Development section, [http://www.sida-sarec.udsm.ac.tz/contentdevelop.html](http://www.sida-sarec.udsm.ac.tz/contentdevelop.html)

\(^{209}\) SIDA-SAREC ICT Cooperation, University of Dar Es Salaam Website, Completion and Upgrading of UDSM ICT Infrastructure section, [http://www.sida-sarec.udsm.ac.tz/infrastructure.html](http://www.sida-sarec.udsm.ac.tz/infrastructure.html)

\(^{210}\) SIDA-SAREC ICT Cooperation, University of Dar Es Salaam Website, Contents Development section, [http://www.sida-sarec.udsm.ac.tz/contentdevelop.html](http://www.sida-sarec.udsm.ac.tz/contentdevelop.html)
impression might be a result of not having enough information. The investments in infrastructure are not formally integrated with the split PhD program for example. The reason why the two projects do not appear integrated is because ownership/management of the infrastructure extension project, IT policy and organization lies on UDSM – and in this area their ties to SAREC are mostly financial at this stage. I was unable to reach the contact person at UDSM for the split PhD program who might have shed more light on the connection between the two. For these reasons, my picture of the SAREC/UDSM cooperation is limited. However, it seems like the current focus of ICT development at UDSM in cooperation with SAREC via DSV involves mainly consulting for the development of technical infrastructure and competence development of IT professionals211.

UDSM and the Nicaraguan universities have similar priorities in the area of contents development: establishing a system for e-publishing, developing models for distance learning, and developing relevant local content.

I interviewed the coordinator of the split PhD program (Rodolfo Candia) at the Department of Computer and Systems Sciences, KTH. He told me that the eight students in the split PhD program that started in 2000 are also in one way or another key staff in IT development at UDSM212. Recruitment of the students was done by the head of the computing centre at UDSM and so the program is in this way tied to the needs of the institution. IT Security is for example crucial for being able to engage in business in the globalizing economy – which is important for Tanzania, according to the coordinator. The skills of the graduates are very much in demand. After graduation of the current doctoral candidates in 2006 SAREC will consider running the program again – and then potentially with more candidates213.

Project structure and scope – Nicaragua

The fact that there are four universities cooperating on one project makes the scope much wider than in the case of Tanzania. Having completed ICT policies and master plan – the project is now about finding more affordable bandwidth, improving organisation, providing training, contents development and extending infrastructure to meet the agreed goals and vision at each of the universities.

In terms of project scope – I found it clearly defined in the case of ‘TIC Nicaragua’ because I could relatively easily find timelines established for the various phases, details on finances required for each phase, plans on how goals would be met and details on who was responsible for each phase. Given that I have had limited contact with those involved in the projects, however, this is not necessarily a reflection on the organisation or outcomes of the projects.

Policy environments and poverty reduction

Research on the connections between ICTs and poverty reduction in Latin America and the Caribbean has shown that generally the effects of new ICTs on poverty are limited when social and economic policies are not compatible, as well as when policies are not integrated and coordinated. Finquelievich maintains for example that economic policies are more effective when they consider perspectives of poverty reduction, greater gender equality and sustainable development214. She has found that most national ICT policies in Latin America and the Caribbean are aimed at increasing the penetration of Internet services (through for

211 Department of Computer and Systems Science, KTH website, ICT in Academic Development at University of Dar Es Salaam http://www.dsv.su.se/research/sida/tanz.shtml
212 Interview via phone and e-mail with Rodolfo Candia, Sweden-based coordinator of Split PhD program KTH/SU/UDSM, September 2004
213 Ibid.
instance reinforcing connectivity and reforming the telecommunications and computer markets) and not so much at increasing accessibility for larger parts of the population.

Both Nicaragua and Tanzania have national ICT policies. The Nicaraguan ICT policy makes reference to the importance of socially and economically sustainable development – but does not deal in a direct way with poverty reduction. The focus is more on economic growth and competitiveness. The Tanzanian ICT policy deals directly with poverty reduction, its vision is “to become a hub of ICT Infrastructure and ICT solutions that enhance sustainable socioeconomic development and accelerated poverty reduction both nationally and globally.”

Both countries also have poverty reduction strategies. The Tanzanian ICT policy makes reference to the need to align efforts with the goals of their poverty reduction strategy. There is no link between the PRSP and the national ICT policy in Nicaragua. Neither of the countries' PRSPs makes reference to the ICT policies.

SAREC's policy indirectly has poverty reduction as its main objective because of the fact that research cooperation is one of the strategies pursued by SIDA with the end goal of contributing to the social and economic development of Nicaragua (which is thought to be achieved primarily through reducing poverty).

The Nicaraguan university ICT policies do not directly deal with potential links to poverty reduction either. If the policies did this - it might strengthen the potential of university-led ICT initiatives affecting poverty reduction. In the vision there is mention of making connections with local organisations, but it is not formally tied in any direct way to poverty reduction efforts. More indirectly, however, there are many aspects of this project that can contribute to poverty reduction. According to the inter-university coordinator of TIC Nicaragua, the ICT project engages the universities and its' partners in continuous and dynamic exchanges of information and processes of learning. Furthermore, he states that the universities have many ongoing programs devoted to issues connected to improving standard of life in Nicaragua which can be improved by the increased use of ICTs. Through these programs other stakeholders involved can also learn about other potential uses of ICTs.

One out of the four public universities in Nicaragua (UNAN Managua) has as part of its objectives to improve government-society-university relations, and another (UNI) has as part of its objectives to:

“To obtain in UNI, a reliable capacity in the field of Information and Communication Technologies that improves the interchange of information between local and international institutions, positioning it as a center of academic excellence that is an active part of the sustainable development of the Nicaraguan Society, specially in the areas of Science and Technology.”

There are, however, no direct references to using ICT in any efforts related to poverty reduction.

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215 Ibid. Pp4-5
218 Ibid. P19
219 Interview via e-mail with Leonel Plazaola Prado, Nicaragua-based inter-university committee coordinator of ICT-Nicaragua project with SAREC/LU and the four public universities of Nicaragua, December 2004
220 Ibid.
221 The Nicaragua ICT project Website, UNAN ICT policy proposal http://www.tic-nicaragua.edu.ni/polunammga.htm
I recognize that the scope of the projects investigated in this thesis relate primarily to building up the capacities surrounding ICT at the universities in question, but given the role (and potential roles) of universities to affect poverty reduction – I am examining their policies from that perspective.

According to the inter-university coordinator of ‘TIC Nicaragua’ – the Nicaraguan government’s support level for the project has been low and passive, though some governmental agencies and ministerial ICT projects have participated in nationwide forums the universities have organised.223

When asked whether he thought increased use of new ICTs at UDSM contributes to poverty reduction processes, the split PhD program coordinator from KTH said that he believes it does - but in a very indirect way – and then more so in the long-term. He said SAREC is working on helping provide better conditions for development through increasing capacity for the production of knowledge. Fully functioning universities with research capacity are crucial for this, and new ICTs can greatly improve research capacity. He maintains that experience from different universities indicates that research institutions that are better equipped technologically (including new ICTs) generally function better than those without.224

**On the connection between research capacity, SI and poverty reduction**

SAREC states that “the term knowledge society means more than the quality and scope of a country’s education and research systems. It also refers to the quality of the interaction between education and research and society at large.”225 This type of interaction is central in Systems of Innovation thinking - dynamic exchange of knowledge and information between people, organisations and institutions produces good conditions for innovation. Given that poverty reduction is the function of the national system of innovation in my model of analysis – and poverty reduction is the main goal of the SIDA country strategies for Tanzania and Nicaragua - SAREC’s activities (at least in theory) would improve the Nicaraguan and Tanzanian national systems of innovation in their function of poverty reduction.

In a report for Intech (“Research Capacity Building in Nicaragua: From Partnership with Sweden to Ownership and Social Accountability”), Léa Velho evaluates the role of SAREC. She says of the changing development cooperation paradigm in the early 1990’s:

> "Evidence began to accumulate that the linearity of innovation was illusory...thus it became clear that it would be advisable, from a policy perspective, to foster links between the various knowledge producers (academia/industry/government/civil society and organisations of all kinds) – stimulating the most varied type of alliances.226"

Velho states: “a national system of innovation made up of actors which are not particularly strong, but where the links between them are well developed, may operate more effectively (in terms of learning and generating innovations) than another system in which one or another actor is strong but the links between them weak.227” Velho says that according to this, it is not enough to strengthen research systems if the links to other parts of the system are non-existent or weak – that a systemic approach to capacity development is necessary.228

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223 Interview via e-mail with Leonel Plazazaola Prado, Nicaragua-based inter-university committee coordinator of ICT-Nicaragua project with SAREC/LU and the four public universities of Nicaragua, December 2004
224 Interview via phone and e-mail with Rodolfo Candia, Sweden-based coordinator of Split PhD program KTH/SU/UDSM, September 2004
227 Ibid. P26
228 Ibid.
Velho maintains that “although, in discourse, SIDA and SAREC have adopted the systemic approach, the practice of the cooperation is still shaped according to the paradigm of the 80’s,” meaning in this case that “SAREC’s support to Nicaragua still adopts a linear model of innovation” due to the emphasis still placed on PhD and Master training. According to the linear model – the universities would identify the needs of society, produce research on these – and society would draw upon these if and when necessary. According to Velho – SAREC’s Master and Doctoral dissertation results have been picked from “general consensus problem areas” and have been assumed to be of relevance to development and poverty reduction. She maintains that this is an unrealistic expectation unless links to rest of the system are fostered as well.

Velho concludes that SAREC has succeeded as far as the objectives established, but that the contributions to development and poverty reduction will continue to be very indirect unless SAREC makes some changes, like for example concentrating on creating more links, and integrating more with other SIDA projects.

Velho’s report was focused on Nicaragua – but according to what I have learnt so far - her comments on the working methods of SAREC can be relevant for Tanzania as well. If SIDA, through SAREC and research cooperation, want to work towards the goal of poverty reduction – it seems that the outcomes could be greater if more effort is spent on connecting to other actors in the systems of innovation of those countries.

Having said this, the ICT project in Nicaragua involves a considerable amount of linking between local/national actors – and is in this sense - a step in the direction that Velho recommends.

7 Analysis and conclusions

I have investigated development cooperation in the area of ICT that SIDA/SAREC engages with in Tanzania and Nicaragua. SIDA’s efforts supporting ICT in these countries are not limited to research cooperation but I chose to focus on ICT in university environments.

Questions I was interested in relate to how increased ICT use at universities (through cooperation with SIDA/SAREC) can affect poverty reduction. I wanted to understand how SIDA/SAREC and its’ project partners envisions these potential connections, what the motivating logic behind the projects are. Furthermore, I wanted to develop an understanding of how these ICT investments could theoretically fit into a national system of innovation.

In this chapter I will use my research questions as a base from which to further analyze the material that I have gathered and to convey the conclusions I have reached. I will conclude with some personal reflections.

229 Ibid. P27
230 Ibid.
231 Ibid.
232 Ibid. P28
233 Ibid. Pp32-33
7.1 SIDA development objectives and ICT initiatives

In what ways can the ICT projects meet the development goals of SIDA?

There are three levels to consider: SIDA’s central development objectives and country strategy goals, SIDA’s IT strategy, and SAREC’s research cooperation objectives.

To recap the goals:

SIDA’s main objective in development cooperation with both Nicaragua and Tanzania is poverty reduction. Currently, cooperation with Tanzania focuses on three areas that are mutually reinforcing: pro-poor growth, human resource development and democratic development. Cooperation with Nicaragua focuses on economic and social equality.

The vision in SIDA’s IT strategy states that SIDA supports a rapid integration of ICT in partner countries in order to increase communication and knowledge exchange within the countries as well as globally. Efforts relating to ICT are done on three levels. The macro-level refers to larger physical infrastructure (like a well developed telecommunications net). The meso-level includes connectivity for government, institutions and business, in addition to access to computers, internal networks, adequate software systems and technical maintenance. The micro-level, which refers to individual access possibilities. The way that SIDA enacts its IT strategy is mainly through research cooperation which is managed by SAREC.

SAREC gives support to research councils, universities and research institutions in order to create better research environments (including in the area of ICT infrastructure) and strengthen research capacity in a number of ways. The research supported falls under one or more of the prioritized themes: sustainable use of resources, health, technology or the political, economic and social dimensions of development.

The TIC-Nicaragua project can meet the goals stipulated by SAREC and SIDA’s IT strategy directly in the sense that increased use of new ICTs in the university environment (meso-level) can strengthen research capacity by facilitating the management of information for staff and students.

The UDSM-SAREC cooperation related to ICT can directly meet the goals stipulated by SAREC and SIDA’s IT strategy by strengthening the research capacity at UDSM by facilitating the management of information for staff and students. The project can do this through its competence development of IT professionals (the split PhD program), as well as by providing consulting for the development of ICT infrastructure.

Regarding the poverty reduction-oriented, central goals of SIDA – both projects can be seen to indirectly meet the goals. The projects can have mostly indirect effects in the sense that increased use of new ICTs can facilitate communication and links within the university and between the university and other local, national and international organisations.

The new ICTs can act as facilitators and enablers of current work and efforts – whether or not the results of these efforts contribute poverty reduction, social and economic equality or democratic development depends on the goals of the projects that the students or staff are involved with, with whom and why.

How do the stakeholders perceive that increased ICT use at universities can contribute to poverty reduction?

SIDA envisions that ICT assists in meeting their general development goals on several levels – and focus primarily on the meta- and micro-levels previously discussed (including connectivity for government, institutions and business and individual access possibilities).
Most of the ICT related projects are done through research cooperation (SAREC) with universities- because SIDA believes that “the creation and dissemination of knowledge at universities is essential for development. ICTs provide tools that can further enhance the possibilities for universities to fulfil their roles in society.234” According to SIDA’s IT strategy - the effects are expected to come in the medium- to long term.

The inter-university committee coordinator in Nicaragua for the TIC-Nicaragua project believes that the ICT project can contribute to poverty reduction because it can improve the “continuous and dynamic exchanges of information/process of learning between actors”235. Though he states that computers themselves do not solve any problems - he believes that increased ICT use can benefit the various programs that the universities are involved with that relate to improving standard of living in Nicaragua236.

Unfortunately I could not get in touch with the coordinator at UDSM, so I do not have their direct input on the question – and I could not get their indirect input on the question because the university ICT policy appears to be in the process of being updated. On the UDSM/SAREC homepage there are only references to the goals within the university. The coordinator of the split PhD program at KTH in Sweden believes that the increased use of ICT at UDSM through the cooperation with KTH can contribute to poverty reduction in an indirect way and in the long-term - by providing “better conditions for development through increasing capacity for the production of knowledge.”237

All stakeholders identified in this case believe there to be a positive relationship between increased ICT use at universities and poverty reduction – but that it is indirect and long term. Specifications of exactly how this would happen are limited – and I believe that this is partly because ICTs are generally seen as enabling technology for already existing efforts. Another reason might be that there simply is not enough emphasis in the related policies on exactly what the links can be.

7.2 SIDA and ICT in a National System of Innovation

How do SIDA’s investments in ICT at universities theoretically fit into a NSI?

Like innovative capacity - poverty and development are multi-dimensional, dynamic and context-dependent phenomena. The development objectives of SIDA have strategies attached to them that take into consideration the system in which particular issues are entrenched. The policies deal with poverty as a systemic problem requiring systemic solutions. The development cooperation policies of SIDA support the establishment of key organizations and institutions as well as creating dynamic links between them. SIDA can in this way be seen as contributing to building and strengthening national systems of innovation in Tanzania and Nicaragua.

235 Interview via e-mail with Leonel Plazaola Prado, Nicaragua-based inter-university committee coordinator of ICT-Nicaragua project with SAREC/LU and the four public universities of Nicaragua, December 2004
236 Ibid.
237 Interview via phone and e-mail with Rodolfo Candia, Sweden-based coordinator of Split PhD program KTH/SU/UDSM, September 2004
A National System of Innovation with the function of poverty reduction

Components of relevance identified in relation to the scope of this thesis:

Projects supporting increased ICT use at universities can facilitate communication and links within the university and between the university and other local, national and international organisations. SIDA’s investments for the increased use of ICTs at universities can from this perspective be seen as one way of potentially improving the dynamics national system of innovation (NSI) of that country.

7.3 Increased ICT use at universities and poverty reduction

Can these ICT investments translate into poverty reduction, how, and over what time period?

It seems clear that they can, but it is less clear how – and over what time period.

We can look at the potential for the ICT investments to translate into poverty reduction from the perspective of how the relevant policies relate to the goal of poverty reduction. I will assume that the function of poverty reduction in this system of innovation is more likely to be fulfilled if the relevant policies are integrated and aligned.

The diagram below shows the links, in terms of ICT-related policy, between SIDA, the national governments, and the universities.
The National ICT policy of Tanzania makes significant reference to aligning ICT efforts with poverty reduction efforts. (Tanzania also has a link from its national ICT policy to its PRSP). In the case of Nicaragua – there is currently no ICT policy available, but there are projects proposals available on science, technology and innovation as well as on information – which both make reference to social and economic development, but not poverty reduction\(^{238}\). SIDA policy makes direct reference to poverty reduction in both cases, and SAREC’s policy does so indirectly. Among the universities in TIC-Nicaragua, a couple of them make reference to contributing to social and economic development of Nicaragua – but there are no direct references to poverty reduction. The UDSM ICT policy and master plan appear to be temporarily unavailable due to an update process.

The links, exchanges and cooperation between actors in a system of innovation are crucial. Given that the function of the national system of innovation in this case is poverty reduction – the dynamics are not optimal. Of course this is only a very small part of the national innovation systems of these countries, but one can see the potential for stronger links.

These diagrams are limited at best in what they can tell us, given that they are only based on goals in the policies discussed here and because the systems of innovation we are discussing contain many other variables. Recognizing this, they show that though there are several links (direct and indirect), more links would improve the effects of increased ICT use at universities on poverty reduction. It would (according to Finquelievich) also be beneficial to the function of poverty reduction if all the actors have goals in some way relating directly to poverty reduction, and if they actively interact with one another.

With the lack of integration of relevant policies, goals and strategies - the effects that increased ICT use at universities have on poverty reduction are likely to remain indirect and over the long-term – and even then, these potential effects do not depend on the ICTs themselves, but the projects and efforts for which they are used.

### 7.4 Concluding reflections

There is a lot of talk about ‘catching up’ in the literature surrounding ICT and development. I am not sure what that means, it seems like a strange race with questionable ends. Why is it assumed that to become competitive, rich and sustainable (and any other number of supposedly desirable ends) it is necessary to follow in the not-so-sustainable footsteps of the ‘more developed’ countries? It seems to me that the inequalities are more likely to be maintained rather than bridged as a result of ‘catch up’ thinking, because in a sense – the road is already paved.

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\(^{238}\) The Nicaraguan Council of Science and Technology, Consejo Nicaraguense de Ciencia y tecnología, [http://www.conicyt.gob.ni](http://www.conicyt.gob.ni)
SIDA’s policies express ideas that reflect a different approach to development than the ‘catch-up’ oriented strategies – but I think that the projects I have looked at bring up some interesting questions.

SIDA states:

“Because development is generated by people in their own societies, Sweden aims to help poorer countries implement their own processes. One way to do this is to ensure that what we do in one context agrees with our actions in other areas. Trade, agriculture, the environment and security are examples of policies which must all be put in the same direction and reinforce each other.”

Though the policy says that Sweden aims to help poorer countries implement their own processes - there is still an underlying assumption about what those processes are or should be – so one wonders which processes are their own?

There is an assumption about how knowledge is produced, and there is the assumption that ICTs can enhance communication and management of information. It is assumed that research cooperation will promote knowledge production – which will positively (albeit indirectly) contribute to development processes – and this will lead to opportunities for economic growth – which is considered a good thing. I do not mean to say that economic growth is a bad thing or that ICTs are bad – but they encompass judgements about what development is and should be.

Figures
Definition: Information: www.dictionary.com
Definition: Knowledge: www.dictionary.com
1.2 Model on the potential connections between variables relating to research questions, done by myself
1.3 From International Telecommunication Union Website, http://www.itu.int/osg/spu/wsis-themes/icstories/Honeybeecasestudy.html
2.1 Model of a potential system of innovation, done by myself
2.6 Diagram of development theory history from De Vylder, S., The Driving Forces of Development (Utvecklingens Drivkrafter), Stockholm, Forum Syds förlag, 2002, P51
2.7 Model of a potential system of innovation, done by myself
4.1 Model done by myself illustrating links between various policies and the goal of poverty reduction
4.2 Model done by myself illustrating SIDA’s three perspectives on poverty
7.1 Model done by myself of a system of innovation with the purpose of poverty reduction, and components relevant in this case
7.2 Model done by myself illustrating links between various policies and the goal of poverty reduction

Tables
3.1 Socio-economic indicators on Nicaragua and Tanzania. Data gathered from The World Bank, UNESCO, UNDP, SIDA, and the IMF Websites.
5.1 ICT statistics for Nicaragua and Tanzania. Data gathered from ITU and the World Bank
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