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Information and Communication Technology Applied for Developing Countries in a Rural Context

Towards a Framework for Analysing Factors Influencing Sustainable Use

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Abstract

Information and Communication Technology (ICT) has been considered a tool that can be used to achieve development goals in developing countries. In the same time, the majority of people living in developing countries, and especially those in rural areas lack access to ICT. Even if there have been many attempts to introduce ICT, they have in general not been long-lasting.

A framework for studying factors that influence use of ICT is desirable. We see it necessary to bring a sustainability aspect into the picture of ICT. In this work the requirement of 'sustainable ICT use' stresses that ICT is long-lasting and that ICT meets the needs of the user. Thus, the aim of this work is *to develop a tool for conceptualisation that can support the understanding of the conditions for sustainable, and therefore successful, ICT projects in developing countries.*

Our theoretical starting point is taken in the Information System (IS) theories. The theoretical base is then broadened to include theories on international development, theories on sustainable development, and theories on diffusion of innovations and transfer of technology. The theoretical foundation, together with four empirical studies, is used to answer the two research questions in this thesis. The first question is: *Which are the critical factors influencing sustainable ICT use in developing countries?* By using 'critical factors' we emphasise a focus on factors which are crucial (even if possibly not sufficient) for bringing about sustainable ICT use. This question is followed by a second question: *How would a framework be structured to properly include these factors in order to support analyses of sustainable ICT use?*

The framework has evolved through the identification of factors from four empirical studies. Forty-one factors were identified and sorted into fifteen subcategories of five major capital assets. The main contribution of our study is that of a generic framework, which can be used as a guideline for planning, implementation, and evaluation of ICT projects in a rural developing country context achieving sustainable ICT. As argued in this thesis technology is not the key resource; it is the combination and system of different resources distributed along a time and space dimension that is the key. With our framework we have demonstrated that the ICT artefact is not the sustainability tool, it is the combination of different resources that makes it sustainable and competitive.

Foreword

Dear Reader, now you have a licentiate thesis in your hands. A licentiate thesis is 'half a doctoral' thesis; it is also the document from a period of apprenticeship that shows that a sufficient level of competence has been attained in order to continue towards a doctoral thesis. It is the result of years of hard work and much joy. Writing a thesis is a physical undertaking with the final result of a written exposé of the process of becoming a researcher; the thesis is the physical evidence of this process. This physical action may sometimes seem like an impossible mission and can be a heavy burden to complete, but that is the nature of research!

In many respects this thesis can be viewed as a non-traditional academic work. On the one hand it deals with an uncommon area within the IS field, according to Professor Gordon B. Davis. On the other the thesis has *two* authors. We have found it very fulfilling to have had the opportunity of writing this thesis in collaboration. We are convinced of that empirical observations gain from *two* authors as so does the analysis; the possibility of discussing 'small' issues as well as 'big' issues have widen our perspective. We have experienced that this contributes to a synergetic effect.

We have written certain parts together as regards work load and contribution to the content, namely chapter 1, 2, and 6. Concerning the other chapters we have divided the responsibility in the following way: Sundén has been the main contributor to chapter 3, section 4.2, 4.5, 5.1.1, 5.1.2, 5.1.5, 5.2, and 5.3 including the introduction to chapter 5. Wicander has been the main contributor to section 4.1, 4.3, 4.4, 4.6, 5.1.3, and 5.1.4 including the introduction to chapter 4.

This work is part of the HumanIT programme 'Bridging the Digital Divide' and has been carried out at the Department of Information Systems at Karlstad University, Sweden. The research centre HumanIT, focuses on the interaction between human beings and information technologies; on the human value of IT.

There are many people who have contributed to this thesis. First of all we would like to thank our main supervisors Anders G. Nilsson and John Sören Pettersson (Karlstad University) together with our assistant supervisors Sten

Carlsson (Karlstad University) and Bo Göransson (Lund University). Further we would like to thank Johan Ernberg (ITU, Geneve), Tomas Gustafsson (Life Academy, Karlstad) and Stefan de Vylder (Consultant of Economics, Stockholm) for their valuable input and comments. We would also like to thank all our colleagues at the Department of Information Systems (Karlstad University) especially Monika Magnusson, Ulrika Mollstedt, and Niklas Johansson, for their great support. Thanks to Jenny Nilsson (Karlstad University) for helping us with formatting the thesis and to Hannah Hall (Karlstad University) for the language check.

Further we would like to thank the MIT community as well as the SPIDER community for support. Finally we would like to thank all people engaged in ZASP (the Zambian Agriculture small-Scale Project), both in Sweden and in Zambia with a special thanks to Agneta Håkangård. She has contributed with a tremendous support during our field studies in Zambia.

Our families and extended families deserve our greatest gratitude for having made this thesis possible. Their patience has been invaluable when we have worked long days and spent weeks abroad on field studies. Our families have always been encouraging and always been there for supporting us.

Lastly we would like to thank 'ourselves', without 'ourselves' this thesis would never have come to completion.

Contents

List of Abbreviations and Acronyms

CSF	Critical Success Factor
DFID	Department for International Development (UK)
ETHICS	Effective Technical and Human Implementation of Computer Systems
HDI	Human Development Index
HIC	High-Income Countries
ICS	Information and Communication System
ICT	Information and Communication Technology
IS	Information Systems
IT	Information Technology
LDC	Least Developed Countries
LIC	Low-Income Countries
MIC	Middle-Income Countries
MIS	Management of Information Systems
MISQ	Management of Information Systems Quarterly
NGO	Non Governmental Organisation
OECD	Organisation for Economic and Co-operation and Development
PRA	Participatory Rural Appraisal
ROI	Return on Investments
SA	Systems Approach
Sida	Swedish international development cooperation agency
SPIDER	Swedish Program for Information Technology in Developing Countries
TDG	Telecommons Development Group
UNDP	United Nations Development Program
UTV	Sida Secretariat for Evaluation and Internal Audit
WCED	World Commission on Environment and Development
WSSD	World Summit on Sustainable Development

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1. Introduction

Developing countries account for the majority of the world's population, and are important and interesting for this reason alone. In addition, the majority of the people lack access to Information and Communication Technology (ICT). The majority, approximately eighty per cent, are living in rural areas where access to services including ICT is even more limited than in urban areas.

There was at one time some discussion as to whether ICT was relevant or not in developing countries. This discussion has clearly shown that ICT is important. The question has now moved from whether it is relevant to *how* ICT can be beneficial.

The importance of access to ICT is taken up by Wilson and Heeks (2000), who state that access to information is a prerequisite for knowledge and development. According to the World Development Report 1998/99 (World Bank 1999) developing countries need to take advantage of new technologies for acquiring and disseminating knowledge in order to further development. In this sense ICT is viewed as a tool with which to achieve development goals. ICT has high potential value across all sectors. A common assumption is that ICT can offer advantages and opportunities in daily life for people in areas such as health, education, public service and business (Boldt, 1997; World Development Report, 2000). We will add that as ICT is the most effective modern day communications tool it should be available to the majority of the world's population, which are people in rural areas within developing countries.

From a pre-study in rural Zambia we can provide examples of where ICT could have been of help in daily life (Sundén & Wicander, 2003). For example, one of the villagers had her relatives in the capital city Lusaka 800 km away. When she needed to get in contact with them she had to travel there by bus. Going back and forth took her approximately one week. If she had been able to use some sort of telecommunication she could have saved a lot of resources both in time and money. Another example from the same area is from a local carpentry workshop that had difficulty finding hardwood for furniture manufacture and the carpenters spent much time travelling to different sawmills. If the carpenters had been able to use some sort of telecommunication with sawmills in the area they could also have saved resources, both in time and money and also found hardwood for making tables and chairs more easily.

In recent years ICT has attracted interest among both national as well as international aid organisations. A national initiative by Sida is the Swedish Program for Information Technology in Developing Countries, 'SPIDER'. On the international arena Kofi Annan has initiated the 'UN ICT Task Force'. Hence, ICT for development is on the agenda!

It is perhaps surprising, given the importance of the topic of ICT in developing countries, that the literature to date is relatively sparse, according to a recent call for papers from the journal Management of Information Systems Quarterly (MISQ) in April 2005. This opinion is also widespread among researchers (Odedra-Straub, 1996; Waema, 1996; Heeks, 1996) and some authors state that ICT use has not been studied much in rural areas in developing countries (e. g. Waema, 1996; Keniston, 2002; Mayanja, 2003).

The expectations of ICT for socio-economic and human development in developing countries have been high, but the real benefits and the positive impacts have been somewhat unsatisfactory. ICT has not been successfully applied and, according to Odedra-Straub (1996), ICT has not been applied to sectors which influence the majority of the population. So, unfortunately, the applications of ICT have not always been successful to date, and indeed there are many examples of failure or partial failure. There are some exceptions though, but the challenge remains to tackle the difficulties of failed ICT projects.

1.1. Background

Failures of ICT projects have been discussed for several years and many studies concerning failure and success have been conducted. According to an often cited report, the failure rate of ICT projects is estimated to be at least one third (Standish Group, 1994). But the situation is even worse concerning the failure rate of ICT projects in developing countries, where it is higher due to several barriers for implementing ICT (Heeks, 2002). Caspary and O'Connor (2003) give examples of failure of ICT projects in South Africa; they show that the majority of ICT projects were closed within four years.

New technologies are easily abandoned if they are not appropriate to the local context. Technology transfer to developing countries has been too dependent

on external factors, like international aid organisations, and too emphasised on technology itself (Avgerou & Land, 1992). The barriers can be those discussed by Lind (1991), who points to ICT solutions, which have been successfully implemented at one place but have failed to perform at other places, often because the actual reality was never fully understood according to local values, authority patterns, rationality and time concepts. In that sense, the question of introducing ICT is not about the technology transfer alone, instead it is about adopting and developing ICT solutions to suit particular local needs (Heeks, 1996). Keniston (2002) claims that one reason for failures in developing countries projects, is that ICT developers know almost nothing about factors that influence the success of ICT projects.

We found factors in our pre-study which are in line with Heeks argumentation mentioned above about technology transfer, and how the technology was not accustomed for local prerequisites, needs and demands. Moreover, we are of the same opinion as Mursu (2002) when she argues that all major ICT projects must have local content and involvement to reach some degree of lasting; and with Avgerou (1996) when she suggests that ICT practices and methodologies are not universal, but need to be adjusted to any given socio-economic, cultural, and organisational setting.

Obviously there have been many attempts to bring in ICT to developing countries, but they have in general not been long-lasting. Hence, we see it as necessary to bring a sustainability approach into the picture of ICT. A fact is that since the 1990s there are many researchers and international aid organisations that stress 'sustainable development' in different sectors of development, e. g. agriculture, environment, financial, and health, and so also in ICT development. The harsh socio-economic and infrastructural context makes the sustainability of ICT a major issue. In the case of ICT, sustainability means the ability to identify and manage factors threatening the long-term viability and use of ICT.

1.2. Research Questions

According to the discussion and argumentation in the above sections, we have identified one overall research problem, namely, that of *failed ICT projects in developing countries.*

Furthermore, several authors state that ICT use has not been studied much in rural areas in developing countries (e. g. Waema, 1996; Keniston, 2002; Mayanja, 2003). To tackle the depicted problem, it is desirable to have a tool for studying the factors influencing the use of ICT. The aim of this work is to *develop such a tool that can support the understanding of the conditions for sustainable, i.e. successful, ICT projects in developing countries*. Such understanding is needed both in research and in practical implementation work. To reach the aim we have to answer the following questions:

- *Which are the critical factors influencing sustainable ICT use in developing countries?*
- *How would a framework be structured to properly include these factors in order to support analyses of sustainable ICT use?*

We have to identify critical factors important for and influencing sustainable ICT use in developing countries, factors that are crucial when considering the implementation process of ICT. By using the wording 'critical factors' we emphasise that focus is on factors which are necessary (even if possibly not sufficient) for bringing success into ICT use.

As we focus on identifying factors this study can be classified as factor-based research. Factor-based research stresses the covariance between dependent variables and independent variables (Soh & Markus, 1995). In our study the factor-based approach implies that ICT use can be described from the state of the affecting factors which can be identified at one particular moment.

The framework will provide a way of thinking about sustainable ICT use. The framework represents a complex reality, but it also represents a manageable possibility. The framework is also fruitful for analysis of sustainable ICT use in developing countries as it provides three dimensions which are central in sustainable development; resource, space and time. The framework has an analytical structure that can be used to enhance ICT use effectiveness and initiate change and improvement.

1.3. The Data Sources

We have reviewed both theoretical and empirical data sources. We will start with a brief presentation of our pre-study which also was the initial study in our research process.

The findings from the pre-study (Wicander & Sundén, 2004) were presented at a conference at Karlstad University. In this thesis we have kept the original form of the pre-study from the conference proceedings, except for some minor reformulations. In the pre-study we analysed data which were collected during a field study in Zambia. The results of the pre-study illustrate factors that constitute so called 'Critical Success Factors' regarding ICT use. (We will discuss the terms 'Critical Success Factors' and 'critical factors' in chapter 2)

During the analysis of the pre-study we made reflections about several issues concerning ICT in developing countries and our reflections are presented in chapter 2 and 4. These reflections are the basis for the selection of our theories. Our reflections implied that we start by exploring the IS theory field; this field contribute a deeper understanding about success and failure of ICT use. The development theory field provided information about development issues in developing countries. The field of 'diffusion of innovations' and 'technology transfer' was explored in order to understand how ICT can diffuse and be transferred in accordance with local needs. The field of sustainability theories provided a perspective of long-term viability – a perspective which evolved to be the main standpoint for the analysis (sections 5.1 - 5.3).

This work can be described as multidisciplinary. Hence, four different theory fields are represented and together they constitute our theoretical foundation: *development theories*, *diffusion of innovations* and *technology transfer theories*, *information systems theories*, and *sustainability theories*.

Four empirical studies were reviewed (our own pre-study and three external studies) with the intention to give factors of what worked as well as what did not work from a sustainable perspective on ICT use. The studies have one thing in common: they all have some kind of sustainability perspective on ICT use in developing countries, particularly in rural areas. As no considerations were taken concerning to which country the studies had been performed no weighing of factors for different regions is possible. The result could be interpreted as general knowledge concerning developing countries.

The four theory fields provide wider perspectives on the identified factors. That is, we identified connections between the factors identified in the empirical studies and the theory fields mentioned above. A broad perspective is

important in a holistic view and is in line with our research approach inspired by the systemic approach.

For the analysis we use an existing sustainability framework, originally developed by Ashley and Carney (1999) and further developed by Batchelor and Norrish (2002). The framework consists of five categories, which are equivalent to five capital assets: Content, Financial, Human, Physical, and Social. This will be further explained in the following chapter.

1.4. Structure of the Thesis and Reading Guidelines

This thesis consists of six chapters and below we describe each chapter, one by one. The description gives the structure of the thesis and at the same time it gives reading guidelines. The chapters and sections mentioned are illustrated in figure 1.1.

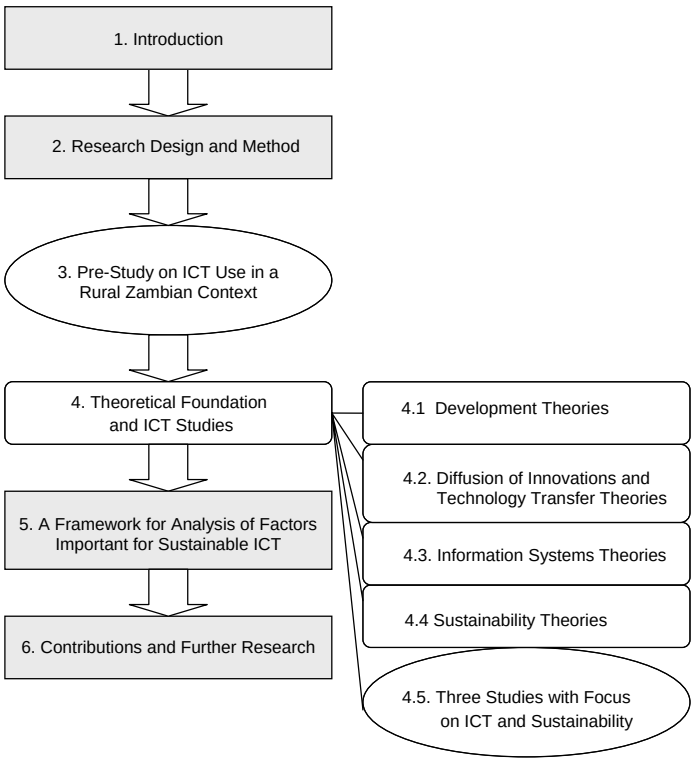

Figure 1.1. The structure of the thesis

Chapter *1* ***Introduction*** discusses the problem area and presents the research questions. In chapter *2* ***Research Design and Method***, an overview to the research design is given, it describes the data collecting and coding process.

The first empirical part is chapter *3* ***Pre-study on ICT Use in a Rural Zambian Context*** which introduces our field study performed in a rural part in Zambia. This chapter focuses on ten so called 'Critical Success Factors' found important for ICT use in rural areas in developing countries based on local opinions. The ten factors are further analysed in chapter 5.1.1 - 5.1.5.

At the same time as the pre-study gives answers in the form of the ten Critical Success Factors we made reflections about development in developing countries and about long-term viable ICT use. Furthermore, we made reflections about the process of the diffusion of ICT and how ICT could be transferred to developing countries.

Chapter *4* ***Theoretical Foundation and ICT Studies*** is an umbrella chapter for useful theories tackling the reflections mentioned above. To set the stage, we started by discussing the issue of development in section *4.1* ***Development Theories***.

Section *4.2* ***Diffusion of Innovations*** and ***Technology Transfer Theories*** clarifies the main concepts in, and the relations between, these two theoretical fields.

In section *4.3* ***Information Systems Theories*** the issue of ICT success and failure are discussed.

The long-term viability is a key issue in sustainability theory; an issue we also recognise to be crucial for ICT use. Section *4.4* ***Sustainability Theories*** takes a deeper look at these matters.

The second empirical part is presented in section *4.5* ***Three Studies with Focus on ICT and Sustainability***. This section highlights empirical findings, both field data and analysis from three independent studies where each study have a sustainability perspective on ICT in developing countries.

In chapter *5* ***A Framework for Analysis of Factors Important for Sustainable ICT*** the analysis is presented. Factors are identified in the four empirical studies, i.e. our own pre-study, and the three studies on ICT in developing countries. The factors are discussed from the perspectives of the theory fields in the theoretical foundation: development theories, diffusion of innovations and technology transfer theories, information systems theories, and sustainability theories.

When summing up, chapter *6* ***Contributions and Further Research*****,** we discuss our own contributions and the implications these could have on the research community and how these contributions could affect international aid organisations, as well as practitioners. We end this chapter with a discussion about how we plan to perform our further research.

The chapters and sections are presented in figure 1.1. The illustration shows the chapters and main sections in a sequential order to guide the reader. The shaded boxes show parts that present the work process towards (chapter 1, 2) the result of the study (chapter 5, 6). The two ovals (chapter 3 and section 4.5) indicate parts that present empirical data and the five boxes (chapter 4 with sections 4.1 - 4.4) indicate parts that present theory fields.

2. Research Design and Method

This chapter describes the research process. Section 2.1 deals with the design of the study. Section 2.2 clarifies our research approach. Section 2.3 describes how we selected literature and what methods we used in the data collecting process. Further section 2.3 presents how factors have been identified and evaluated in the coding of the data for inclusion or rejection in the framework.

2.1. Design

In this section we focus on our research design. The design is meant to promote the aim of this work which is to *develop a tool that can support the understanding of the conditions for sustainable, i.e. successful, ICT projects in developing countries.*

From this aim we have identified the research object to be 'critical factors influencing sustainable ICT use'. The geographical research area is 'rural areas in developing countries', see figure 2.1.

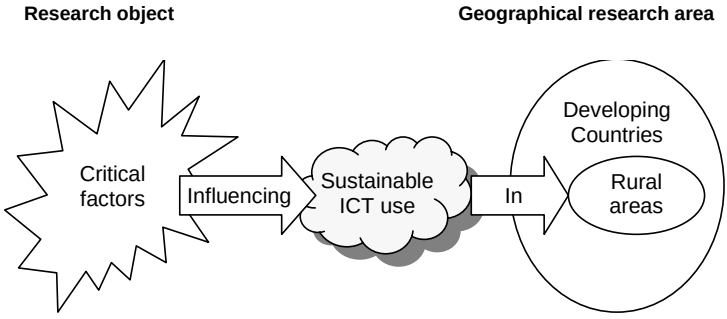

Figure 2.1. The research object and the geographical research area

In the following three paragraphs we comment on our use of the terms 'critical factors', 'sustainable', 'use', and 'ICT".

It has been mentioned previously, but it is worth mentioning again that our use of 'critical factors' means that we emphasise that certain factors are necessary but not sufficient for bringing sustainable ICT use. As we focus on identifying factors this study can be classified as factor-based research. Factor-based

research emphasises the covariance between dependent variables and independent variables (Soh & Markus, 1995). Further the factor-based approach makes it possible to reach a desired value on the dependent variable by changing the value on the independent variable. In our study the factor-based approach implies that ICT use can be described from the state of the affecting factors which can be identified at one particular moment. We do not discuss the value of the factors, but merely state whether or not they influence sustainable ICT. We use the term 'critical' for indicating that a factor is crucial. Further the relation between the factors are not the main focus in this study. The identification of the factors will be further clarified in section 2.3.2.

'Sustainable' means that we focus on long-term ICT use. We will discuss the meaning of 'sustainable' more extensively in section 4.4. 'Use' has a broad meaning as it includes both introduction and utilisation of ICT.

'ICT' is the technology required for information processing. In particular the use of electronic computers, computer software, and mobile phones to convert, store, process, transmit, and retrieve information. ICT can also be defined as "…the artificial resources we use to develop, implement, operate, use, maintain, and manage an information system." (Weber, 2003:325) and these artificial resources can be classified as hardware and software, according to Weber. We will use the concept of ICT as it is an inclusive concept including communication devices.

Further, our geographical research area is limited to rural areas in developing countries.

For the development of the framework it is necessary with two major inputs to the analysis process. First is the input that gives perspectives from several relevant approaches to factors important for ICT solutions, particularly in rural areas. This input comes from the survey of theories. Second is the input in the form of factors that influence sustainable ICT use. The empirical sections contribute with this input.

The relevant perspectives were defined from reflections made during the pre-study (the reflections are described in section 2.3.1). The reflections implied that four theory fields were relevant in discussions about ICT use in developing countries. The desired perspectives can be found in *development theories, diffusion of*

innovations and *technology transfer theories, information systems theories* and *sustainability theories*. The theory fields constitute our theoretical foundation.

When defining factors, empirical studies performed in developing countries with a sustainability perspective give us important information about factors that could influence ICT use. The four empirical studies are our own pre-study, Batchelor et al. (2003); Caspary and O'Connor (2003); and Mursu (2002).

The four theory fields and the four empirical studies are crucial in the analysis process where data is categorised and put into an existing analytical framework developed by Batchelor and Norrish (2002); the analysis process will be further described in section 2.3.

In summarising the above presentation of the research design the work can be classified as multidisciplinary as it cuts across several academic research fields. This holistic approach is important in the systems approach which we will present in next section.

2.2. Research Approach

In this section we clarify our research approach which is influenced by systems theory. As mentioned in the Introduction section our study needs an approach favouring holism and multi-disciplinarity. These features are components of systems theory. Further we discuss 'system' from an ontological and an epistemological perspective. Systems thinking, introduced by Checkland (1981), and systems theory are a concern with 'the whole' (Langefors, 1995). In other words, a systems approach is a holistic approach. But the systems approach also has critics who state that, for example, the use of systems theories within development studies has not given any outcome, according to Lundahl (1994).

The history of systems theory can be traced back to Aristotle who used the concept of systems (Bertalanffy, 1968). The German philosopher Hegel characterised a system in the following way: the whole is more than the sum of the parts, the whole determines the nature of the parts, the parts cannot be understood if considered in isolation from the whole, and the parts are dynamically interrelated or interdependent (van Gigch, 1978). These statements imply features of a system as synergism, holism as well as dependency, and give a hint to a definition of a 'system'.

What is a 'system'? Within Information Systems (IS) research the term 'system' is very frequently used with fairly distinct meanings although all are more or less related. IS theories as such can be regarded as being very influenced by systems theories. Langefors (1973:35) gives his definition of systems: "A system is a correlation of objects, called parts, which are correlated in some way". He develops this further when he states that the true systems concept has to do with the "…problems of the whole and the interconnection between the components rather than the components proper". Another author is Checkland who also gives definitions of the concept "...a concept of a whole which has properties as a single entity" (Checkland, 1981:273). A third author puts it this way "The term system may be loosely defined as a collection of elements that display coherence" (Verrijn-Stuart, 2003).

A system can be discussed from both an ontological as well as from an epistemological perspective. From an ontological view a phenomenon *is* a system, something that exists in reality. Checkland (1988) uses the concept 'hard system thinking' for this ontological view. Problems within hard system thinking are solved using *systematic* methods. From an epistemological view a phenomenon can be studied *as* a system. In this view a system is an abstraction, an epistemological device which can be used to investigate some of the problems in the world. According to Checkland (1988), this can be labelled 'soft system thinking'. Problems within soft systems thinking are solved by using *systemic* methods. Further, Checkland (1988) states that systemic methods are in themselves a learning process. The two types of thinking are complementary to each other and not a dichotomy (Avison & Fitzgerald, 1995).

Bertalanffy (1968), a biologist, used the concept of 'system' as an epistemological device to describe organisms. Dahlbom and Mathiassen (1993) explain their epistemological view like this: "system thinking is a way to deal with a world that is diverse and constantly changing". This can be interpreted as the world is constructed by us in our perception of it and a system is an attempt to organise our perception of the world. A system is an epistemological entity which one uses as an abstraction of reality and abstraction is one way to deal with complexity for the human mind. Thinking in abstractions is in accordance with the systems approach. In other words it is a way to look upon reality as a system. After all, systems are used to make perspectives explicit, and through debate our experiences become clearer by being confronted with such systems (Dahlbom & Mathiassen, 1993).

General Systems Theory (Bertalanffy, 1968) can be said to have its origin in observations of similar phenomena existing in many different sciences. This makes it possible to define and investigate systems and their phenomena free from any other biases than that of the concept itself (Yngström, 1996).

Systems approach (SA) can be considered to have the following characteristics (Yngström, 1996; Schoderbek et al, 1990): SA emphasises the whole; SA studies open systems; SA defines explicitly the environment; SA considers changing and learning goals; SA considers many hierarchies; SA considers adaptive and changing systems states. These characteristics imply high complexity; hence we can state that 'systems approach' is a way to deal with complexity. As many systems are complex, multidisciplinary, dynamic, human, social (Langefors, 1995) and open as for example ICT projects, there is a need for a 'systems approach'. Further, to emphasise the system approach is to stress that it is the combined effect of the parts that is important.

A classification of systems could be made on the basis of their behaviour or function. A common system dichotomy is that of static and dynamic systems; a static system has a structure which is not in itself performing any kind of activity, and a dynamic system has both structural components and activity. Additional classes of systems are open and closed systems. An open system could be described by its input, processes and outputs including feedback. Hence, an open system has a relation to and an exchange with its environment in the form of input and output. The environment is the source of information, material, and energy, vital to the continuation of the system. This implies interaction and dependency with the environment. An organisation can be regarded as an open system with input, processes and output as the main parts of the system and it can be used in this way for diagnosing human behaviour (Andersen & Sørsveen, 2003). We consider this to be true for a community as well and be useful not only for diagnosing human behaviour but also social behaviour.

A system could be divided into subsystems which is a way of illustrating the relation between size and complexity of the system. A complex system has to be divided into subsystems to reduce complexity in order to be able to study it. Langefors (1973) talks about subsystems and explains that every system which is subject to influence from its environment is a subsystem of some larger system and that every system part is potentially a system. In other words,

systems which have links with each other form a larger systems; "…a system is a system of systems" (Langefors, 1995:39).

Langefors (1973) states that technical people tend to specify the technical constraints first or to formulate the user constraints in technical jargon so they are unintelligible to the users. To guarantee that the user's needs are given enough considerations one must specify user-oriented and usage-oriented constraints first and introduce technical constraints as late as possible (Langefors, 1973). This puts certain requirements on the methods. Formal and stringent methods are needed in order to achieve efficiency and to reach the best results. The methods could include more planning and analysis following a true systems approach. Such methods must involve making the participants understand what is going on, as well as making it possible for them to have an influence on the design (Langefors, 1995). The recommendation to do studies in stages, starting with feasibility studies, does represent a systems approach (Langefors, 1973).

Finally, we conclude that systems approach can be envisaged as a process which is in principle never ending because there are systems everywhere and hence there is always a system within a system, a sub-system. There is a need to facilitate the analysis of a problem if one is to be able to reach holistic understanding. It is a way of looking at reality in parts which is the only way to be able to understand reality. By this we do not mean an atomistic approach, instead it is a matter of abstraction. Or as Langefors (1995) puts it: "Complexity is the property of being a thing that can only be perceived piecewise".

Having said this we must, however, emphasise that we do not focus on the relations between the factors as this is mainly an explorative study. Instead we search for data in many different areas since our intention in this study is to *identify* factors. The theorists above claim that a system is a collection of elements that display coherence (Verrijn-Stuart, 2003) or are correlated in some way (Langefors, 1973:35). Hence our approach is not fully a system approach, but constitutes a necessary first step for a holistic framework analysing ICT use in developing regions.

2.3. Research Methods

This section focuses on the set of procedures and techniques used in the process of collecting and analysing data, that is, the 'research methods' of our

study (Strauss & Corbin, 1998:3). We start with a brief presentation of our methodological thoughts and then follows a description of how we selected the literature, hence our data sources. We describe the methods used when collecting data and we clarify the coding of the data which are the methods used in the analysis process (the results of the analysis are presented in chapter 5).

If one should categorise our research in some kind of overall methodological category it could be described as qualitative. There are some issues that are essential for the decision to use qualitative approaches. Trauth (2001) means that the research problem is important, as is the researcher's theoretical lens, the degree of uncertainty surrounding the phenomena, and lastly the academic politics. Concerning all these issues we consider it advantageous to adopt a qualitative approach as we have a social interest, the studied phenomenon, our research object, is 'critical factors influencing sustainable ICT use' and it is surrounded by uncertainty, and finally, it is an accepted practice to perform qualitative studies within the IS paradigm.

Qualitative data have one important feature, which is "that they focus on naturally occurring, ordinary events in natural settings, so that they have a strong handle on what 'real life' is like" (Miles & Huberman, 1994:10). This statement has connection to Maxwell's (1996) advantages with qualitative research which concern the practical purpose with a study, as well as that the study generate results and theories which are understandable and give empirical benefits for the people being studied and for others. He also claims that an advantage is that the results give concrete development by supporting existing practice. The advantages correspond with the way we want to relate to the practice and the practitioners we in the future want to support with this work.

2.3.1. Theoretical Grounding

As mentioned in the Introduction chapter, the selection of theoretical perspectives is based on reflections raised during the pre-study. Below we will motivate our selection of theory fields by presenting these thoughts. We do not give any direct answers to the reflections; instead we will later discuss the connections between the identified factors and the theory fields. This discussion is offered after the presentation of the factors in chapter 5. The reflections and the theory fields are:

What is the history of development in developing countries? There is a substantial body of theories on international development. This leads to the next reflection, what are current trends among international aid agencies in the fields of development? The development theory field generally discusses these issues.

What affects the spread of ICT? We explored the diffusion of innovations and the technology transfer theory fields in our search for highlighting the concepts important for understanding how ICT can diffuse and be transferred successfully both within a developing country and between developed countries and developing countries.

What is the history of the IS research? Furthermore, what are the failures and successes of ICT projects, how are they explained? The IS theory field was examined aiming at giving answers to the questions above.

How can the ICT use be viable in the long-term? The sustainability theory field gave the perspective of the importance of the long-term viability.

Even if the theory fields were selected early in the research process we had to choose relevant studies and theories within each field. This was done iteratively as concepts and view points emerged during the work within the analysis.

2.3.2. Selecting Data Sources

Four empirical studies were reviewed with the aim of providing factors on what worked as well as what did not work from a sustainable perspective on ICT use. The selection of the three external studies was preceded by a search in academic databases, and a general search on the Internet. The search criterion was that the studies should have some kind of sustainability perspective on ICT use in developing country, preferably in rural areas. No discrimination as to where, in which developing countries, the studies had been performed was made because, collection of data from different areas could result in general knowledge appropriate to developing countries. Our pre-study is presented in chapter 3 and the three other studies are reviewed in 4.5. The three studies are: Batchelor, Norrish, Scott, and Webb 'Sustainable ICT Case Histories' (2003); Caspary and O'Connor 'Providing Low-Cost Information Technology Access to Rural Communities in Developing Countries: What Works? What Pays?' (2003);

Mursu 'Information Systems Development in Developing Countries – Risk Management and Sustainability Analysis in Nigerian Software Companies' (2002). The fourth study, our own pre-study is Wicander and Sundén (2004) 'Identifying Critical Success Factors for ICT Use in a Rural African Context'. This study does not have any clear sustainability approach; however the study can exemplify factors relevant to a sustainability perspective.

The four studies contributed with factors reported as influencing a sustainable ICT use. The factors constituted an input to the analysis process in chapter 5, a process which we describe thoroughly in the next section. A summary of the different data sources in the literature review and the input to the analysis process are presented in figure 2.2. In the literature review we had the ambition to include several authors with experience from a developing world context.

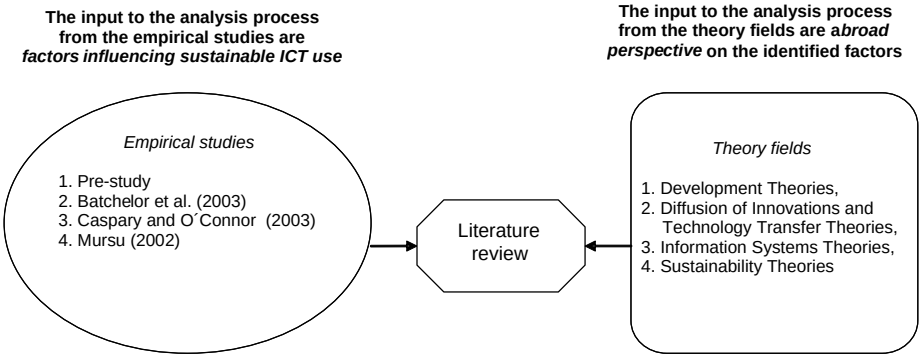

Figure 2.2. Used data sources in the literature review

2.3.3. Analysing Data

We start by presenting the research framework (Batchelor & Norrish, 2002) we used for categorising the data. Then follows a description of the data collection and data coding process, which resulted in us developing the existing framework further.

According to our aim and research questions, we use factors that influence sustainable ICT use as a unit of analysis and the analysis level is at the level of groups of individuals, e.g. communities and organisations.

For the categorisation of the identified factors we used an existing framework, the research framework developed by Batchelor and Norrish (2002), see figure 2.3, illustrated with a pentagon. The origin of the model is the Sustainability Livelihoods Framework developed by Ashley and Carney (1999). It has a focus on five capital assets: financial, human, natural, physical, and social and between which a balance has to be sought. Within this framework it is considered that sustainable systems – whether livelihoods, communities or national economies, accumulate stocks of assets; they increase the capital base over time (Batchelor & Norrish, 2003:30).

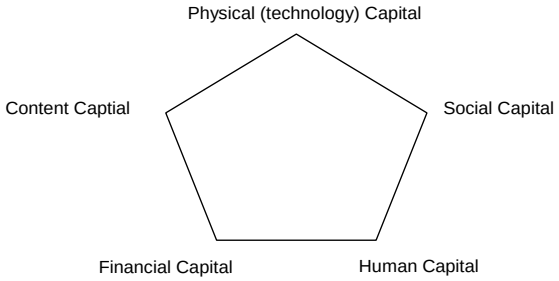

Figure 2.3. The capital assets including the Content Capital (adapted from Batchelor and Norrish, 2002:2; the origin is from Ashley and Carney, 1999:47)

Batchelor and Norrish (2002) developed the Sustainability Livelihoods Framework further by replacing 'natural capital' with 'content capital'. They emphasised that content capital is a crucial issue that needs to be considered in their ICT case studies. The framework contains five capital assets: Content, Financial, Human, Physical (technology), and Social capital.

Except for the Batchelor and Norrish (2003) definitions we use definitions from Perdan (2004), as he explores the concept of sustainable development with a focus on practical interpretation and that sustainable development depends on the context. The different capital assets are defined as follows. The category Human capital is defined by Batchelor et al. (2003:31) as "human resource training and skill development". Perdan (2004:25) uses a broader description as he sees it as "the form of knowledge, skills, health, ability to work, and cultural endowment". The category Social capital is described by

Batchelor et al. (2003:31) as "social and institutional arrangements that will keep the ICT being used for its intended social benefits". Perdan (2004:25) emphasises that it is "the institutions and structures that allow individuals and groups to develop collaboratively". The category Financial capital is defined by Batchelor et al. (2003:31) to be "mechanisms for (re)covering costs and replacing equipment". Perdan (2004:25) claims that it is "the value of which is simply representative of the other forms of capital". The category Physical capital is described by Batchelor et al. (2003:31;38) as "choice of technology…the infrastructures which enable the technologies to operate" another description is "basic infrastructure for the supply of energy, shelter, water, transport and communications, productions equipment". Perdan (2004:25) uses the concept 'built capital' instead of 'physical capital' to represent "machinery, buildings and infrastructure". The category Content capital is defined by Batchelor et al. (2003:32) as "…the information communicated by the ICT…". They argue that this capital seems to be one of the key capitals and they express this as "If the information becomes out of date or irrelevant then as this capital fails so too the whole ICT project". The analysis framework is presented again in section 4.5.1. These definitions guided us in the analysis process. In some cases we made our own interpretations of the existing definitions of the capitals. These interpretations are presented in chapter 5.

The framework by Batchelor and Norrish (2002) constituted the ground for the analysis as we had the definitions of the categories to start with – the five capital assets constituted our five categories. In our analysis work we added a level of subcategories between the categories and the factors, and the analysis model then consisted of three levels: first, the category level in the form of capital assets; second, the subcategory level; and third, the factor level. For each factor we have examples, 'indications', which act as verifications of the factor.

The three levels can be described as:

- Level 1: Categories in the form of capital assets are the main categories in the existing analytical framework of Batchelor and Norrish (2002), see figure 2.4. For the capital assets we use the definitions of Batchelor et al. (2003) and Perdan (2004).
- Level 2: Subcategories are concepts that are related to a category, see figure 2.4. The subcategories give the main categories a further

clarification and specification by answering questions about the factor such as when, where, why, and how (Strauss and Corbin, 1990:101).

- Level 3: Factors are independent variables which influence the ICT use, see figure 2.4. The factors were derived from the four empirical studies: our pre-study, Batchelor et al. (2003), Caspary and O'Connor (2003), and Mursu (2002).

The indications found in the four empirical sources constituted proofs for the factors. Further they were identified, and coded together with the belonging factor. Indications consist of: quotations from the pre-study; observations from the pre-study; conjectures from the empirical studies; and results from field studies presented in the empirical studies. Indications consisted of positive or negative statements including words like *advantage, possibility, strength, exist, success, risk, disadvantage, limit, problem, failure, belief.*

In figure 2.4 we illustrate the three levels. Another way of presenting the categorised data in chapter 5 is in tables, see table 2.1 or 2.2, where also the indications are included.

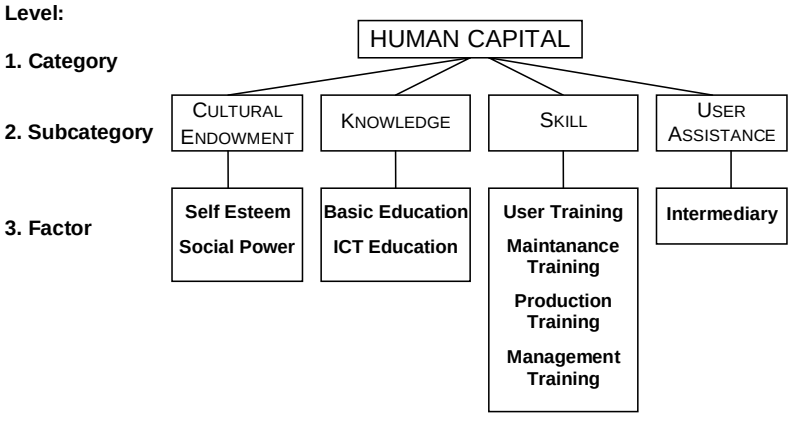

Figure 2.4. The category HUMAN CAPITAL and its subcategories and factors

Collecting and Coding Data

When we collected data we examined the four empirical data sources: our own study, referred to as the Pre-study in chapter 3, the study of Batchelor and Norrish (2003), the study of Caspary and O'Connor (2003), and study of Mursu (2002). For the latter three, see section 4.5.

The basic unit in the four empirical studies are words. Therefore we started with defining what kind of words that pointed to a factor. Typical words we defined as key words were words pointing to either limitations in ICT use or increase in ICT use.

This can be further clarified by an example from the analysed data (section 5.1). It is a phrase which is a quotation from Batchelor et al. (2003:26) "Self esteem of users... *do not* have the capacity to use technology". The two words 'do not' clearly indicate that lack of self esteem limits ICT use. In this example we defined the factor to be 'self esteem' and the complete presented indication was "...a belief that they [themselves] do not have the capacity to use technology, particularly women". See also table 2.2.

Our data collecting process is equivalent to that of Strauss and Corbin (1990:101) and their 'open coding', which is according to them, when "concepts are identified and their properties and dimensions are discovered in data".

Initially we indicated all identified key words, phrases, and sentences with a number. The use of numbers evolved to be a coding system for the categorisation of factors, see below.

The coding process continued by relating factors to subcategories and further to the categories in the form of capital assets. Subcategories are "concepts that pertain to a category, giving it further clarification and specification" (Strauss & Corbin, 1990:101). Sometimes we started with identifying the subcategory and then moved further with splitting it in pieces which led to identification of factors from the indications. At other times we identified several factors which were united under one umbrella term which became the subcategory.

The linking between the factors, the subcategories, and the categories was based on clues in the original text in the data sources. This can be described by an example from section 5.1 and the subcategory Skill. The term is taken from the

definition of Human capital, where Perdan (2004:25) describes Human capital as "the form of…skills". We defined different kinds of focuses of training to be factors representing 'skill'. The four different factors are: User training derived from Mursu (2002:237, 296), Maintenance training and Production training derived from Caspary and O'Connor (2003:29), and Management Training also derived from Caspary and O'Connor (2003:29).

All indications of the above factors are presented in table 2.1 and they all contain the term 'training'. This word helped us to categorise them together under the subcategory 'Skill'. More factors evolved during the further analysis process, and the factor User training was identified according to the combination of the terms 'user + training' also found in the indication.

We continued the analysis by tracing connections between the identified factors and the theory fields: *development theories, diffusion of innovations* and *technology transfer theories, information systems theories,* and *sustainability theories* (presented in chapter 4). For example we identified that the technology transfer theory had connection to factors within Skill. We do not illustrate these connections in the table of the developed framework in chapter 5.

Table 2.1. An example from section 5.1 illustrating the final categorisation in a table

SUBCATEGORY	FACTOR	***INDICATION*** (BY EXAMPLE)
H.3 SKILL	**H.3.1 User Training**	a. (-) "Inadequate *user training*"[3:237] b. (+) "Proper *training of users*: users will be self-supporting[3:296] c. (-) "…absence of *computer training* in schools and local administrations."[4:14]
	H.3.2 Maintenance Training	a. (+) "*Training*. Clearly, one of the keys to a successful network development lies in training people to use as well as *maintain* the system."[2:29]
	H.3.3 Production Training	a. (+) "*Training in the production* of locally relevant materials."[2:29]
	H.3.4 Management Training	a. (+) "…*training needs in the telecentre context* ought to be understood more broadly to include *reaching out to the community and strategically building a clientele* that can make a telecentre demand driven"[2:29]

This is one example of how we have derived the factors from the empirical data sources, and how we have found connections between the factors, linked to a

subcategory, which in turn is connected to a capital. In several cases we classified the data differently compared to the analysis in the original data sources. That is to say, we changed the level to another level, mostly from factors to subcategories. This is a result of our development of the framework that includes more levels than the original one.

We used a coding system consisting of unique letter and number-combinations. The coding system makes the coding process transparent as it is easy to trace identified subcategories and factors to their 'home' data sources. In this coding system each subcategory, factor, and indications got their unique letter- and number combination, see table 2.2.

The categories were given a capital letter, for example the category Human capital was given an H. Then the subcategories were given numbers, so also the factors. For example the HUMAN CATEGORY factor SELF ESTEEM with its indication a. (-) "...*a belief that they* [themselves] *do not have the capacity* to use technology, particularly women"[1:26] got the letter and number combination: H.1.1.-a. The example is a quotation that implies a negative value (-) to the factor SELF ESTEEM and the quotation is found in data source number 1 (1:26) which is the number for data derived from Batchelor et al. (2003) and the quotation can be found on page 26. The words which are in italic (in the example above the words: *a belief that they* [themselves] *do not have the capacity*) point to the words which make this example an indication of the factor.

Table 2.2. The four levels (1, 2, 3, and 4) in the conceptual framework exemplified by the category HUMAN CAPITAL and its subcategories, factors and indications

(Level 1) Category HUMAN CAPITAL		
(Level 2) SUBCATEGORY	(Level 3) **FACTOR**	***INDICATION*** (BY EXAMPLE)
H.1 CULTURAL ENDOWMENT	**H.1.1 Self Esteem**	a. (-) *"...a belief that they* [themselves] *do not have the capacity* to use technology, particularly women"[1:26] b. (+) "...female owners/operators have *experienced some social and economic empowerment* by virtue of the income the phones bring to their housholds"[2:14]
	H.1.2 Social Power	a. (-) "...traditional holders of *power* threatened by innovations"[1:26]

The number system used for identifying the data source needs a description. The first raised number indicates the data source: 1 = Batchelor et al. (2003); 2

= Caspary and O'Connor (2003), 3 = Mursu (2002); and 4 = Wicander and Sundén (2004)[1]. The second raised number gives the page number. For example, in table 2.2 the 'H.1.2 a' indication states that "…traditional holders of *power* threatened by innovations"[1:26] where the first raised number '1' indicates that the quotation is taken from Batchelor et al. (2003) and the second raised number '26' gives the page number.

The letter and number combinations helped us to make the work easier and to get a general view over the data. The combinations were also used in the iterative process of tracing the data from the data sources and sorting it into the conceptual framework, which is manifested physically as a series of tables.

We also use a coding system when we describe the framework in chapter 5. The capital assets are written in capital letters 'HUMAN CAPITAL'. The subcategories are written in small capitals 'CULTURAL ENDOWMENT'. The factors are written in extra bold type '**Self Esteem**'.

The overall research design as well as the methods used in the analysis process, have been presented in this chapter. The next chapter presents our pre-study which contributed the ten so called Critical Success Factors important for the analysis process. It also contributed with ideas which led to the grounding of the presented factor analysis. Another way of using the concept of 'success factors' when creating a framework is made by Björck (2005).

[1] The page references to Wicander and Sundén in the tables refers to the original chapter, ICT Use in a Rural Zambian Context – Local Conceptions Expressed as Critical Success Factors. In *Risks and Challenges of the Network Society*, edited by Duquennoy, P., Fischer-Hübner, S., Holvast, J. and Zuccato, A. Karlstad University Studies, 2004:35.

3. Pre-Study on ICT Use in a Rural Zambian Context

This chapter describes the pre-study which consists of a field study performed in a rural part of Zambia in year 2000. It has been presented earlier at a conference (Wicander & Sundén, 2004, Proceedings of the Second IFIP 9.2, 9.6/11.7 Summer School). In this chapter we have made some minor changes, mainly in section 3.1 Introduction, where we have reduced the section as it has much in common with chapter 1 in this thesis.

In this thesis the pre-study has contributed with reflections that guided us in the selection of theory fields, previously mentioned in chapter 2, and with the ten so called Critical Success Factors important for ICT use. The Critical Success Factors can be considered to be relevant in the analysis of critical factors influencing sustainable ICT use, even though the pre-study does not have an explicit sustainability perspective.

By way of introduction we must clarify the mixing of the words 'implementation', 'utilisation' and 'use' in this chapter. Even if all three words are used we do not make any distinction between them, as we consider they describe the same thing, the ICT situation and the use of ICT, actual as well as planned.

3.1. Introduction

The objective of this study is to contribute to the analysis of the ICT situation in rural Zambia. The study aims to identify Critical Success Factors essential for ICT implementation and use within a district in Zambia. Data was collected during a two-month field study in the eastern part of Zambia in 2000. We carried out interviews with people of different occupations. The study provides a characterisation of the ICT situation in a rural Zambian context based on conceptions expressed in interviews with local people. The factors range from national to local level. Notably, the Critical Success Factors are not limited to technology. In fact, most Critical Success Factors in our study relate to socio-cultural and governmental issues, which need to be addressed before and parallel to technological solutions.

In developing countries approximately 80 percent of the population lives in rural areas, the figures are even higher for Zambia with 85 percent living in rural areas (Hesselmark & Esselar, 2002). By definition, rural areas are those geographical areas which are affected by varying levels of 'peripherality', depending on their distance from economic markets and their access to services (Grimes, 2000). Compared to urban areas the access to ICT is very limited in most rural areas. Few studies, however, have been conducted in rural areas in Zambia.

The present study was performed in Zambia, one of the poorest countries in the world according to the Human Development Index (World Development Indicators, 2002). Zambia is a country facing a number of severe challenges such as high level poverty, the impact of HIV/AIDS, unsatisfactory performance in the agricultural sector, gender inequalities and a poor management public sector (Hesselmark & Esselar, 2002).

Tentatively, we present our results in the form of 'Critical Success Factors' which are meant to pinpoint factors that are relevant for success or failure concerning ICT implementation and utilisation within a context of a rural district. There are possibly many more factors to take into consideration for success in any given situation, that is, even if our Critical Success Factors are met, an ICT implementation can fail. We do not argue that the number of factors is complete. Neither have we argued any logical order among the different Critical Success Factors. Many of the Critical Success Factors may seem fundamental and as a matter of course. However, to make the presentation of our analysis complete and to make it possible to compare our results with other empirical studies, all key factors perceived by the interviewees are presented here. The factors range from a national to a local level. The factors belong to five key areas: economy, infrastructure, knowledge, service, and technology.

Our study is limited to strategies and solutions concerning Critical Success Factors and the relation between specific ICT tools and the Critical Success Factors. The chapter is structured as follows. First, we give a brief introduction to Zambia, to Lundazi District, and to the information technology situation within the country. Next, we provide a description of the above mentioned problem areas and then argue for locally identified factors for failure and success. This is followed by a section concerning our research method. Then

the results are presented expressed as ten Critical Success Factors. Finally, we give a short summery of the study.

3.2. Zambia – A Brief Introduction

The Republic of Zambia, located in the inland of Southern Africa, has a population of approximately 9.5 millions. Lusaka is the capital and largest city with approximately 1 million inhabitants. Life expectancy is 38 years and the country's population is made up almost entirely of members of the Bantu ethnic and linguistic group. English is the official language, and approximately 75 African languages and dialects are spoken. Most of the population follows traditional African beliefs; about 20 percent are Christian.

Some 85 percent of Zambians work the country's relatively infertile soil as subsistence farmers; commercial agriculture is mostly confined to a small number of large farms. The mining and refining of copper constitutes by far the largest industry in the country. By the end of the twentieth century, the standard of living in Zambia was about half what it had been in the mid-1960s, before copper prices began falling. Unemployment and inflation were high, and the country was threatened by the unprecedented prevalence of deadly AIDS/HIV infections. Zambia is ranked 153 on the Human Development Index (Encyclopaedia; UNDP, 2002; Hesselmark and Esselar, 2002).

3.2.1. The Local Context - The Lundazi District

The study was conducted in Lundazi District, which is one out of seven districts in the Eastern Province and is situated 800 km northeast of Lusaka. In this district 95 percent of the population are small-scale farmers. The road network is insufficient and some roads are impassable during the rain season (New Encyclopaedia Britannica, 'Zambia', 1990). A population census was taken in 1990; the population statistics from this period showed that Lundazi district had 179,414 inhabitants and the estimated population of 2000 is 267,000 (personal communication, D. Sikazwe, Council Secretary at Council Department, September 27, 2000).

3.2.2. The Information and Communication Technology Situation in Zambia

In 2000, Zambia, under the leadership of the Ministry of Information and Broadcasting Services, developed an ICT policy. The document articulates the need for Zambia to come out with a broad-based information society policy with emphasis on the development of physical infrastructure, promotion of universal access, human resources development, by launching electronic government, the development of ICT sector and creation of job, harnessing ICT by small and medium enterprises particular the electronic government, the electronic commerce and the promotion of applications in education, environment, livelihood and health (National Information and Communication Strategies).

Although the information technology market is very limited in Zambia, the market is growing. Academic, commercial, non-governmental organisations and the Government are introducing computer applications in their operations in order to enhance efficiency and productivity. Telecommunications are adequate, but not reliable and mobile cellular service is currently offered in Lusaka and in urban areas (FY 1998 Country Commercial Guide: Zambia, 1998). The telecommunication density is in the four major cities 2.01 per 100 persons, whereas in rural areas it is estimated at 0.09 per 100. That is 9 telephones for every 10,000 people living in rural areas (Kakubo, 2000). Hesselmark and Esselar (2002) state that telecom costs in Zambia are very high, especially when incomes are considered. For example, Internet bandwidth is about 210 times more expensive in Zambia than in Sweden.

Zambia has four licensed Internet Service Providers. These four providers have approximately 6,500 hosts, which represent about 20,000 users (Kakubo, 2000). Jensen (2000) states that the most common Internet users in Zambia are males and the large majority of the users are well-educated.

3.3. Five Problem Areas

We identified five key problem areas discussed by various authors concerning ICT in developing countries, e.g. Odedra-Straub (1993), and Zappacosta (2004). The problem areas are: economy, infrastructure, knowledge, service, and technology. They are mostly described in a comprehensive and general manner, and not in relation to a specific geographical or social context. In our study we decided to give the problem areas a contextual framing, see figure 3.1. The

intention is to highlight these five problem areas in the local context by developing a set of Critical Success Factors based on the conceptions expressed by our respondents. Our analysis resulted in ten Critical Success Factors, each of which is related to one of the five problem areas. Before defining the concept of 'Critical Success Factor' we present the five problem areas in figure 3.1.

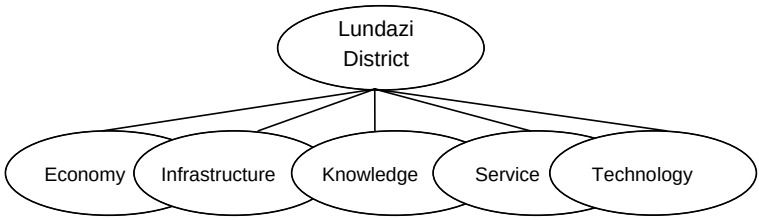

Figure 3.1. Five problem areas

The economic situation is essential for ICT implementation, considering both the short term and long term. Moyo (1996) stresses the importance of a sound macro-economic policy framework to enable development of ICT in Africa. Furthermore, co-operation between national and regional levels is needed to stimulate ICT investments in areas of mutual interest. Lack of funds has meant that ICT has not been developed in some Sub Saharan countries according to Odedra-Straub (1993). These statements are also valid for Zambia according to Hesselmark and Esselar (2002) and Kunda and Brooks (2000). Mansell (1999) discusses investments in telecommunication infrastructure in developing countries and concludes that heavy investments are required if the goal is community access.

One of the most common problems for ICT development in Africa concerns infrastructure (van Audenhove, 2000). Telecommunication networks are either nonexistent or under-dimensioned. According to Odedra-Straub (1993) there is an unmet demand and low diffusion, combined with poor quality and unreliable service. Moyo (1996) claims that the infrastructure has improved for telecommunications and power supply. On the other hand, Zambia has suffered from a decade long deficit in infrastructure ICT investments. This has caused a weak ICT infrastructure with inadequate internal and external transmission capacity. Rural electrification in Zambia is not widespread and follows mainly a narrow belt along the railway from Livingstone in the south to the Congolese boarder, in the north. The national power supplier ZESCO does not yet have a rural electrification plan (Hesselmark & Esselar, 2002).

A third problem area is the apparent lack of knowledge of ICT in the African society at large (Moyo, 1996). One of the most common problems faced by many African organisations is the shortage of skilled personnel, because many countries lack the necessary education and training facilities (Odedra-Straub, 1993). The quality of ICT training available in Zambia at public and private schools is in many cases low and out of date. To mention, the University of Zambia has one Institute of Computer Studies with three staff members (Hesselmark & Esselar, 2002).

A fourth problem area is 'service'. A common obstacle to efficient use of ICT in Africa is lack of ICT suppliers, which is a result of the absence of a local ICT industry. Poor delivery of ICT equipment is another barrier for the ordinary use of the ICT equipment (Odedra-Straub, 1993). The problem is that the vendors which are present do not offer 'total solutions', they are focused on selling hardware and software, but not providing support (Moyo, 1996). Kakabo (2000) points out a couple of restrictions for wider ICT use in Zambia: the shortage of repair facilities and the limited number of skilled software experts.

A fifth problem area is that the construction of hardware and software does not give sufficient attention to the local context (Mansell, 1999; Mao, 1999; Odedra-Straub, 1993). The applications are developed and designed for markets in industrialised countries, which are then transferred to developing countries with little concern about the need for technical modification or the importance of local content, as well as skills or training. Moyo (1996) emphasises that software engineering is a cornerstone for successful technology adaptation, which focuses on the requirements of the African environment. According to Kunda and Brooks (2000) the methods and techniques for component based development are most often inappropriate to developing countries because they generally do not take account of the socio-cultural context of developing countries.

3.4. Failure and Success in a Local Context

The context is essential when implementing ICT and Avgerou (2001) argues that it is crucial to use information about the local context in the development of ICT solutions. Keniston (2001) claims that one reason for failure in developing countries is that ICT developers know almost nothing about factors that influence the success of ICT projects. For many ICT installations in

organisations in developing countries, local factors were not taken into account. This resulted in outcomes that did not fit the needs of a developing nation (Okunoye, 2002). Furthermore, Lind (1991) states that many enthusiastic ICT projects in developing countries were launched where computer solutions, that were successfully implemented somewhere else, failed to perform. This was often because actual reality was never fully understood according to local values, authority patterns, rationality, and time concepts.

There are many different studies identifying factors, which are important for successful ICT implementation in different organisations or in different countries (Palvia, Palvia & Roche, 1996; Mao, 1999; Mansaray, 2000). Odedra-Straub (1993) is another spokesman for basing ICT solutions on the actual context. She says there is a need to identify factors which may influence success and failure and to identify factors which may be unique to the context. We are not planning an ICT implementation, but we think that presenting specific circumstances, as we do in this chapter, is important for informing the theoretical debate.

What is meant by a Critical Success Factor (CSF)? The concept CSF has been used in a variety of contexts and for different purposes within ICT research. The concept was first discussed in management literature by Daniel (1961). Rockart (1979) used the concept to identify the real information needs for managers to attain organisational goals when designing information systems. CSF are some factors, according to Rockart (1979), that are decisive for a business or an organisation to be successful or not. The factors must be handled in a correct way to reach the intended result and a sustainable development. In other words, the CSF must be positive or develop in a positive way to yield success within an organisation or within a company. We use the concept CSF in the sense of factors which are necessary but possibly not sufficient for bringing success into a project. Concerning the use of the concept CSF in a developing country context, it has already been used for instance by Odedra-Straub (1993) in her "Critical Factors Affecting Success of CBIS: Cases from Africa". Her paper is based on research conducted in a number of public sectors in Sub Saharan Africa. Also Mao (1999) uses the concept in his paper "Information Systems Success Factors in China" with the aim to depict the factors that affect development of ICT in China and to propose a list of CSF pertaining to the current and future success of ICT development.

3.5. Planning and Carrying out the Field Study

This study uses a qualitative, abductive and descriptive research approach to gain understanding and develop new knowledge about an undocumented and distinctive research area and to develop fundamental knowledge that is needed to be able to solve problems within this specific context.

The field study in Lundazi town and in the villages within Chief Pikhamalaza area was undertaken in a period of eight weeks in 2000. The research object was the conceptions of our respondents concerning the local ICT situation. We selected the respondents systematically with the help from a key informant and we tried to get a varied set of respondents by choosing them from different areas of activities, namely education, aid agencies, local government and farming. We carried out 33 interviews with people from these various settings. Interview length varied; they lasted from half an hour to one and a half hour. In twelve of the interviews an interpreter was used, because the interviewed person was not English speaking. Tape recording was used in all interviews and they were transcribed in full length the same day. Notes were taken during each interview, however not very extensively. Follow-up questions were used to trace themes and dissolve ambiguities and other unclear issues.

We were convinced that the questions would be more valid if we had the opportunity to have an insight in the local society and to learn about local conditions. Therefore, the questionnaires were written in Zambia. Observations and archival documents resulted in five question areas related to the five problem areas: the funding ability by the local government; availability, quality and capacity of telecommunication and electricity infrastructure; ICT experience and ICT education; ICT support; and adaptation of ICT.

We started the interview with the respondents who, according to our key informant, had the highest expected knowledge about the local ICT situation. Further, the interpretation of the answers from those respondents guided the wording of the questions for following respondents. Consequently, the interview sessions started with aid workers and officers at the local government and were then followed by students and farmers. The interviews addressed issues such as: background and demographic questions; opinion and value questions about ICT; experience and behaviours questions about ICT.

We used direct observations as a second data collecting method. Yin (2003) claims that making a field visit to a research site can create the opportunity for direct observations. This approach enabled us to gain access to the complex nature of actions and the social world of the respondent. Hence, we could collect data based on relevant behaviours or environmental conditions, such as the location of computers in the interviewed person's office. We made the observations mostly in connection with the interviews, and the data were collected in an observational protocol.

Finally, we used archival records as a source of information. The archival records had the form of: maps of local geographic characteristics, census records, and organisational charts. In addition we received an oral description from Chief Pikhamalaza about the local context.

3.6. Ten Critical Success Factors

The analysis started by interpreting the observational protocol and the transcribed interviews. We fragmented the data and aggregated individual utterances in relation to the question areas. Thereafter we made a further interpretation of the data in relation to the five problem areas. Then we searched for concrete examples within each critical problem area. We considered this to give a picture of the ICT situation in the problem area.

We found ten distinct factors that could be called Critical Success Factors, by coincidence distributed evenly over the five problem areas, see figure 3.2. They can be seen as capturing the essence of notions and conceptions expressed in the interviews about success and failure regarding ICT usage in Lundazi District.

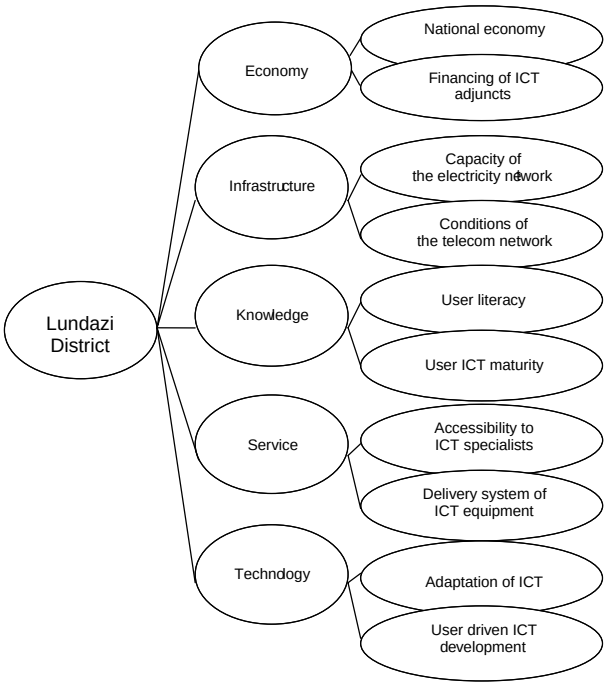

Figure 3.2. The ten Critical Success Factors

The ten factors are presented below. For each factor a quotation from our interviews is given, followed by a short commentary on the nature of the factor.

I. **The national economy within a country is a Critical Success Factor.** "No, no computer. The computers are governmental founded and they have no money." (A Senior Officer at Lundazi Local Government). The economic status of the country will strongly affect the possibility of implementing ICT. In our study, we found that neither the national government nor the local ministries had the financial means to make an investment in ICT. The computers that were available within the district were funded by international development agencies.

II. **The financing of ICT adjuncts is a Critical Success Factor.** "No, not connected. I would like to be connected, but I am not able to pay the connection." (A Senior Officer at Lundazi Local Government).

Financing of both accessories and spare parts for ICT equipment is also dependent on the economical situation within the organisation. The economic situation is also relevant for the possibilities to finance different fixed charges as an Internet subscription. We noticed during our study that a lack of accessories resulted in an inefficient use of the available ICT equipment.

III. **The capacity of the electricity network is a Critical Success Factor.**
"There we have a problem! We are not using the computers so much, because when we want to use them we have no electricity." (A Senior Officer at Lundazi Local Government). The capacity of the electricity network will affect the use of ICT. The electricity supply within our research area was both insufficient and unstable. The access to the electricity net was interrupted constantly and the ICT users could only expect a supply of electricity for three to four hours per day. This resulted in problems with planning the use of the computers, lost files and even computer breakdowns.

IV. **The condition of the telecom network is a Critical Success Factor.**
"…the shortage of available connections in the district." (An aid worker). The condition of the telecom network will influence Internet connection. The telecommunication network within the district consisted of only a few fixed lines with poor quality. This results in occupied lines as well as repeated interruptions when accessing to the Internet. Another effect from the limited access to the telecommunication network is problems with downloading information from the Internet. This resulted in difficulties with planning the use of Internet and forced users to operate during night time.

V. **User literacy is a Critical Success Factor.**
"As a matter of fact, Zambia has among the highest level of illiteracy in the world; about 20 percent to 40 percent of the adult population is illiterate." (An aid worker). To be able to handle a computer efficiently the user must have a basic knowledge in reading, writing and counting. Within our district we assume that the level of illiteracy was at least 40 percent as the majority of the local population are farmers with limited possibilities of attending school. We believe there is a relation between illiteracy and ICT illiteracy.

VI. **User ICT maturity is a Critical Success Factor.**
"We have been taught that in the future we will be using computers in any job, but I don't know the reason." (A student at Lundazi Secondary School). The users ICT maturity is of importance in the wider perspective of ICT usage. In our research district there was no computer education, neither within the school system nor within the local governmental administration. This was, according to our respondents, due to the districts rural location. This resulted in a limited knowledge concerning ICT and limited ICT awareness concerning capability.

VII. **The accessibility to ICT specialists is a Critical Success Factor.**
"If the computer is broken we have to take it by car to Lusaka. Someone here in Lundazi should be able to repair the computer." (A Senior Officer at Lundazi Local Government). The accessibility of ICT specialists such as service and support staff is necessary to keep the ICT equipment functioning. In our research district there was no possibility of receiving ICT support or service. In case of a computer breakdown the user had to transport the computer personally by bus, either to the province town Chipata, 200 km away or to the capital Lusaka, 800 km away. The time taken to get the computer repaired could vary from one week up to two months.

VIII. **The delivery system of ICT equipment is a Critical Success Factors.** "All accessories are found in Lusaka, and it is not easy, you have to go there in person, you can not send any accessories by post." (A Senior Officer at Lundazi Local Government). There is a need for an efficient and functional delivery system of ICT equipment. In Lundazi district the postal service was not reliable and there was always a risk of losing the item. Furthermore, the postal service in the district was not frequent and this resulted in difficulties with delivery of ICT products. Furthermore, the delivery time could range from a couple of days up to several months.

IX. **The adaptation of ICT is a Critical Success Factor.**
"The cost for software licenses cannot be of Western dimension; instead it must be adjusted after the presumptive users' economic capacity." (An aid worker). It is imperative to adapt ICT to the local condition and its disposal resources. In our research area the resources were very limited

and the concept of open source and open net could make a wider ICT use possible. Moreover, the technology needs to be adapted to the physical environment. In our area there is a need for robust ICT equipment considering the high temperatures, high humidity and dust in the area.

X. **A user driven ICT development is a Critical Success Factor.** "It is important that there is a soft meeting between the individual and the technology where the technology as much as possible must adapt to the user." (Not explicitly expressed but inferred by Sundén and Wicander, 2003). The development of ICT applications together with the user is key. The development process should start by investigating the socio-economic and cultural characteristics within the area. The process should continue by identifying and analysing the needs of the local area and the users' demand. In the geographical area focused in our study, we noticed a great need for information in the local language.

3.7. Summary of Findings

The objective of this study was to provide a characterisation of the ICT situation in a rural Zambian context based on the conceptions of local people. The success or failure of ICT implementation and use are connected to the local context. In advance, we identified five main problem areas, namely: economy, infrastructure, knowledge, service and technology. When extracting ten Critical Success Factors from the local opinions collected in interviews, we were able to relate them to these five problem areas.

In terms of economy we found that lack of funds is a major obstacle to ICT implementation and to the necessary upgrading of ICT accessories and spare parts. Neither the national government nor the local ministries had the means to invest in this area, and the lack of accessories resulted in inefficient use of the available ICT equipment. The second key area of relevance to ICT development is infrastructure. Insufficient power supply and telecom connections severely affected computer usage. Frequent interruptions, occupied lines, and electricity time limits impeded usage. This situation was further aggravated by inadequate user literacy and ICT maturity, which relate to the knowledge area. The lack of basic skills in reading, writing and arithmetic was compounded by the absence of computer training in schools and local

administrations. Similarly, the absence of ICT specialists and reliable delivery systems made service a problem area. The unavailability of specialists and equipment meant non-functioning computers. Finally, in the area of technology we observed a general disregard of the need for technical adaptations to local conditions and user-friendly applications.

Our study in a rural Zambian district suggests that Critical Success Factors in regard to ICT implementation and utilisation in peripheral and rural districts are not limited to technology itself, not even those factors belonging to the technology and infrastructure problem areas. In fact, most Critical Success Factors in our study relate to socio-cultural and governmental issues, which need to be addressed before and parallel to technological solutions. Successful future ICT implementation and utilisation in peripheral areas will depend on the extent to which all relevant factors for success or failure in a specific context have been identified and taken into account.

3.8. Reflections Raised During the Pre-study

Our pre-study resulted in the ten Critical Success Factors related to the five identified problem areas, but it also resulted in reflections which we did not deal with in the pre-study. Our thoughts emanated from the observation that there were ICT equipment physically present but, according to our observations and answers from the local people, it was seldom or never used. In other words, we observed a 'failure'.

The equipment had been donated from international aid organisations, according to the respondents. One can assume two things, first that the purpose of the ICT equipment was to support local development. Second, because the equipment was not in use, there had been no or little attention to investigate the local users' needs. We started to discuss what ICT failure in developing countries is a phenomenon of and how one can problematise it. We started to raise questions in order to find causes to the stated failure.

The reflections raised during the pre-study are summarised below:

- What is the history of development in developing countries? And what are current trends among international aid organisations in the fields of development? How is the view on technology and ICT in developing theories? Why do international aid agencies donated ICT equipment?
- What is affecting the spread of ICT?
- What is the history of the IS research? And in what way are users discussed in the IS theory? Furthermore, about failures of IS or ICT projects, how are they explained? How can we understand the concept success and failure?
- How can ICT use be viable in the long-term? How can the existing resources be used?

The reflections constituted a ground for us to investigate certain theory fields in the further work. The theory fields are presented in next chapter, chapter *4 Theoretical Foundation and ICT Studies*.

3.9 The Pre-study's influence on the present work

Our pre-study identified five problem areas concerning ICT in developing countries: economy, infrastructure, knowledge, service, and technology. The problem areas constituted the analytical model for the pre-study as we related the Critical Success Factors to the above areas.

The problem areas furthermore constituted the background when we searched for an analytical model to treat data for the present study. In particular we looked for models spanning a broad spectrum of factors. Eventually we employed an existing conceptual framework of Batchelor and Norrish (2002). Their framework has much in common with our problem areas as the conceptual framework of Batchelor and Norrish contains five areas, named 'capital assets': Content capital, Financial capital, Human capital, Physical (technology) capital, and Social capital. However, there is one salient difference between the two analytical models. The framework of Batchelor and Norrish includes one specific category, viz. Content capital, which does not match our categorisation of problem areas. They hold that Content capital is a crucial issue that needs to be considered concerning ICT and they define it as "the information communicated by the ICT" (Batchelor et al., 2003:32). The

similarities between the areas and capitals are listed below (note that the Content capital is missing):

The Five Problem Areas	**The Conceptual Framework**
• Economy	Financial Capital
• Infrastructure	Physical Capital
• Knowledge	Human Capital
• Service	Social Capital
• Technology	Physical Capital (again)

The analytical framework of the present study was introduced in section 2.3.3 and is further elaborated in 4.5.1.

4. Theoretical Foundation and ICT Studies

"Theory is our chronically inadequate attempt to come to terms with the infinite complexity of the real world. Our quest should be for improved theory, not best theory, and for theory that is relevant to the issues of our time" (Walsham, 1997:478)

When defining a frame of reference for our study there are several theories to choose between. As our research questions are multi-disciplinary in character it requires a multi-theoretical foundation. Our pre-study resulted in a number of final reflections and questions. As the questions are widely spread we have to use different research fields in order to find the appropriate approaches. Also, as the findings from our pre-study are based on local opinion there is a need to anchor them in theory and to give them a more general character by relating them to other empirical findings.

These different theory fields are labelled theoretical foundation as we see them as a base for our study. The theoretical foundation is constituted by four theory fields, starting with *development theories, diffusion of innovations* and *transfer theories*, followed by *information systems theories* and ending with *sustainability theories* with focus on sustainability and ICT. The different theories will give a wider meaning and contribute to the overall understanding of our research problems. We believe that when 'old' theory fields meet on new arenas new knowledge is created in this multi-disciplinary meeting.

Even if this theoretical foundation is extensive we think it is essential in order to understand the entirety. It is impossible to understand a complex problem if one reduces it too much. It is also impossible to understand the relevance of a research question if one does not put it in a wider context. In order to understand the whole you must look at the parts. This is in line with the system approach and the holistic perspective we have applied to this study. Our ambition to reach an entirety view demands a wider theoretical perspective.

We will introduce the different theory fields by defining some key concepts, followed by a history and background. We will move from a general level towards a more situation specific one ending up in matters concerning ICT in developing countries. We will move from a general discussion towards a focused discussion dealing with our research area that is ICT use in developing countries with special interest in rural areas.

The different theory fields will be approached from a historical perspective in order to understand the position of this study. It is obvious that a theory does not just 'pop up'. It has always a connection to the prevailing political and socio-economic situation. Further a theory is dependent on previous theory buildings within the same field as well as from theories from other research areas. Concepts are also spread from one research field to another as different theory fields influence each other. Examples we have noticed during our study are term like *participatory*, and *sustainable*. These terms seem to be so called buzz words and they both appeared during 1970-1980.

As this is a multi-disciplinary study with a multi-theoretical foundation it implies that readers are also from multiple fields with multiple backgrounds. As a courtesy to our readers we have therefore chosen to present a historical review and conceptual clarification within each theory field. With this follows that to some readers the historical review and the conceptual clarification may appear elementary while for others it may give a basic understanding of the character and context of our research problem.

As in the quotation of Walsham above, 'theory' is about trying to understand a complex world and complex problems. In the following parts of this chapter our aim is to be a part of this complex problem solving process. The chapter starts with section *4.1 Development Theories* followed by *4.2 Diffusion of Innovations and Transfer of Technology Theories*, followed by *4.3 Information Systems Theories*, and *4.4 Sustainability Theories*. Then, in section *4.5 Three Studies with Focus on ICT and Sustainability*, we present the three empirical sources we will utilise. The chapter ends with a section, 4.6, that explains the contribution of this chapter to the framework.

4.1. Development Theories

Development theories concern changes in society and belong to the research fields of economics and political science. On account of the reflections from our pre-study about the essence of development we find it logical and fruitful to include this theory field in our work. The understanding of development theories will be advanced by both conceptual clarification and more attention to history. In this chapter we aim to problemise the concepts of development and developing countries because these concepts are essential for the further discussion. Furthermore, we aim to discuss what development theories imply

through a review of the historical development looking at different paradigms, and to go deeper into one of the more well-known theories within the prevailing paradigms of today. Finally, we discuss theories on the relationship between development and technology with special interest in ICT.

4.1.1. Key Concepts

Within the discourse on development we have identified two key concepts: *development* and *developing countries*. Furthermore, the concepts *modernisation* and *globalisation* we see as related to them and they are also treated in this section. Both modernisation and globalisation are often used as synonyms to 'development' in literature and debates on international development.

We start by looking at various authors who define these concepts; we then discuss the concepts in order to highlight similarities and differences. The concept 'developing countries' will further be discussed in section 4.1.2.

Esteva (1992) expresses 'development' as "a change towards a desirable goal". Järvelä and Kuvaja (2001) develop this further as they define the concept as considered to represent "a positive social and economic change, as well as the policies to achieve it". A focus on economic development can be seen in this definition as well as in the following definitions: "Development is about the creation of economic (often market) 'value' as natural resources are transformed into 'goods', into commodities. The process of economic development involves the substitution of resources by human-made capital." (Redclift & Sage, 1995:1). Meier (1980:1) expresses it as "Development is a process of cumulative change that results from positive forces that raise productivity".

Max Weber (1966) introduced the concept pair 'modern' and 'traditional'. According to Weber, modernisation is "primarily a question of rationalisation and bureaucratisation was an effect of this rationalisation processes". According to Hettne (1990), modernisation is "equivalent to economic growth and in which communities are seen as passive objects". Järvelä and Kuvaja (2001) argue that modernisation as a concept "does not evaluate social changes, either positive or negative and that modernisation exists in every society, but in different ways and pace". Modernisation concerns the whole society, including economic, social, and political structures (Preston, 1986). Further, in the debate

modernisation is closely related to industrialisation. Modernisation can also be defined in terms of relationships expressed as 'relations determined by achievement' (Leys, 1982). The concept traditional is, by the same author, characterised by social relationships like 'kinship, nobility, and serfdom, which are determined by birth' (Leys, 1982).

During the most recent period, since 1990, the concept globalisation has been much in use. The phenomenon as such is not new; actually we can say it started, from a European perspective, 1498 when Columbus reached the American continent. But it is the magnitude that has changed the last decades. Globalisation can be seen as 'a world system, a world economy, which has expanded steadily and covers most of the world' according to Hettne (1990). McGrew (2001) refers the concept to the ways in which changes in one region can rapidly come to have significant consequences for quite distant regions of the globe. Further, globalisation is facilitated by technological shifts and especially 'the information revolution'. The strongest underlying driving force behind globalisation is that communication has become faster and faster at the same time as cheaper and cheaper (de Vylder, 2002). In this sense globalisation has been expressed as "…the widening scope, deepening impact and speeding up of inter-regional flows and networks of interaction within all realms of social activity from the cultural to the criminal" (McGrew, 2001). But most developing countries have only a marginal participation in the globalisation process (de Vylder, 2002).

The globalisation issue will be further discussed in relation to the post-development approach ahead. The opposite of globalisation is labelled *localisation* with focus on changes on a local level (Naisbitt, 1994). We will go deeper into the concept localisation in section 4.4.

Now, what are the similarities and differences between the concepts? To start with, one can establish that there is no common and univocal definition of either one of the concepts. The definitions are more suggestions of what the concept should imply in particular contexts.

In our opinion the concepts are all closely associated with words like growth, evolution, and maturation. Further, the definitions are more about material things and tangible needs than about immaterial and intangible needs. But they differ in extent. Modernisation is the one most concerned with material things

in our opinion. Development, on the other hand, implies a more qualitative change. And this change is also likely to appear in institutions and in a change in attitudes and values. The change is social and cultural as well as economic (Meier, 1980). One more way to define development could be 'satisfying both material and non-material needs'. In accordance, its opposite, underdevelopment, can be defined as 'no change, not enough change or not the desired change all resulting in unsatisfied needs'.

We can see the three concepts as a way to describe change of a society over time, but they differ in time scale. Development as a concept can be used throughout history, while modernisation is related to the time after industrialisation and finally globalisation became more relevant during the 1990s. Further, all three concepts are related to new technology. But while development is connected to new technology in general the other two are linked to specific technological occurrences: industrialisation and digitisation.

The concepts are all complex, political and controversial. The concepts also presume a polarisation or dichotomy like development versus under-development; modernisation versus traditional; and globalisation versus localisation.

Further, all three can be regarded as relative concepts. Every society could be considered as underdeveloped, traditional and local in some aspect at the same time because a completely developed, modern and globalised society is utopian because there are constantly new needs and demands to satisfy. In addition, it would be logical to introduce the concept 'overdeveloped' in order to make the different states of development complete. Though, the concept is not commonly used in the debate. 'Overdevelopment' can be seen as an expression for development that has created huge problems. The issue of overdeveloped has clear connection to the issue of sustainable development and we consider that the sustainability approach is about a process searching for more knowledge to be able to solve the problems. Sustainable development and 'overdevelopment' will be further discussed in chapter 4.4.

We can also state that the three concepts are a matter of solving problems at the same time as new problems are created. This in turn is governed by the resources that are offered in a given moment. The concepts are also about the human consciousness about its own situation and problems. Further, it is also

about a process towards a growing standard of living together with a search for more knowledge.

Finally, we argue that the concept of development can not be used as totally equivalent to the concepts modernisation and globalisation as indicated in the popular belief. We find the concept development to be the most appropriate to our study as it implies a more qualitative approach. Development could be summarised as 'growth and change'. A synthesis of similarities and differences concerning the discussed concepts is shown in table 4.1 Key concepts – similarities and differences.

4.1.2. History and Background

In this section we will give a background and history to development theories including different assessments of development. The theory field has its roots in the beginnings of the liberation of the former colonies. During the colonisation period we can notice an exotic and arrogant attitude in everyday language towards colonies. The population of the colonies was described as 'primitive' and 'natives', or 'barbarian' and 'uncivilized' (Hettne, 1990). The societies were described with terms like 'backward societies' or 'emergent nations' (Alavi & Shanin, 1982).

After the Second World War we notice a change in the vocabulary. In President Truman's speech from 1949, the majority of the world's population were no longer seen as diverse peoples, but as a homogenous group characterised by their condition of underdevelopment (Esteva, 1992; Nustad, 2001). A UN report from 1951 (Measures for the Economic development of Under-developed Countries) can be seen as the starting signal for the international development discourse. Following this the concept 'underdeveloped country' became accepted usage for a majority of the world's population as underdeveloped countries comprised three-quarters of the population. However, the concept 'underdeveloped' was not considered political and diplomatic correct during the 1960's and the political establishment instead preferred to speak about 'developing countries'.

During the 1950's the so-called 'cold war' was the root for a division of the world into three parts, or blocks, and also three concepts. The Western market economies were called the 'First World'. There was the 'Second World',

including eastern countries with the Soviet Union and the other socialistic countries. And finally, there was the 'rest', the 'Third World', including Africa, Latin America, and Asia (Hettne, 1990). Hence, the concept 'Third World' was used as synonymous with developing countries. The Third World consisted of the new independent nations that looked for their own line of self-government, a 'third national way'. During a meeting in Bandung, Java, Indonesia, 1955 they were identified as the Third World (Volkow & Avgerou, 1995).

But, according to Amin (1997), it is not correct to characterise the developing countries as a homogeneous group but consideration must be taken to the differences in economic development. During the post-war period industrialisation also took place among many developing countries, mainly in Asia and Latin America, and Amin suggested that the old system was transformed to differentiate a semi-industrialised 'Third world' from an un-industrialised 'Fourth world', see table 4.2. Synonymous concepts that are used in the debate for the Fourth group are 'despaired cases' or 'worst off', together with the official UN term 'Least Developed Countries' (LDC) or 'Low-Income Countries' (LIC) which is the term used by the World Bank. The semi-industrialised countries could further be divided into three different groups concerning their trade and export:

1. Oil exporting countries (e.g. Arab countries, Nigeria, Indonesia),
2. Raw material exporting countries (e.g. Chile, Zambia),
3. Industrial producing exporting countries (e.g. South Korea, Taiwan, Mexico, Malaysia)

Table 4.1. Key concepts – similarities and differences

KEY CONCEPT	**Approach**	**Time Scale**	**Relation to Technology**	**Characteristics of dichotomous concept**	**Main needs**
Development	- a positive social and economic change towards a desirable goal as well as the policies to achieve it that is satisfying both material and non-material needs	~1950 -	Related to technology in general	Underdevelopment - no change, not enough change or not the desired change, all resulting in unsatisfied needs as lack of physical capital, a rapid growing population, lack of education, and unemployment	Qualitative change, immaterial and intangible needs
Modernisation	- a question of rationalisation with bureaucratisation as an effect of the process, equivalent to economic growth in which communities are passive objects, does not evaluate social changes, exists in every society, but in different ways and pace, relations are determined by achievement	~1960 -	Closely related to industrialisation	Traditional - social relationships like 'kinship, nobility, and serfdom, which are determined by birth	Quantitative change, material and tangible needs
Globalisation	- a world economy system, which covers most of the world, changes in one region can rapidly have significant consequences for distant regions	~1990-	Closely related to digitization	Localisation – changes which focus on a local level	Quantitative change, material and tangible needs

Table 4.2. Division of the world

DIVISION	1:ST WORLD	2:ND WORLD	3:RD WORLD	4:TH WORLD
Political	Western countries, capitalism	Eastern countries, (former) Soviet union, socialism	New independent nations including Africa, Latin America, Asia	'Worst-off', 'despaired cases', Sub-Saharan countries
Level of industrial.	Industrialised	Industrialised	Semi-industrialised	Un-industrialised

Finally, we will add that in the international discourse of development and aid of today another dichotomy is commonly used to describe the level of development, the terms 'North' and 'South'. 'Modern' and 'traditional' societies as well as that of 'rich' and 'poor' countries are also in use. This is, according to Amin (1997), a way of polarise the world into two blocks similar to 'industrialised' or 'developed countries' or non-'industrialised' or 'developing countries' implying different levels of development, see table 4.3 and 4.4.

Table 4.3. Examples of different polarisations of the world implying different levels of development – lower versus higher level of development

LOWER	HIGHER
Underdeveloped	Developed
Developing	Developed
Non-industrialised	Industrialised
Traditional	Modern
Poor	Rich
South	North

Table 4.4. Different assessment of development (UNDP, 2005; World Bank, 2005)

ASSESSMENT	INDICATOR	ORGANISATION	LEVEL
LIC (Low Income Countries) < 765 US	Economic -GNP per capita	World Bank	National
LDC (Least Developed Countries)	Economic and Social – economic and human resource criterion	UN	National
HDI (Human Development Index)	Social - life expectancy, adult literacy, real GNP per capita	UNDP	Individual-national

We are using the terms of developing countries and industrialised countries as these are used in the literature of development in general. We do not refer to

cultural or socio-economic reasons when discussing developing countries. Instead, we refer to the global political and economical system of the world and which, according to Korpela (1994), includes for example low income level, low productivity and low domestic demand.

However, at the same time we can see a risk with using the concept developing country. It implies a polarisation towards developed countries that influence our view as well as the view of the people in the developing country. The choice of concept includes a set of values. In our opinion, it is an example of a dictatorial language. The concept implies dependence on more developed countries and hence a lack of self reliance. A more value-free denomination is to relate to GNP as assessment for development. But at the same time it is only a quantitative measure in line with the official World Bank term mentioned above, Low Income Countries, LIC.

4.1.3. Different Paradigms within the Field of Development Theory

This section starts with explaining what development theories imply and we will further analyse the history of development theories through looking at different paradigms. We will also take a look at radical reactions against former paradigms.

Even if development theories are a rather new phenomenon it has its roots in an older tradition of ideas. Of interest during the 17th century was the development of society and especially the European society. These 'old' theories constitute an important background for development theories. They consist of economy theories, evolution theories, and classical sociological theories.

What is a 'development theory'? It could be seen as a theory concerning the development of a society in the previous mentioned Third and Fourth world. Development theories try to elucidate which factors determine social progress, what causes underdevelopment and also it tries to answer how development can be achieved. It tries to analyse and interpret situations, facts, and problems in a wider perspective. It means that the complexity of problems are put into a theoretical context with assumptions about how the global reality is constituted, asking questions about reasons, connections, and consequences, and offering explanations, problem solutions and action programs. But at the same time it is

important to remember that every country must start from its own prerequisites, development is not a matter of blue print (de Vylder, 2002).

One of the most important questions to answer is what causes underdevelopment or is a hinder for development. An old and common attitude was that because of climate- and race factors it was impossible for the colonies to develop as the European countries has done. The 'white mans burden' was a common expression borrowed from a poem by Rudyard Kipling. But this antiquated attitude has since long ago disappeared. Today other hinder are discussed such as the ones of Baumol and Blinder (1997). They mention a number of general main reasons that are hindrance for development such as: lack of physical capital, a rapid growing population, lack of education (de Vylder, 2002) and unemployment. In addition there is the colonial heritage where the colonial structure could be seen as a hindrance to development as well as the fact that many developing countries only recently acquired political independence. Connected to the colonial heritage is the so-called 'dual economy' which constitutes of a minor modern commercial industrial sector along with a major traditional agricultural sector (Meier, 1980).

As well as asking what causes underdevelopment, we must also ask what causes overdevelopment. As mentioned above we regard the issue of overdevelopment connected to the discussion about sustainable development and will go deeper into that issue in chapter 4.4.

But development theories are so much more and the process of evolving development theories has not been simple. It has been characterised by theoretical contradictions and ideological polarisations (Hettne, 1990). Three general theories or paradigms can be identified within the process of development theories: the *modernisation* paradigm, the *dependency* paradigm, and the *multiplicity* paradigm (Hettne, 1990; Nulens, 1998: Mursu, 2002).

The Modernisation Paradigm

In the modernisation paradigm, underdeveloped regions are expected to reach the same level of development as the advanced countries by imitating the latter (Hettne, 1990). This line of thought – 'catching-up' as it were – can be considered as a type of convergence theory. This idea emanated from the post-war restructuring. This restructuring in Europe was based on the Marshall Aid

from US (Hettne, 1990). There was a strong belief that this linear Western modernisation could be copied in the Third World and the Marshall Aid was converted to development aid (Waylen, 1996).

A common opinion within this paradigm is that the degree of development could be measured by quantitative variables like income and investment. Walt Rostow (1960), one of the most well known development theorists, describes five stages that all developing societies had to pass going from a 'traditional' society to becoming a 'modern' society. His theory had great impact concerning development politics for many international development organisations. Rostow identified the following five stages and their characteristics concerning economic growth. We will discuss Rostow further in section 4.1.4:

- First step - the traditional society - characterised by low level in development of technology and large agricultural sector,
- Second step - the pre-take-off society - characterised by modern methods of production and extended infrastructure,
- Third step - 'take off' - characterised by expansive industrialisation and accumulation,
- Fourth step - the road to maturity characterised by diffusion of modern technology, and
- Fifth step - the mass consumption society characterised by consumption in excess of elementary basic needs.

Within this paradigm Western technology was believed to be cultural neutral and was seen as an instrument for accelerating development. Culture was considered as irrelevant to development, and was more seen as an obstacle to development. Different cultures were thought to adapt themselves to the economic process as well as to the technological development. But, the modernisation paradigm has not been successful. It did not reach the goal of transferring the Western model to a Third world setting. The theories within the paradigm seem to be too simplistic to solve world problems and also too impressed by ethnocentrism. The modernisation paradigm had its greatest impact in the 1950s and 1960s (Hettne, 1990; van Ryckeghem, 1992; Nulens 1998). In the late 1960s and 1970s there was a strong reaction and criticism against the modernisation ideas and new development theories were evolved among radical thinkers over the world. An important source of inspiration was the liberation and the political development in the Third world around 1970.

The Dependency Paradigm

The dependency paradigm evolved principally in Latin America. The leading idea of the paradigm is that capitalism causes a division into core and periphery, with a dependency of the latter on the former (Hettne, 1990). The most famous of dependency theorists are Andre Gunder Frank with his 'metropolis-satellite-model' and Samir Amin with his economic 'core-periphery-model. Also included in the dependency school is the Norwegian peace researcher Johan Galtung. A synonym to 'the dependency paradigm' could be 'the economics of discontent', in accordance to Meier (1980).

The purpose of the dependency paradigm was to overcome dependency. The dependency concerned dependence on export markets and foreign capital as well as being primary-producing countries (Meier, 1980). The concept 'appropriate technology', was defined for the first time. It was seen as a strategy for breaking dependence and for reaching economic growth within the nation (Hettne, 1990; van Ryckeghem, 1992; Nulens, 1998).

The dependency paradigm is almost on all points the opposite of the modernisation paradigm. According to the latter the western industrialised countries were supposed to support the modernisation process in developing countries, while the dependency paradigm argued that it was in fact the relation itself to the Western world that was the original cause to underdevelopment, stagnation, and destitution in developing countries.

The dependency paradigm does not put a clear distinction on the role of the local culture. Within the paradigm the cultural dependency exist only as a reflection of the economic dependency. The focus in the dependency paradigm is in general on the external causes of underdevelopment. National problems that were causing development difficulties were not taken into consideration (Hettne, 1990; van Ryckeghem, 1992; Nulens, 1998).

Both the modernisation and the dependency paradigms focus on the concept of growth and profit. They also presuppose that development for developing countries is to reach something that is already reached in developed countries. In the modernisation paradigm the Western world is seen as the obvious goal in the developing process. The dependency paradigm sees economical development synonymous to industrialisation, not in a capitalistic way but in a

socialistic regime. As a reaction to both these paradigms the multiplicity paradigm has evolved.

The Multiplicity Paradigm

The third paradigm, called the multiplicity paradigm by Nulens (1998), developed during the 1970's, questions a universal development model with unlimited growth. There must be different kinds of development processes in different regions. The paradigm can be seen as 'alternative' development theories with the strong belief that development must progress in a 'bottom-up' perspective (Hettne, 1990). The paradigm can also be seen as a reaction to the awareness of the growing problems caused by industrialisation. The essence in the multiplicity paradigm, according to Hettne, is that 'another' way of development is possible, a development without industrialisation and large-scale methods that is instead based on agriculture, handicraft, and small-scale industry. This view was expressed in 'Small is Beautiful – A study of economics as if people mattered' (1973) by the British economist, E.F. Schumacher. In the multiplicity paradigm development is based more on qualitative principles like basic needs, self-reliance of local communities and participatory democracy. Crucial is an endogenous and sustainable development from a grass roots level. The multiplicity paradigm emphasise that development does not need to be based on western values.

Hettne (1990) has summarised the objectives of the multiplicity paradigm with its characteristics in the following five points together with their definitions: 1) egalitarian development (redistribution with the purpose of satisfying fundamental human needs via control over the whole life situation), 2) self-reliance (reach optimal local 'small scale' self-reliance), 3) sustainability (forthcoming generations is not deprived its resources), 4) territorial principal (regions and local societies must develop comprehensively via local self-government), and 5) ethno-development (identity and self-reliance as an ethnic group with culture multiplicity).

The multiplicity paradigm resulted in a widening of the concept development, into 'human development'. United Nations and its development programme, UNDP (United Nations Development Program) published the first Human Development Report in 1990, which pays attention to socio-economic development. Development is now measured in terms of: 1) life expectancy, 2)

adult literacy and 3) real GNP per capita, expressed as HDI (Human Development Index). Human development is here seen as a process including enlargement of relevant human choices (Esteva, 1992). Further, in the multiplicity paradigm, communities have been the major focus of development activities and they have been seen as central actors to define contents of development (Järvelä & Kuvaja, 2001).

The Post Development Approach

A more radical reaction to the former development theories can be seen in the 'post development' approach. One of its front figures, Escobar (1992) even claims that the era of development is over.

The approach criticises the way development policies have been practiced since the Second World War and tries to give an answer to the question why so many development projects fail. The post-development approach rejects the development process not because of its results, but because of its intentions, its world-view and its economic mindset. Development is seen as a western-like transformation of the non-western world. Instead development should evolve from the grass roots, assisted and facilitated by development professionals (Nederveen Pieterse, 2000). People have to abandon 'modernity, science, reason, technology, westernisation, consumption, nation-state, globalisation and development'. Instead values like 'simplicity, frugality, meeting basic needs from local soils, and sitting together' are common denominators.

Globalisation is one of the most debated issues within this approach. In the common view the world is seen as a one and only global system with mutual independence. But, according to Hewitt (2001), globalisation is a misleading label since it implies that the entire globe is suddenly involved in integrated economic activity. He argues that the geographical reach of capitalism has receded in recent years instead of extended. The relative share in global trade of Latin America and Africa has declined as well as the share of foreign investments since the colonial period, according to Hewitt. In a number of regions, among them sub-Saharan Africa, globalisation has not so much impaired the state but bypassed it since only weak structures exist (McGrew, 2001). Globalisation is also said to offer both an egalitarian and voluntarist culture but this is a paradox as no one can 'afford' to be excluded from the system (Holderness, 1994; Gill, 1995). Globalisation can be seen as the latest

stage of modernisation, according to Volkow and Avgerou, 1995. The globalisation issue has also been discussed earlier in section 4.1.1.

Participation is a central concept within this approach, involving integration of local knowledge into the development process (Esteva & Prakash, 1998). One of the most famous authors within this school is Robert Chamber and his Participatory Rural Appraisal. We will delve into his thinking in the following section.

Of course, there has been criticism against the post-development approach for lack of instrumentality and absence of a future program. The post-development approach should acknowledge that the resources in which development is embedded has certain effects and is built on certain assumptions. Further, it is central to study the appearance of development in concrete problem situations (Nustad, 2001). Moreover, the post-development approach is based on a paradox. It criticises development, but does not put any emphasis on the positive parts such as democratisation and better technologies.

Authors have also admitted strengths in the post-development approach. The agendas of development and the several failures have been highlighted and confronted. The human perspective has been put in focus with awareness about the complexity of development issues (Corbridge, 1998; Nustad, 2001). Corbridge argues that even if the discourse of development has its roots in the cold war and even if development has also been associated with negative effects one can not abandon development as an idea.

The characteristics of the discussed development theories are summarised in table 4.5. It is important to mention that the described paradigms are not mutually exclusive.

Participatory Rural Appraisal

One of the more well-known methodologies within the multiplicity paradigm, including the post development approach, is Participatory Rural Appraisal (PRA) with Robert Chambers as a front figure. We wish to highlight PRA as the participatory approach is a recurring concept in our work. In this section we will take a look into the origin of the theory from Chambers's point of view, followed by some of the main ideas and methods. And finally we will add some criticism against Chambers's theory.

Table 4.5. Development theories

TIME FRAME / CHARAC-TERISTICS	50 - 60	60 - 70	70 – 80	80 – 90	90 - 00
Paradigm	Modernisation	Dependency	Multiplicity	Post development	Globalisation
Origin	Post war restructuring	Liberation in Latin America	Problems caused of industrialization	Failed development	Possibilities of ICT
Measurement/ assessment of development	Quantitative factors - Economic factors like income and investment GNP	Quantitative factors - Economic factors like income and investment	Qualitative Factors - basic needs, self reliance, participatory democracy, HDI	Rejects the development process	Quantitative factors - Economic factors like income and investment
Key concepts	Underdevelopment Modernisation Development	Dependency /breaking dependency	Alternative development, bottom-up perspective	Participation	The global village
Main message	Imitate West, cope the Marshall plan, development aid, linear development through stages	External causes like capitalism and relations to West causes dependency	Different development processes in different regions	The era of development is over, human perspectives in focus	The world is seen as a one and only global system with mutual independence
Purpose	Reach the same level as West, – mass consumption society	Economic growth and profit – overcome dependency	Question a universal development model with unlimited growth	Abandon modernization	A world economic system
Constructs	1:st, 2:nd and 3:th world	Core - periphery	Sustainable development	PRA	The information revolution
Main theorists	Walt Rostow	Andre Gunder Frank, Samir Amin, Johan Galtung	E.F. Schumacher	Robert Chambers Arturo Escobar	Manuel Castells
Criticism	Too simplistic, too ethnocentric	National problems causing underdevelopment were not taken into consideration	Lack of instrumentality, absence of future programs	Lack of instrumentality, absence of future programs, based on a paradox as it does not put emphasizes to the positive effects of development	Misleading as the entire globe is not an integrated economy
View on technology	Neutral, instrument for development	Appropriate technology	Small scale technology	Traditional technology	ICT as an enabler
View on culture	Irrelevant to development, adaptive to economic process	Cultural dependency as a reflection to economic dependency	Culture multiplicity	Culture multiplicity	A world culture that is at the same time both egalitarian and voluntaristic
Political/economic system	Capitalistic	Socialistic	Radical socialism	Radical socialism	Neo liberal

Chambers criticises former development theories with these words: "The beliefs of those times – in linear and convergent development through stages of growth, in central planning, in unlimited growth, in industrialisation as the key to development, in the feasibility of a continuous improvement in levels of living for all – these now have been exposed as misconceived and, with the easy

wisdom of hindsight, naive" (Chambers, 1997:1). The process of development is characterised by failures, according to Chambers and he suggests different ways of handling this problem. He argues that there has to be a change in perspective, from 'Northern cores to Southern peripheries'. At a general level, that is the idea of putting the people first, and especially the poor people first. There must be a change in priorities and thinking "from things and infrastructure to people and capabilities" (Chambers, 1997:9). Or in other words, as expressed by Meier (1980), we have to move from theories *about* development to theories *for* development.

Chambers gives three key words as explanation to the former development 'error': *professionalism*, *distance*, and *power*. He develops this further in the following way. First, professional realities present much of the problem, valuing 'things over people', 'measurement over judgment', 'reductionism over holism', with a dominant culture of economics. He argues that development professionals need new approaches and methods for interacting, learning, and knowing. Learning in the professionals' view was more likely to come laterally or from above than from below and also to follow current western ideologies and fashions. In many countries, urban and rural people alike have shown the ability to express and analyse their local, complex and diverse realities which are often at odds with the top-down realities imposed by professionals.

Second, distance: most of those who were 'wrong' were physically, organisationally, socially, and cognitively distant from the people and conditions they were analysing, planning and prescribing for, and making predictions about. Analysis, planning and action were also top-down and centre-outwards.

Third, power hinders learning and those who were 'wrong' were powerful influential white men. Chambers argues that personal, professional and institutional change is essential if the realities of the poor are to receive greater recognition. Self-critical awareness and changes in concepts, values, methods and behaviour must be developed (Chambers, 1997).

Perhaps the most pervasive value of normal professionalism concerns measurement, according to Chambers. Many physical things are amenable to measurement. They can be controlled, countered, compared, manipulated and their behaviour can be predicted. They are also subject to universal methods and norms of engineering. Connected to measurement is the problem of

reductionism that is reducing the complex and varied to the simple and standard. Problems arise because the simplifications, standardisations and controls which work in physical science have been transferred to the human sciences and to other more complex intersections of the biological sciences with people's desires and needs. In diverse, dynamic and uncontrollable conditions with continuous variance and multiple linkages, reductionist methods can be both costly and misleading. Yet many professionals seem driven compulsively to simplify what is complex and to standardise what is diverse.

Another example of the problem of reductionism is poverty. Deprivation as poor people perceive it has many dimensions, including not only 1) lack of income, and 2) lack of wealth, but also 3) social inferiority, 4) physical weakness, 5) disability, 6) sickness, 7) vulnerability, 8) physical and social isolation, 9) powerlessness, and 10) humiliation (Chambers, 1995). But in practice much of this wide spectrum of deprivation and ill-being is covered by the common use of the word poverty. Poverty also has a narrow technical definition for purposes of measurement and comparison. Poverty is then defined as low income, or often low consumption, which is more easily and reliably measured. The problem, according to Chambers (1997), is that the simple definition of poverty is made not by the poor, from their experience, but by the well-off.

PRA has been developed and inspired from different sources such as action-reflection research (Argyris et al., 1985; Shon, 1983, 1987) and also from the work of Paulo Freire, "Pedagogy of the Oppressed" (1970) and "Education for Critical Consciousness (1974). The Freirian theme is that poor and exploited people can and should be enabled to analyse their own reality. PRA is also inspired by agro-ecosystem analysis, which is combining systems thinking with ecological thinking, and by applied anthropology that appreciate the richness and validity of rural people's knowledge. PRA can be seen as an extension and application of socio-anthropological insights, approaches and methods.

PRA methods have been classified as visualised analyses including methods for interviewing and sampling, as well as methods for group and team dynamics. These methods has been distinguished especially by shared visual representations and analysis made by local people, such as mapping or modelling on the ground or on paper. It has also been distinguished as an

approach rather than a method. Many practitioners consider that PRA should be regarded as an on-going empowering process. Most of the applications of PRA approaches and methods have purposes of training and orientation for both outsiders and local people as well as an empowering process of appraisal, analysis, planning, action, monitoring and evaluation. PRA approaches and methods have had practical applications as alternatives to questionnaire surveys.

Chambers has been criticised for being a romantic populist and accused of building utopian alternatives to industrialisation at a village level (Chataway & Allen, 2001). Chataway and Allen argue that since the world is industrialised the question of local alternatives is irrelevant and an impossible dream. Self-reliant agrarian utopias, in which everyone works together as a community, are not a viable option. They see Chambers idealistic precepts such as 'handing over the stick' to poor communities and to allow them to design and run their own development projects as concerned with risks of failing instead of gaining benefit (ibid).

In spite of the criticism, by the mid-1990s activities described as PRA have been practiced in nearly 100 countries. One prerequisite for PRA to spread over the world has been an international community of communication, including ICT, according to Chambers (1997). Globalisation is facilitated by the technological development and dependent on 'the information revolution' (c.f. McGrew, 2001). It is a bit of a paradox that PRA that favours traditional technologies and abandon modernisation has ICT, the main prerequisite for globalisation and which is seen as a prolongation of modernisation, to thank for its dispersion.

The characteristics of PRA are summarised in table 4.6.

Table 4.6. Characteristics of Participatory Rural Appraisal

ISSUES	CHARACTERISTICS
Origin	Failed development process
Key words	Professionalism, distance, power Measurement, reductionism, poverty
Main idea	Participation
Methods	Mapping or modelling on the ground or on paper
Constructs	Putting the last first, handing over the stick
Critic	Romantic populism
Penetration	~100 countries

4.1.4. Implications of Development Theory for ICT in Developing Countries

In this section we will focus on development related to ICT. We will start with a discussion about technology in general as we find it fruitful to have that as a base. A historical review on technology and development sets the background and will be followed by a section about different strategies and institutions for technology development. We will then discuss different potential roles and areas for ICT in developing countries.

Development and Technology

When it comes to technology one can ask how technology can serve in development. According to Baumol and Blinder (1997) there are two primary needs for developing countries: the need for technological knowledge and the need for resources. The issue of resources will be discussed further in section 4.4. In this section we focus on development related to technology. Technology is a vital part of most human activities and can be defined as: "…a purposeful, practical activity that involves the application of knowledge by organisations of human beings and their interaction with hardware" (Wilson & Heeks, 2000:403).

There has been tension between 'technology-as-solution' and 'technology-as-problem' views for decades. During the 1950s and 1960s technology was represented as the solution to and goal of development. Development was seen as the same as technology and technology was the same as development. This view has its roots in the industrialisation era and modernisation is the dominant goal, see section 4.1 for a discussion on modernisation. In official development aid discussions the idea of technology as the solution and as development can be seen in the huge investments made in infrastructure projects in the 'Third world' (Wilson & Heeks, 2000). Rostow (1960) points out that developing countries have a huge advantage as modern technology is accessible and does not have to be reinvented. During this period Western technology was believed to be cultural neutral and was seen as an instrument for accelerating development. Different cultures were thought to adapt themselves to the technological development.

However, in the 1970s there was a reaction to this view where technology was seen as a problem. Several authors questioned the association of technology with progress. Schumacher expressed his criticism in 'Small is Beautiful – A

study of economics as if people mattered' (1973). This contribution can be seen as a call to action for a technology with a 'human face' and he defined this as "…making available to them a technology that recognises the economic boundaries and limitations of poverty…" (Schumacher, 1973:158). He expressed a search for an alternative technology, a small-scale, labour-intensive technology instead of a labour-saving. He focused mainly on the 'Third world' and argued that people there should be enabled to help themselves, to be self-sustaining, and argued that people should not be replaced by machines.

This different approach to technology was also expressed by others and concepts like 'alternative technology' and 'appropriate technology' were formulated. They all shared a common view of development as 'people-centred' and giving controls to individuals and communities at a local level. The movement created criteria for an appropriate technology in a strongly normative way. The concept 'appropriate technology', was highlighted for the first time. It was seen as a strategy for breaking dependence and for reaching economic growth within the nation (Hettne, 1990; van Ryckeghem, 1992; Nulens, 1998). Van Ryckeghem (1992) defines appropriate technology in this context as 'small, simple, capital-saving, and labour-intensive'. According to her, building proper technologies became the newest strategy for breaking the dependency relation with northern countries. However, at the same time, Ullrich (1992) argues that one important reason for inequality *is* the development of technology to be seen as a tool for progress. The so called 'digital divide' can be seen as an example of this statement.

There was also a reaction against the alternative approach. Both Nulens (1998) and Kitching (1982) consider that 'alternative' or 'appropriate' technology builds on rather utopian visions in the current international power structure. It is not an adequate basis for a theory of development and the movement failed to see the society as a whole, according to Wilson and Heeks (2000).

During the 1980s another approach was emerging that explained technology as a social process. Technology was seen as embedded in social, cultural and economic relations in the particular society. This approach views technology as both reflecting and influencing the society that produces it and technology is seen as only one among others that is shaping a society. When technology is transferred from one society to another it also reflects social values, institutional forms and the culture of the former society. In other words, one has to take

into account the social, cultural and economic contexts in which it is to operate. But at the same time the consequences of technological development are not necessarily negative, even if it disrupts cultural norms (Wilson & Heeks, 2000).

More recently, a more systemic view has evolved stating that one can never exert total control over technology. Technology development can be managed if one recognises its embeddedness in other relations like economic, social and cultural relations. This approach views action for development as taking place within a system of inter-related arenas, such as the social, economic, cultural and technological arenas, where action in one has impact on the others (Wilson & Heeks, 2000).

A summary of the views on technology and development is shown in table 4.7 below.

Table 4.7. Views on technology and development

TIME FRAME	**50-70**	**70-80**	**80-90**	**90-**
View on Technology	Technology as solution - Neutral instrument for accelerated development	Technology as problem - Call for technology with a human face	Technology as social process - Take account of the social, cultural and economic contexts	Technology as system - Action in one arena has impact on the others

Strategies for technology development

We will highlight three strategies for technology development in developing countries with their concomitant claims regarding impact on poor people, examined by Wilson and Heeks (2000). The first strategy could be expressed as opening up the development process. This is a conventional insight which means greater competition, free trading and to 'show the way'. It is advocated by among others the World Bank. This strategy has been criticised as destroying indigenous knowledge and instead of reducing poverty it is likely to increase it. The second strategy can be expressed as a strategy for the poor themselves. This strategy is aimed at reducing risks in a balance between risks and opportunity. Hence, risk aversion can be an impediment to technological development. Finally, the third strategy is focused on institutions for technological development, implying organisations as well as 'accepted ways of doing things' see table 4.8 for a tabulate of the different strategies.

Within this third strategy the authors identify three types of institutions that can be related to technological development at different levels: research and development, networks, and participatory technology development.

Table 4.8. Three strategies for technology development according to Wilson and Heeks (2000)

STRATEGIES	BENEFITS	DRAWBACKS	APPROACH
Opening up the development process	Greater competition, Exposure to foreign goods, 'show the way'	Destroy indigenous knowledge, increase poverty	Top-down
Strategies of the poor themselves	In line with mainstream development organisations	Risk adversity becomes an impediment to technological development	Bottom-up
Institutions for technological development	Accepted ways of doing things on different levels	Poor coordination between levels and organisations.	Mixed

Concerning the first type of institution, research and development, they claim that in reality this is more a matter of development and design and of a slow process instead of a leap-frog. The second type of institution, networks, includes a need for co-ordination between different actors as poor co-ordination results in fragmentation of efforts. There is a need for a network approach, bringing together interests from different stakeholders such as public, private and NGO (Non Governmental Organisation). But networking is most likely to take place among those where mutual trust exists with the consequences that such networks are relatively 'closed'. The third type of institution, 'participatory technology development', contains normative arguments claiming empowerment, adaptive behaviour, and to learn about the context. Empowerment includes ownership of the planning and implementation of the intervention. Adaptive behaviour comprises interventions to build on what is already there rather than introducing something new. Further, for experts to learn about the context results in a more effective process, according to the authors. This participatory approach is also favoured by Platt and Wilson (1999), but they argue that the question remains *how* to institutionalise the approach. See table 4.9 for a tabulate of the different institutions.

Table 4.9. Three institutions for technology development according to Wilson and Heeks (2000)

INSTITUTIONS	BENEFITS	DRAWBACKS
Research and development	Generating new technology and scientific knowledge	Catching-up take too long time
Networks	Co-ordination	Lacking trust gives closed networks with limited quantity and quality of knowledge generated
Participatory technology development	Empowering, encourage adaptive behaviour, an effective process	Needs behavioural and institutional changes among agencies

Development and ICT

Seen in a historical perspective, information has been an important ingredient for development in the Western world as well as in developing countries. Several researchers (Ngwainmbi, 1995; Fuglesang, 1972; Lerner, 1958; Rostow, 1960) have pointed to the importance of information and communication and they all see this as a prerequisite for economic and social development. Ngwainmbi (1995) describes development as a continuous process which demands information in constant circulation between politicians, decision-makers, project leaders, and receivers. Ngwainmbi mentions political awareness and engagement, increasing equality, better public health, and diminished famine as all examples of positive effects from better information and communication. At the same time we can state that information is a 'non-exhaustible' ingredient. The usage of information does not in itself reduce its present or future availability (Meier, 1980).

The importance of information and ICT has given rise to a theory, the New Growth Theory, that attempts to explain the process of development and growth through endogenous forces such as human capital, knowledge 'spill over', and ICT (Sengupta, 1998).

Concerning development aid ICT is now given high attention according to the former director-general of Sida (Swedish international development agency) Bo Göransson (2000) as he stated that ICT gives unique possibilities to establish contact and relations as well as being a source for knowledge exchange and innovations. This is in line with the Swedish Government Bill from 2002/03 concerning development aid ICT is stated to change the prerequisites for

development and enable contact over geographical boundaries, as well as diminishing distances in both time and space and increasing participation.

But there are also critique against this positive point of view of ICT and development. Wilson and Heeks (2000) argue that ICT like any other new generic technology is often mentioned in wide statements about what it can do for development. There is an overall belief that poor people must gain eventually from adopting new technology. Great claims are being made for the role of ICT in poverty alleviation and development in general. These claims should be considered with caution. Not only may the benefits be exaggerated, but ICT development also takes away resources that may be better placed elsewhere, according to Wilson and Heeks. There is also an overall belief that developing countries have a great advantage as modern technology is accessible and does not have to be reinvented, so called leap-frog. This belief includes skipping certain technological stages and this view could be related to the view expressed by Rostow in the 1960s, as mentioned in section 4.1.

There is a need for a systemic and contextual view of technology to be able to understand the role of ICT, as indicated above. Wilson and Heeks (2000:414) argue that ICT can be seen as having three main potential roles and the authors have also related these roles to the development process in developing countries. They focus small-scale entrepreneurs, which we find relevant as approximately 80 percent of the population in developing countries live in rural areas working as small farmers. Below we have summarised the message from Wilson and Heeks.

The first potential role views ICT as an output and as a production technology. That is some enterprises produce either tangible, as computers, or intangible, as software, products as outputs. Others, such as publishers, produce heavily information-based outputs. Such enterprises are becoming more vital to developing countries but still "…remain one step removed from 'mainstream' poverty alleviation…". The second potential role views ICT as an information processing technology, with the motivation that all enterprises need to process information that arises from both inside and outside the enterprise. Given the relatively high ICT costs and the low labour costs in developing countries, ICT can easily raise, rather than lower, processing costs. To small enterprises the processing requirements for processing formal information is relatively limited and can frequently be met by paper-based methods.

In the third potential role ICT is mainly a communication technology. All enterprises, including even the smallest ones, have a significant need for both receiving and sending information. This can be seen as the main potential area for ICT applications for developing countries as ICT normally lowers communication costs substantially, according to the authors. This view is in line with Ngwainmbi (1995) as he states that ICT can be seen as a tool for fast and reliable communication.

Connected to the third role of ICT we can state that this role also implies different roles for the people or the community. They could be regarded as: receiver, provider, producer, mediator, and intermediator of data and information.

Hence, the main potential role and potential area for ICT in developing countries is to receive and provide information, according to above. This could be analysed in a quantitative as well as qualitative aspect. Most poor people get their information from informal information systems and the information from such systems can be both incomplete and inaccurate. Consequently most poor people do not access enough information and not enough relevant information. This problem is similar to the one of 'asymmetric information' introduced by the Economy Nobel Prize winners of 2001, George Akerlof, Michael Spence and Joseph Stiglitz. Asymmetric information is a matter of incomplete information where not everyone involved has access to relevant and complete data, neither the possibility to assess the data or apply to and adapt the data into information. What is needed is "knowledge about knowledge" (Meier, 1980:414). The issue of asymmetric information has high relevance in developing countries due to inefficient information systems, (de Vylder, 2002) lack of resources and relevant data. But ICT is only a part of a much broader social process. And from a poverty perspective we can add that if the information is to become really interesting and useful it has to be transformed into action. With a systemic approach this can be illustrated with an action chain, in accordance with Wilson and Heeks (2000:415), see figure 4.1, the Five A's model.

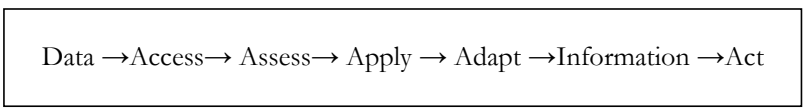

Figure 4.1. The Five A's model (adapted from Wilson and Heeks, 2000:415)

Asymmetric information is also, according to Wilson and Heeks (2000), caused by the inability of the poor people to voice their demands. The authors argue that the provision of information is often driven by the objectives of the source rather than the needs of the recipient. Hence, there remains a lack of proximity between sources and the poor people as recipients. This observation tends to underline the perspective where the poor are seen as recipients of information. This could be due to colonial heritage as well as the relationship to donors concerning development aid.

In other words, there is an assumption by proponents of this view that poor people are, and should be, only recipients of information, knowledge and technology. But certainly poor communities as well as poor people generate and produce their own information and knowledge. Or in other words, poor people are producers of information and knowledge as well as being consumers. In this process ICT can play a positive role by allowing information and knowledge to be more widely disseminated. ICT provides the means for local people to produce information and knowledge (Ernberg, 1998). ICT can above all be used to transfer and mediate information produced locally between local people, their enterprises, and communities. ICT can also be used to transfer and mediate information from communities to donor agencies, NGO as well as to governmental organisations. This is in accordance with the observations we made during our pre-study and with the examples mentioned in the Introduction chapter.

Further, already in 1973 Fuglesang argued that there was a lack of dialogue with local people. There is mainly a one-way communication, both mentally and physically. He states that the accessible knowledge in this area is on a too abstract level and is impossible to convert into reality. There must be a more practical applicable knowledge to gain development. There is too much discussion and research on western mass communication on macro level in the development discourse. There has to be a focus on the micro level and of local applications of information and communication technology, according to Fuglesang. Ngwainmbi (1995) is of the same opinion and argue further that it is fundamental to understand people and how they find themselves and the surrounding world to be able to mediate relevant information. It is also of importance to listen to people and to understand their collected knowledge concerning traditional ways of mediating information which, in our opinion, is in line with the participatory approach. In other words, it is imperative to

consult the people in order to be able to choose the most efficient means to mediate information, whether it is electronically or the 'traditional' way.

A report from the Food and Agriculture of the United Nations concerning information, communication and development states the importance of not replacing the 'traditional' means of communicating with 'modern' ones. Instead it is imperative to integrate them into a hybrid that utilises both the technological, economic as well as cultural strengths (Ngwainmbi, 1995). Wilson and Heeks (2000) see other mechanisms than ICT to assists people as newsletters and radio and televisions.

From the field study in Zambia, described in chapter 3 Pre-study, we can give an example of an informal information system. During our stay there we got to know a young man, Chibadola. He biked or walked between different villages in the area delivering messages. In other words, he acted as a messenger between the villages in the area. He got paid a small amount of money or a piece of food. At the same time as he delivered or picked up the messages he also acted as a news channel bringing news between villages. Chibadola could be regarded as a symbol for an informal but efficient information system. Referring back to the Introduction, the example given there concerning communication with relatives in the capital, Lusaka, can also be seen as an example of an informal information system, but this time an inefficient one.

Inefficient systems can be incredibly resource demanding and by that they may take away resources from people who already lack resources and who could spend their resources in a better way. ICT can offer alternatives to travel and facilitate a more efficient use of transport resources (Göransson & Söderberg, 2003). In other words, it is a matter of doing the right things as well as doing the things right!

It is important to remember that ICT is a matter of both information in the sense of knowledge and information in the sense of communication. Both types are resources with a clear connection to development.

As mentioned before, Wilson and Heeks (2000) are not all positive to the belief of a need of ICT in developing countries. They claim that ICT is neither universally necessary nor a sufficient condition for giving a voice to poor people. Besides, there are no realistically solutions for reaching all poor people

using ICT on the same way as there is in the 'rich' world in the foreseeable future, according to Wilson and Heeks (2000). The main strategy must be to provide ICT to intermediary institutions, such as NGOs and community-based organisations. The most popular model is telecentres, a multi-purpose and multi-function solution with Internet-linked computers and other facilities. There are many initiatives concerning telecenters from around the world with both positive as well as negative results (Ernberg, 1998). We will further discuss experiences concerning telecenters in chapter 4.5.

Finally, some authors argue that information that is not produced locally must be adapted locally including knowledge and understanding about local conditions and local people (Ngwainmbi, 1995). Otherwise, there is a risk to mainly provide "…a flood of noise: digitized, Westernized irrelevance" as Wilson and Heeks (2000:416) express it. Information can today be regarded as a commercial goods necessary for knowledge and relevant for the development process in developing countries. ICT can in this process act as both a capital-saving as well as a labour-saving technology. As capital-saving, ICT has as one main key factor the microchip which is based on an almost permanently renewable resource, silicon (Göransson & Söderberg, 2003). As labour-saving, ICT could be related to better management, organisation, and work procedures (Meier, 1980). But Meier also mentions a risk with this process as it tends to aggravate the underutilisation of labour. Meier points to the fact that most developing countries have a so-called 'dual economy' which constitutes of a minor modern commercial industrial sector along with a major traditional agricultural sector.

We will pursue the discussion on development and technology in the next section, where we will review and comment on approaches to the theory of technology transfer and diffusion of innovation.

4.2. Diffusion of Innovations and Technology Transfer Theories

The theories of diffusion of innovations and technology transfer rely upon innovations and technology spreading in society. Whereas the diffusion of innovations explains social change and belongs to the research field of sociology (Rogers, 2003), the technology transfer explains the absorption of technologies. It does not belong to any particular body of literature even if issues within this field have been discussed within organisation theory,

economic theory, political theory, and social capital theory (Vozikis et al., 1992:452; Bozeman, 2000:645).

The dispersion takes place on different levels of the society, between or within nations or group of nations, geographical areas or social groups. Further, the spreading is influenced by several aspects which affect the *adoption* of an innovation positively. One of these aspects is *adaptation* of the technology to local circumstances. We identified adoption and adaptation as the two key concepts in the theories related to our research interest.

The two theories constitute a theoretical ground based on the reflections raised during our pre-study. We were puzzled about observations we made in the local administration offices of Lundazi town in Zambia. Why did clerks not adopt the technology? Our observations clearly indicated that computers were not in use as they were put in a corner of the offices. Other observations indicated that computers had been donated to the local area from international aid organisations with no attention to local conditions. Why was the technology transferred from one country to another with no consideration to local conditions?

This chapter is not directed towards finding exact answers to the above questions, but rather to pinpoint relevant concepts in the diffusion of innovations and the technology transfer theories related to the reflections raised during the pre-study. Finally, in section 4.2.4, we put forward several practical implications that the diffusion of innovations and technology transfer theories have on ICT in developing countries and we show the connection between the adaptation process and the adoption process.

4.2.1. Two Theories and Two Key Concepts

We start by introducing the theories of diffusion of innovations and technology transfer. We then define the concepts adoption and adaptation, and continue with a discussion about the concepts in order to trace points in common. A summary of central descriptions of the theories and key concepts are presented at the end of the next section 4.2.2.

The *diffusion of innovations* could be described according to Rogers (2003:5) as a process in which an innovation is communicated through certain channels over

time among the members of a social system. Innovation is an idea, practice, or object which is perceived as new by an individual or group of people. This process is a special type of communication and information about an innovation is mainly sought from peers. Therefore, the diffusion of innovations is particularly a social process in which subjectively perceived information about new ideas are communicated from person to person. Hence, the meaning of an innovation is thus gradually worked out through a process of social construction.

Adoption is one of the possible results of the decision process within the process of diffusion of innovations. A universal definition of adoption is "the act of adopting" and according to Webster's universal dictionary (s.v. 'adoption') the verb implies "to take up and practice or use". The word alludes to a person who makes a positive decision about an innovation. Rogers (2003:21) elaborates on the idea with a focus on *use* as he means that adoption is the decision to fully use an innovation since this is the best course of action available. But there are other interpretations of adoption.

Technology transfer can be explained as the process when technology, know-how or technical knowledge moves from one organisational setting to another (Bozeman, 2000:629). Kaynak (1985:155-156) defines technology transfer to be "the transmission of know-how to suit local conditions, with effective absorption and diffusion both within and from one country to another". Maskus (2003) means that the technology may be codified or uncodified, e.g. know-how of engineers, and it may be embodied in products or disembodied in ideas. O'Reilly (1995:242) has a process view and he includes both the diffusion and the contribution when he describes the technology transfer. According to him the process can be divided in three stages and they are: the transfer of existing technologies; the assimilation and diffusion of these technologies; the contribution of these technologies to indigenous capacities for innovation.

Adaptation can be one of the critical aspects in a successful technology transfer. A universal definition of adaptation is "the act or process of adapting" and according to Webster's universal dictionary (s.v. 'adaptation') the verb implies "adjustment to environmental conditions". The word alludes to technology which is modified to make it fit particular present circumstances. Worth mentioning is also that it is not only technology which needs to be adapted, in a social change process people also adapt to new innovations and technology.

According to Gilbert (1992:406) there is a *mutual adaptation* which he explains is a further step than the traditional adaptation which focuses only on the receiver environment to meet the specifications intended by the source. He stresses that the importance is to adapt the technique to accept local skills and materials inputs, while adapting the receiver's managerial structure and processes to master the still evolving technique. Bozeman (2000:629) describes that technology can be changed by the characteristics of its use or by changes in the physical or social setting within which the technology exists. He explains this further when he states that "technology is adapted through personalised application based on some combination of unique needs and tacit knowledge".

Diffusion of innovations traditionally explains issues on a group or individual level mostly focusing on an individual-as-adopter perspective (Maitland et al., 2001). Technology transfer is about technology spreading between countries and the theory explains issues on an international and/or national level. In the technology transfer we have identified one key concept which is adaptation. Adaptation of technologies to local conditions influences how successful the adoption of the technologies will be. Adoption is a decision when an innovation is accepted and used; hence this concept is strongly connected to the diffusion of an innovation, see figure 4.2.

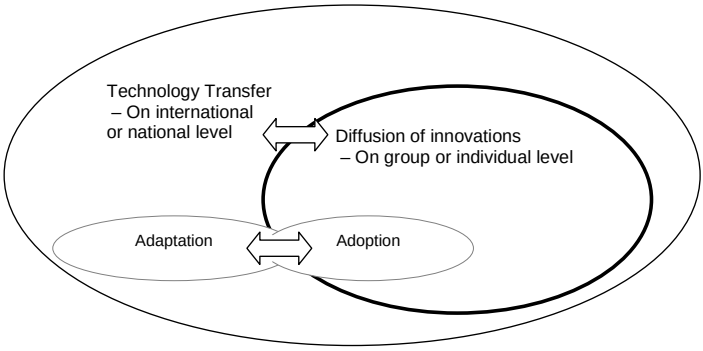

Figure 4.2. The two theories and the two key concepts and the analysis levels

We believe that these theories and concepts are related to each other. One of the crossings we will further discuss in this chapter is the conceptual bridge: adoption – adaptation, as adoption is influenced to what degree adaptation of the actual innovation is conducted, see figure 4.2. Adaptation and adoption are

sub processes within the main processes of technology transfer and diffusion of innovations.

Thus, we stress the connection between technology adaptations to local conditions in the process of technology transfer to adoption of the technology in the process of diffusion of innovations. The consequences of the relation between adoption – adaptation will mainly be raised in a discussion about ICT in developing countries in section 4.2.4.

4.2.2. History and Background

The history and background of the theory field will be clarified here, starting with the theory of diffusion of innovations and followed by the theory of technology transfer. At end of this section we have summarised the main findings in table 4.10.

Diffusion of Innovations

The theory of diffusion of innovations originates from diffusion research conducted as early as 1903 by the French sociologist Tarde who plotted the original S-shaped rate of adoption. Rogers (2003:41) claims that Tarde's S-shape curve is crucial because most innovations have an S-shaped rate of adoption, see figure 4.3, adoption (y-axis) is measured by number or percentage of adopters.

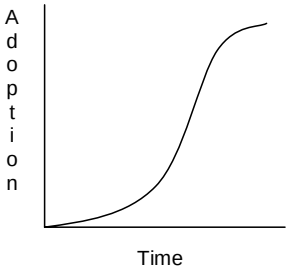

Figure 4.3. S-shaped diffusion curve. Adapted from Rogers (2003:113)

Another group of diffusion researchers were the early anthropologists in Europe, whose diffusion ideas evolved during the years soon after the time of

Tarde's studies. In the 1940s agricultural innovations studies rooted in rural sociology were performed in United States. Those agriculture studies are also viewed to be the starting point for an increasing interest in the research field which has developed up to these days (Rogers, 2003:43). Rogers (2003) joined an agriculture diffusion research project in the beginning of the 1950s and has since that date been one of the leading researchers within the diffusion field.

Nowadays, diffusion research is performed in several fields such as anthropology, communication, education, geography and sociology. This multidisciplinary research is conducted on a variety of innovations. A reason for this is that the diffusion of innovations explains social change, which is one of the most fundamental human processes. Diffusion research, is presented in a great number of publications: Rogers (2003: xviii) estimates the numbers to be more than 5,200. In November 2005, a search on the web[2] gave almost 260,000 hits for the phrase 'diffusion of innovations'.

Before 1960 diffusion studies were mainly conducted in the United States and Europe, but during the 1960s there was an increase in the number of diffusion studies performed in developing countries. The diffusion theory framework was used to evaluate the impact of development programs in, for example, agriculture, family planning, and public health (Rogers, 2003). Nowadays international aid organisations pay attention to the diffusion of ICT in developing countries and for example the UN system has several of specific agencies promoting the diffusion and use of ICT (Andersson et al., 2003).

Diffusion theory has one person as both spokesman for and developer of the theory field. The books of Rogers (up to now the fifth editions) have all been important for the development of the field. In his own words, his books "mark turning points in the growth of the diffusion field", but his latter publications reflects a more critical stance than his previous books (Rogers, 2003:xviii).

During the years there have been several reactions against the diffusion of innovations. Freeman and Perez (1988) state that the 'trickle-down' theory was long the dominant theory among researchers in the diffusion field: the centre innovates and is able to harvest the benefits of the innovation, while the periphery will consist of late adopters. Late adopters are comparable to Rogers

[2] on Google, http://www.google.com/

(2003:281) 'late majority' which is an adopter categorisation measured by time. The implication of the diffusion theory is that developing countries should follow the developed countries and use the innovations developed in a Western context to get the same benefits. Traditionally, rural areas can be found on the outer periphery, and these areas are the ones that are the last adopters of new technologies. But the trickle-down theory is challenged by authors like d'Orville (2000), Mansell (1999), and Mayanja (2003) when they emphasis that a bottom-up perspective is necessary.

Rogers (2003) discusses the weakness of the diffusion theory. He points out that some of the limitations of diffusion research are its pro-innovation bias. He explains the pro-innovation bias to be "the implication in diffusion research that an innovation should be diffused and adopted by all members of social system, that it should be diffused more rapidly, and that the innovation should be neither re-invented nor rejected" (Rogers, 2003:476). As a result of the pro-innovation bias, there is much more knowledge about the diffusion of rapidly spreading innovations than about the diffusion of slowly diffusion innovations; adoption than about rejection; and continued use rather than about discontinuance.

Technology Transfer

The topic of technology transfer has been studied extensively from a variety of perspectives and a single search on the web[3] (conducted in November, 2005) indicated the huge amount of publications dealing with this issue as more than thirty-two million hits were obtained for the phrase 'technology transfer'. In spite of the massive amounts of research in recent years within this research field, there is no single method or canonical body of literature on the subject (Vozikis et al., 1992). Bozeman (2000:630) share a similar understanding and he points out that "technology transfer is defined in many different ways, according to the discipline of the research, but also according to the purpose of the research". Consequently, the theory field is multiple with no single definition and Bozeman (2000:628) argues that due to the number of definitions the concept begins to lose meaning. Anyhow, the topic 'technology transfer' has spurred great interest among academic researchers and policy-makers. For example, since 1980 many nations have passed major policy

[3] on Google, http://www.google.com/

initiatives dealing with technology transfer aiming at promoting it (Bozeman, 2000:628).

From a traditional and historical economic point of view of technology transfer Vozikis et al. (1992) state that it is the technological differences between countries that constitutes inequalities; this opinion has also have been recognised among aid agencies. Discussions about technology transfer have been on the agenda on international conferences for more than thirty years. The United Nations Conference on Trade and Development, UNCTAD, negotiations in 1974 was conducted aiming at identifying an international code for technology transfer. In 1987 the Bruntland Report stressed the trajectory of sustainable technology development in the defined overall need for globally sustainable development.

There has been universal acceptance of the need for improvement of the technological capabilities of developing countries, but agreements have stopped there according to Sandbrook (1995). Sandbrook claims that international meetings have only resulted in good intentions being turned down. He explains the problems with agreements on technology transfer and means that they are caused by governments in developed countries since they argue that privately owned technology is best transferred through the market. Developing countries respond to this, which means that the market is biased against them and that they need incentives such as concessional and preferential terms (Sandbrook, 1995:195).

Below in table 4.10 we have summarised the main characteristics of the two theoretical fields, their key concepts are presented in section 4.2.1 and 4.2.2. It is a mix of direct quotations and interpreted wording. The first characteristic 'Origin of research and of paradigm' describes where the research within the two theoretical fields started, it also explains where the theory has its roots; the second characteristic clarifies who has been the main theorist(-s) for the development of the theory field; the third characteristic 'Analysis level' explains on which analysis level most studies are performed within the theory field; the fourth characteristic 'Main ideas' describes the most important thoughts for each theory field; lastly 'Description of the concepts' summaries the definitions of the key concepts.

Table 4.10. Characteristics of the theoretical fields and the key concepts

THEORETICAL FIELDS / CHARACTER-ISTICS	DIFFUSION OF INNOVATIONS	TECHNOLOGY TRANSFER
ORIGIN OF RESEARCH AND OF PARADIGM	Agricultural studies in U.S within the sociological paradigm (Rogers, 2003).	Economic studies, organisational studies, and social studies (Vozikis et al., 1992; Bozeman, 2000). No definite paradigm.
MAIN THEORISTS	Everett M. Rogers	No main theorists
ANALYSIS LEVEL MAIN IDEAS	Group and individual level A process in which *an innovation is communicated through certain channels over time among the members of a social system*. This process is a special type of communication, in that the message is concerned with new ideas (Rogers, 2003:5).	International and national level A process when technology, know-how or technical knowledge moves from one organisational setting to another (Bozeman, 2000:629). *The transmission of know-how to suit local conditions, with effective absorption and diffusion both within and from one country to another* (Kaynak, 1985:155-156).
KEY CONCEPTS	**ADOPTION**	**ADAPTATION**
DESCRIPTION OF THE CONCEPTS	A decision process which is a mental process through which an individual passes from first hearing about an innovation to final adoption (Rogers, 2003).	An adjustment or modification process of the technology which makes it fit to particular present circumstances (Webster, s.v. 'adaptation'). 'Mutual adaptation' means adapting the technique to accept local skills and materials inputs (Gilbert, 1992:406).

4.2.3. Important Concepts in the Two Theories

In this section we widen the descriptions of the theories by presenting several important concepts within each theory.

Diffusion of Innovations

A further explanation of the theory of diffusion of innovations will be conducted here and focuses on the four main elements which are, according to Rogers (2003): innovation, communication, time, and social system, and within

each element he has identified different characteristics which explain the element.

The first main element, *innovation* is described by Rogers (2003) as an idea, practice or object that is perceived as new. Most of the new ideas whose diffusion has been analysed are technological innovations. He explains that technology usually has two components, hardware and software, and that technology almost always represents a mixture of those two.

According to Rogers (2003) innovations have different attributes which help to explain their different rates of adoption. First is *relative advantage*, which is the degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms, social prestige factors, convenience, and satisfaction for an individual. Second is the *compatibility* which is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the existing values and norms of a social system will not be adopted as fast as an innovation that is compatible. Third is the *complexity* of an innovation which is the degree to which an innovation is perceived as difficult to understand and use. New ideas that are simpler to understand are adopted more quickly than innovations that require the adopter to develop new skills and understandings. Fourth is *trialability*, which is the degree to which an innovation may be experimented with before adoption takes place. An innovation that is trialable represents less uncertainty to the individual who is considering it for adoption, due to the fact that it is possible to learn by doing. Rogers (2003) means that adopting an innovation is not a passive phase of just implementing a standard technology or idea. Many adopters want to participate actively in customising and shaping an innovation to fit their unique situation. This re-invention influences the diffusion process in a positive way and it also supports the adoption to be sustained. Fifth is *observability*, which is the degree to which the results of an innovation are visible to others. The easier it is for people to see the results of an innovation, the more likely they are to adopt it. An evidence of the observability is the clustering of visible innovations and peer-to-peer networks.

In accordance with the discussion above it can be concluded that innovations that are perceived by individuals as having greater relative advantage,

compatibility, trialability, and observability and less complexity will be adopted *more rapidly* than other innovations.

Communication is the second main element in the diffusion process. Rogers (2003) means that the essence of the diffusion process is the information exchange through which one individual communicates a new idea to one or several others. In an elementary form the diffusion process can be described as involving an innovation, an individual that has knowledge of or experience using the innovation, another individual (or group of individuals) that does not yet have knowledge of or experience with the innovation, and a communication channel connecting the two individuals. Rogers points out that the diffusion of ideas happens more frequently between two people if they are similar. Even if this is a well-known fact this condition is seldom met. This is due to one of the most distinctive problems in the diffusion of innovations, which is that the participants are usually different in certain attributes. In many cases a 'change agent' is used to spread an innovation, but the effects are seldom those desired, due to the fact that the change agent is more competent in several of areas, than his or her clients. An ideal situation is where the participants in the diffusion process are similar on all variables, such as education, socioeconomic status, and the like, and only different regarding the innovation.

Time is the third main element in the diffusion process according to Rogers (2003). The time dimension is involved in the decision process by which an individual passes from first knowledge of an innovation through to its adoption or rejection. Time is involved in the diffusion of innovations when it concerns the rate of adoption, which is the relative speed an innovation is adopted by members of a social system. Most innovations have an S-shaped rate of adoption (illustrated previously in figure 4.3) when the number of individuals adopting a new idea is plotted on a cumulative frequency basis over time. Rogers define the adopter categories as: innovators, early adopters, early majority, late majority and laggards.

A further note concerning time is that the diffusion of innovations is in most cases a slow process according to Rogers and the time period between a technology becoming available to it is widespread adoption is often long. The time period for the diffusion process depends on many important factors such as the compatibility with values, beliefs, and past experiences of individuals in the social system.

Social system is the fourth and last main element in the diffusion process. This element can be described as a set of interrelated humans that are engaged in joint problem solving to accomplish a common goal (Rogers, 2003). The diffusion occurs within a social system; the system can be viewed as a boundary within which the innovation diffuses. This process is dependent upon several social factors according to Rogers: (1) The effect of norms and diffusion – one part of the social structure is norms, the established behaviour patterns for the members of a social system. (2) The roles of opinion leaders and change agents – an opinion leader is an individual who is able to influence informally other individuals' attitudes or overt behaviour in a desired way with relative frequency; a change agent works towards a goal deemed desirable by a change agency. She or he attempts to influence a persons' innovation-decision in a particularly desirable way. An individual that tries to influence a persons' decision process, but is not as professional as a change agent is called an 'aide'. (3) The types of decisions – an innovation can be adopted or rejected by an individual member of the system or by the entire social system, which in turn can decide to adopt an innovation by a collective decision or by an authority decision. (4) The consequences of innovation – refer to the change that occurs to an individual or a social system as a result of the adoption or rejection of an innovation. See below in table 4.11 for a summary of the elements and its attributes.

Table 4.11. Important concepts within diffusion of innovations theory

IMPORTANT CONCEPTS WITHIN DIFFUSION OF INNOVATIONS THEORY (Rogers, 2003)				
Elements	**Innovation**	**Communication**	**Time**	**Social System**
Attributes of the elements influencing the decision process	Characteristics of the innovation:	Variables of communication participants:	Main steps as time-ordered sequences:	Factors of the social system:
	- Advantage - Compati-bility - Complexity - Trialability - Observability	- Education - Socioeconomic status	- Knowledge - Persuasion - Decision - Implementation - Confirmation	- Norms - Roles of opinion leaders and change agents - Types of decision - The consequence of innovation

Technology Transfer

We have identified two important concepts to describe technology transfer: *channels* (Odedra, 1990) and *stages* (O´Reilly, 1995). Both Odedra (1990) and O´Reilly (1995) describe technology transfer from a specific perspective, namely focusing on ICT in developing countries. This perspective will further be discussed in the next section 4.2.4.

Initially we give a general description of technology transfer which more deeply explains the issues within this theory field than the brief description held in section 4.2.1. Vozikis et al. (1992:453) explain that technology transfer refers to the use of technology in a setting other than the one in which the research and development originally was conducted. They widens this description by giving examples of sources, subjects and methods of technology transfer. Sources of technology: government, universities, company labs, private inventors. Subjects to be transferred: know-how, patents, software, product licenses, processes. Methods of transfer: licensing, publications and literature, setting up new business, consultancy, transfer of experts. They mean that technology transfer is not only about technology itself and they widens this concept by including sources, subjects, and methods for the technology transfer. For example they see that knowledge about the technology is a subject that should be transferred. These examples shows the complexity of technology transfer.

Rogers (2003:150) states that technology transfer is a process through which the results of basic and applied research are put into use by receptors. He means that technology is particularly composed of information as technology in most cases is both hardware and software. Because technology is a mixture of those two Rogers states that technology transfer can be viewed as a communication process. Nowadays many researchers and authors realize that technology transfer is a two-way exchange where two or more parties participate in a communication process as the goal is to establish a mutual understanding about the meaning of the technology (Rogers, 2003:150). The traditional way of technology transfer emphasised the one-way process in which the technology was distributed.

As mentioned previously Gilbert (1992:454) says that a two-way process of mutual adaptation is needed if the technology transfer will be complete. Vozikis et al. (1992) also emphasise the importance of a two-way process in technology transfer where interaction between the receiver and sender is crucial. The

communication process is important, and so are the channels where the transfer takes place. According to Odedra (1990) the technology transfer takes place through three *channels*: acquisition of technology; education and training; and technical assistance.

Technology transfer can also be divided into different *stages*; such a description is formulated by O´Reilly (1995:242) when he typifies technology transfer as a process consisting of three stages. The *first stage* is the transfer of existing technologies; the *second stage* is the assimilation and diffusion of these technologies; and finally the *third stage* is the contribution of these technologies to indigenous capacities for innovation. Woherem (1992:73) focuses more on the final stage, with the same focus as Maskus (2003), he declares that the real technology transfer should refer to the situation when a particular technology can be developed, repaired, managed and operated domestically. Factors that are important for the absorption of technologies and a country's accumulation of technology capabilities are: local participation in the choice, implementation and absorption of technologies. The absorption of technology is according to Chooi et al. (1995:198) dependent on general knowledge being disseminated throughout the indigenous population.

To clarify the problems and possibilities with technology transfer from developed countries to developing countries, Chooi et al. (1995:199) give a brief literature review of technology transfer where the transfer is divided into four groups. The first group concerns acquisition and capability. There are difficulties in teaching, imitating, and appreciating the capabilities of technologies. Acquisition should preferably concern capabilities which can contribute to a country's capacity to undertake independent technological efforts including replication and adaptation of foreign technology as well as creation of new technologies. The second group concerns requirements. Factors regarding requirements are the precursor conditions for the absorption of technology. A country's absorptive capacity is dependent on general knowledge being disseminated throughout the indigenous population. A well-trained population which is numerate, literate, and has technical professional skills is a good base for positive absorption. The know-how is also a type of knowledge and it corresponds to the above mentioned first knowledge type. To know how something works is of equal importance as to know why it works. This enables users of the technology to adapt it to local conditions, or to go beyond that and develop something knew that is even better (Heeks, 2001).

The third group concerns the technological needs of developing countries. This is characterised as being mainly composed of small firms, farms and businesses, with a large quantity of unskilled labour and a shortage of capital. The fourth group concerns the relationship between multinational corporations and host countries. This is characterised as being unequal as the multinational corporations generally seek to satisfy their own goals rather than those of host countries. This results in technological creativity being concentrated in larger firms in developed countries.

A policy framework is needed to ensure a successful absorption of imported technology and its adaptation to the prevailing factor endowments. Chooi et al. (1995) argue that the key policy issue for governments and commercial undertakings is to identify the levels of technology which are necessary and which can be integrated with a minimum of social upheaval and yield maximum potential long-term benefits. Some of the technology may represent the core know-how, whilst others may be just operational or peripheral, and therefore, a technology and capability examination is essential. Table 4.12 provides an overview and a summary of the main concepts within technology transfer theory.

Table 4.12. Important concepts within technology transfer theory.

IMPORTANT CONCEPTS WITHIN TECHNOLOGY TRANSFER THEORY			
Channels (Odedra, 1990)	1. Acquisition of technology	2. Education and training	3. Technical assistance
Stages (O´Reilly, 1995)	1. Transfer of existing technology	2. Assimilation and diffusion of technology	3. Contribution of technology to indigenous capacities for innovation

4.2.4. Implications of the Theory Field for ICT in Developing Countries

The theory fields have several implications for ICT in developing countries. We will here discuss some issues which we have recognised to be important. Moreover, connections between the processes adaptation and adoption will also be made.

Odedra-Straub (1995) estimates that the number of computers introduced through international organisation assisted-projects have grown geometrically.

In most cases, the computers are either donated for specific projects or the recipient organisation may request the technology, which they may not have been able to afford otherwise. However, *successful* technology transfer has not received enough attention within international aid organisations – Odedra-Straub (1995) argues that more often it serves donor interests and is a business in which large private gains can be made.

Huq (1995) means that the large-scale import of machinery and equipment from the industrialised countries often involves technology of the 'wrong' kind and scale. O'Reilly (1995:243) means that in developing countries, it is common that donated machines lie idle and gather dust for years. The big issue is that technology has to be appropriate to the local culture.

Mayanja (2003) emphasises that only people at the grass roots level can tell whether they have the economic and technical resources to allow the technology to function and what technology they need for what purpose. Odedra-Straub (1995) sees the problem as developing countries usually accept equipment which may not be the most appropriate, or of the highest quality, and which may rule out any attempt to standardise uses of equipment as a way of reducing the range of spare parts needed. Further, she states that this distortion is already creating serious problems in many countries where the limited foreign exchange reserves reduce the ability to import required parts.

International aid organisations have provided assistance in the acquisition of technology, in education and training, as well as in technical assistance, but not in an effective way (Odedra, 1990). Hence, the equipment is often given to organisations with no training or provision of extra recurrent costs. Education and training is often neglected in projects. About the technical assistance, the people who are supposed to be supporting the locals are often over-worked, or worse, they are usually neglecting the transfer of skills to users (Odedra-Straub, 1995).

The appropriateness of technology in the aid package usually depends on the conditions under which the technology is transferred from developed to developing countries, and the influence that will be exercised by both parties on the whole transaction (Odedra-Straub, 1995). Mutual adaptation is one factor which can ensure that influence is exercised by both parties. It emphasises the learning in the receiver organisation (in developing countries) so that people

can master the still evolving technology. Learning is also highlighted by the factor 'mutual adaptation' in the sender organisation (in developed countries) as the technology is adapted to local skills (Gilbert, 1992:406).

The adaptation is critical and it influences the diffusion of an innovation to be successful or not. Rogers (2003) means that adopting an innovation is not a passive phase of just implementing a standard technology or idea. Many adopters want to participate actively in customising and shaping an innovation to fit their unique situation. This re-invention influences the diffusion process in a positive way and also supports the adoption in being sustained. To be able to participate actively in customising and even evolving the technology local knowledge is in focus. One may not forget that the major source of learning among the majority of the people in the developing countries is 'by doing' or by various informal mechanisms, such as from a family member or a friend (Platt & Wilson, 1999).

A connection between the concepts adoption and adaptation can be made when discussing local knowledge. Chooi et al. (1995) mean that a general background level of basic education, together with more specialised and advanced training in the operational fields of technical skills and business is needed for a successful adoption, as well as creative skills of science and management. The absence of such necessities will prevent local businesses from playing an active role in the adaptation or implementation of more advanced technologies or the indigenous development of new products.

All the problems mentioned can result in failures in the technology transfer process. One way to handle the problems is to organise and manage aid. Without adequate management by the authorities of the recipient country aid is likely to be of limited effects. Odedra-Straub (1995) also argues for management when she claims that there is a need for international organisations to formulate technology transfer policies and guidelines that make effective transfer possible. Support is also required to develop and promote a national capacity for the production spreading of indigenous technology. Tan and Tan (1990) explain that many developing countries have regulated the activities of foreign direct investors. In the long run, such policies may only bring short-term benefits to the countries, unless they themselves have well-defined and integrated long-term domestic, industrial and technological policies.

According to Heeks (1995:8) attempts to focus on particular stages of the transfer process and improve or regulate them have had only limited effect.

A notice concerning time is that diffusion of innovations is in most cases a slow process according to Rogers (2003) and the time period between a technology becoming available to it being widely adopted is often long. This fact leads to many organisations and individuals wanting to speed up the rate of the diffusion of a new technology by using a change agent, but it is crucial that a change agent is able to put him or her in the role of the clients. The time period for the diffusion process depends on many important factors such as the compatibility with values, beliefs, and past experiences of individuals in the social system. Other important preconditions are the local environment and the individuals. It has been mentioned earlier but it can be repeated once more, the diffusion of technology is a social process more than a technical matter.

The above discussion makes it clear that in many cases the introduction of ICT in developing countries follows the traditional 'trickle-down' model, deliberately or not. We also shared this experience as we saw how difficult it was to have 'successful' ICT use in the rural district in Zambia. It was obvious that computers had not been adopted by the official workers in Lundazi town and we concluded that this was dependent on ICT being transferred without any consideration to the users or the context. In other words the technology had not been adapted to local circumstances.

In this chapter we have described the two key concepts adoption and adaptation within the diffusion of innovations theory and technology transfer theory. Further we have highlighted the connection between the two key concepts. We have also described several concepts within the two theories. All concepts are relevant in relation to the reflections raised in the pre-study; therefore they are also important in the analysis of the critical factors influencing a sustainable ICT use in chapter *5 A Framework for Analysis of Factors Important for Sustainable ICT*. From this chapter the input to chapter 5 is the identified concepts which give the perspectives of diffusion of innovations and technology transfer to the identified factors.

ICT use can also bee discussed from the perspectives of information systems theory. The next chapter provides an overview of information systems theory with a focus on success and failure of ICT use.

4.3. Information Systems Theories

On account of the research questions together with the reflections from our pre-study we find it logical and fruitful to include this theory field in our work. The understanding of Information Systems (IS) theories will be advanced by both conceptual clarification, attention to history, and focus on some vital issues to our study.

In this chapter we aim to problematise some of the key concepts of our study essential for the further discussion. Further to discuss what IS theories imply through a view of the historical development by looking at different eras. Section 4.3.3 of this chapter examines success and failure for ICT in general. We take a standpoint in the IS literature regarding studies treating success and failure analysing what the concepts success and failure imply.

4.3.1. Key Concepts

Within the IS field we have identified three key concepts that we wish to highlight in this section, *information*, *information and communication technology* (ICT), and finally *information system*.

As *information* is the most fundamental concept of the three we will start with that. The concept *information* is defined by Verrijn-Stuart (2003:54) as "…any increment in (personal) knowledge, for decision-making, reassurance, entertainment". A more formal definition of information is the infological equation by Langefors (1973/1978:248): I = i (D, S, t). Information (I) is a function of an interpretation (i) of data (D), the receiving structures (S), and time available (t). The receiving structures (S) are related to a person and her/his prior knowledge, frame of references, understanding, education, experience, skill and language. Information is hence a function of available data, previous knowledge and training together with time. To be able to interpret data one needs prior knowledge, a frame of reference, or perspective. As expressed by Langefors (1973/1978:249): "The importance …is to make it clear that the data used to present a message to a human being must be designed with a view to suiting their semantic background 'S'." The infological equation implies that information is a relative concept. There is dependence between the information and the interpreter and her prior knowledge, frame of reference and perspective. We agree with Lundeberg (2001) when he states that this has

fundamental consequences for the use of the concept 'information'. We consider also that if one has different frames of references or perspectives one will interpret data differently. This discussion is in line with the one about asymmetric information in section 4.1.4.

Further, the concept of *information and communication technology* (ICT) can be defined as "…technology used to acquire and process information in support of human purposes…" (March & Smith, 1995). ICT can also be defined as "…the artificial resources we use to develop, implement, operate, use, maintain, and manage an information system" (Weber, 2003:325) and these artificial resources can be classified as hardware and software, according to Weber. This definition from Weber implies that IT and ICT can be used as synonyms. We will use the concept of ICT as it is a more inclusive concept including communication devices. ICT can be divided into non-digital based and digital based or in line with Wilson and Heeks (2000) into 'other technologies' and 'new ICT'. The former includes fixed telephone, books as well as 'the bush telegraphs' while the latter is synonymous to what we today label ICT. This is illustrated in figure 4.4. Another way to divide ICT is into three stages – old, new, and converging – where 'old' constitute 'writing', 'new' constitute e.g. fixed telephone, TV, radio, and 'converging' constitute digital based technology (Hall & Preston, 1988 in Göransson & Söderberg, 2003).

The third concept, *information system,* has been used and defined broadly within different interests. To show the diversity concerning this concept we give some examples of different definitions. As indicated above, *Information Systems*[4] *(IS)*, with capital initials, is used to name the research field for an academic discipline, while an *information system* is the object of this research field. Langefors was one of the first researchers to define an information system and in a simplified version it could be expressed as (1973), 'information systems handle data to provide information'[5]. Further, a number of authors stress the importance of defining an information system as a social system (Walsham et al., 1990; Land, 1994; Avison, 1997). Walsham et al. (1990) gives the concept a

[4] There are several different but related concepts regarding the field of Information Systems (Davis, 2003). Information Systems (IS), the Academic field of IS (AIS), Management of IS (MIS), and Information Management are all used as synonyms. Over time, there has been a trend to employ the simple term, IS (Davis, 2003).

[5] The complete definition: "By information system we mean here: A system of information sets needed for decision and signaling in a larger system (of which it is a subsystem) containing subsystems for collecting, storing, processing, distributing information sets." (Langefors, 1973/1978:195)

broad definition as they define information system as a social system that has both some technical aspects as well as social, political, and communicative aspects involved. This definition is similar to the one of Land (1994) when he considers information systems to be essentially social systems having ICT as one aspect. With this follows a diminished focus on the technology aspect. A difference is that Land takes ICT for granted as the technical aspect. Avison, (1997) on the other hand, does not take the ICT part for granted in his definition: "An information system is a human activity (social) system which may or may not involve computer systems" (1997:115). This is in line with Dahlbom (2003) when he declares that in information systems, technology is not the essence, even if an efficient management constitutes of information facilitates of 'modern' information technology. Lee (2003:315) goes further as he declares that "…an information system is an organisation enabled by information technology".

Hence, some authors do not link the definition of information systems to ICT at all while other consider ICT as implied in the concept of information systems. Lee (2003) declares that even in the past when the information technology was not electronic or digital, there were information systems even then. This conception of an information system involves a return to some basic ideas in the IS discipline (Lee, 2003:315). This is in line with Weber (2003:325) as he believes information systems rather than ICT will be the source of the phenomena that allow us to build theories that establish the identity of the IS discipline.

The above discussion is in line with Wilson and Heeks (2000:413) and can be illustrated with their systemic model, see figure 4.4 below. This constitutes an information system be built up of two main elements, people and processes. Further they highlight the influence from the surrounding environment including influencing factors and institutions. In their view, an information system is about people undertaking processes of activities using different types of ICT with the purpose of transmitting information. This systemic model of an information system is in line with Goldkuhl, Nilsson and Röstlinger (1986:12). The concept 'systemic' has been discussed earlier in section 2.2. Some of the so-called 'influencing factors' are in line with the categories in the analytical framework we have chosen to use.

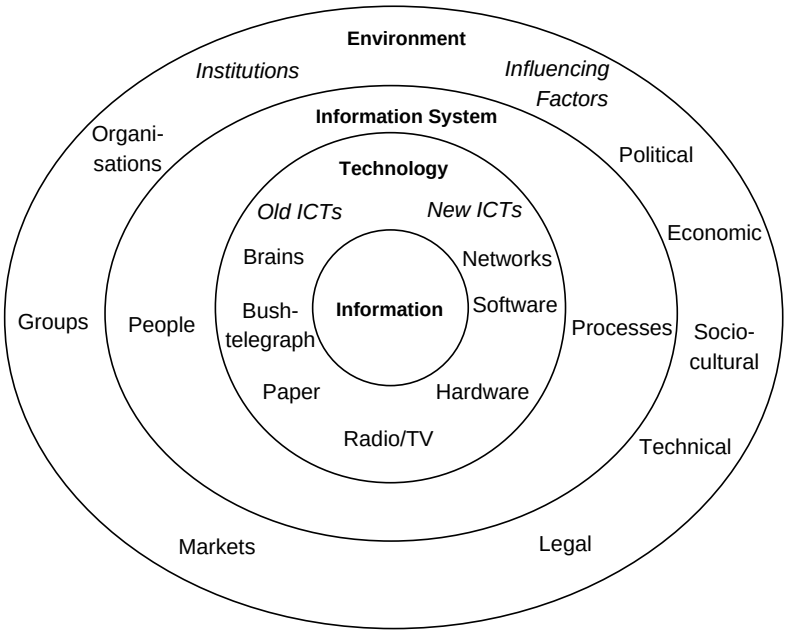

Figure 4.4. The systemic model of an information system (adapted from Wilson and Heeks, 2000)

We consider an information system can refer to a system for handling data and for information transfer. Further, an information system can be used, and also studied, in a different context; within or between organisations, as well as within a community. Following this, we consider that an information system can be seen in a wide perspective, and we stipulate an information system to be a social system for information transfer within a community including new ICT as well as old ICT and with a socio-economic goal, hence not only correlated to economy and cost savings. But at the same time it is important not to forget the 'IT artefact' as Orlikowski and Iacono (2001) label ICT. They stress the interdependence between technology and the social context including its history and culture. The authors offer five premises about ICT: ICT is not neutral or universal, ICT is embedded in time, place, discourse and community, ICT is made up of a multiplicity of components, ICT is neither fixed nor independent, and ICT is dynamic and conditional.

4.3.2. History and Background

A historical perspective is critical in order to understand the existing situation. The research dealing with information systems is both diverse and pluralistic. The diversity in this research paradigm seems to reflect in the history of Information Systems (IS) research and its development.

The field of IS concerns a broad area including development, use and implications of IT. Hence it deals with technical, human and organisational issues. It studies human interaction with information systems in different operations with the focus on developing knowledge of the use of information technology in society.

In the 1960s, sociologists like Daniel Bell (1973) began saying that we were leaving the industrial society, moving into a post industrial service society. Others e.g. Manuel Castell (1998) pointed to the growing amount of information work, speaking about the 'information revolution'. Something was obviously happening and looking back it is easy to see the role of ICT in this 'revolution'.

The keys of IS history

We will start this historical review by mentioning some key dates, key persons, and key books; in other words, the keys of IS history.

Davis (2003) highlights some key dates in his historical review of IS research. He mentions that the first business use of computers was in 1954 while research on information systems has its roots back in the mid 1960s when Börje Langefors (Sweden) was appointed as the first professor of IS in 1965. Further, in 1968 the first formal MIS (Management of Information Systems) academic degree program was started at University of Minnesota, US, by Professor Gordon B. Davis. Further, there are some key people who have been involved in the formation of the international community of IS, according to Davis (2003). To mention again is Börje Langefors, with his conceptual work followed by Enid Mumford (UK) with her socio-technical view, C. West Churchman (US) who laid out the systems approach and Peter Checkland (UK) with his soft systems approach.

In addition, to make the history more complete, we would also like to mention some key books such as: 'Introduction to Electronic Computers' (1965) of Gordon Davis, 'Theoretical Analysis of Information Systems' (1966) of Börje Langefors, and 'Systems Thinking, Systems Practice' (1981) of Peter Checkland. Noticeable is also that the early academic researchers came from a variety of backgrounds. To mention Börje Langefors comes from engineering and Gordon Davis has his roots in accounting. We believe that that the variety of backgrounds is reflected in the development of a diverse research field.

The eras of IS history

Another way to view the history of IS is to relate to a work of Mathiassen (1998) in which he divides the history of IT into three eras referring to Avison and Fitzgerald (1988), Lyytinen (1989), and Applegate et al. (1996). Each era introduce new trends which lead to additional challenges. The challenges changed with new technologies and new types of applications. Mathiassen's scheme is briefly accounted below, including also comments on the IS history made by Probert (1997) and Friedman (1989). Probert looks upon the history as a move from technological questions to business needs and further on to more strategic views of possibilities for exploiting the technology. Friedman focuses on constraints during each time period. He refers to four phases, each with its own constraint on further computerisation.

According to Mathiassen (1998) the first era covers the early 1960s to the mid 1970s. During this period ICT was used to automate existing manual processes. The overall purpose of using ICT was to increase productivity and efficiency. During this period the IS discipline was mainly dealing with technical questions (Probert, 1997). According to Friedman (1989), constraints during the first part of this period (1940s to mid-1960s) concerned hardware costs and limitations on capacity and reliability. During the second part of this period Friedman mentions software constraints as productivity, time and budget to be the focus.

The second era covers the mid 1970s to the late 1980s, according to Mathiassen (1998). This era had two important trends. First, there was a new and more extensive use of ICT. Second, there was a growing collaboration between different groups and the user-role was highlighted. There was also a shift away from technology itself towards the use of ICT. The overall purpose could be expressed as individual and group effectiveness. Further, there was a focus on

business needs for ICT (Probert, 1997). Constraints during this period could be software constraints as productivity, time and budget, moving over to user relations constraints as quality problems from inadequate perception of user demands and needs (Friedman, 1989).

The third era covers the late 1980s until the millennium, according to Mathiassen (1998). The dominant change during this period is the global networks which transcend boundaries for using ICT and which focus on collaboration. There is a growing concern for the cultural environments that shape ICT solutions. There are also more strategic views of possibilities for exploiting the technology (Probert, 1997). Friedman (1989) focuses on organisation environment constraints during this period. In table 4.13 'Eras of IS history' below, a summary of the IS history is made. The different eras are highlighted together with their related trends, purposes, key issues, and constraints.

Table 4.13. Eras of IS history (Mathiassen, 1998; Friedman, 1989; Probert, 1997)

ERAS	Early 1960s-mid 1970s	Mid 1970s-late 1980s	Late 1980s-early 2000
Trends	Automate existing manual processes	1) A new and extensive use of IT 2) Collaboration between different groups with the user in focus	1) Global networks 2) Cultural environment shape IT solutions
Purpose	Increase productivity and efficiency	Individual and group effectiveness	Collaboration
Key issues	Technological questions	Business needs	Strategic views
Constraints	1) Hardware costs 2) Limitations on capacity and reliability 3) Software constraints as productivity, time and budget	1) Software constraints as productivity, time and budget 2) User relations constraints as quality problems from inadequate perceptions of user demands and needs	1) User relations constraints as quality problems from inadequate perceptions of user demands and needs 2) Organisation environment constraints

The geography of IS history

Describing the history of IS-research can also be done by looking at IS-research geographically and by looking at the distinction of IS research between the

United States and Europe, according to Benbasat and Weber (1996). In the United States, they argue, research is based mainly on a positivist tradition, and it made use of empirical research approaches based on natural science. In Europe IS academics rely more on interpretative studies advocating greater pluralism, more diversity, greater use of methods that allow researchers a possibility for interpretation, and adoption of theoretical perspectives that are not founded on a rational and mechanistic view of the world (Benbasat & Weber, 1996).

Scandinavian research can be seen as a separate tradition or as an additional tradition included in the European tradition. As we see ourselves as belonging to the Scandinavian school we will describe the history of this approach in some detail.

The Scandinavian school

Scandinavian researchers originating from Langefors have had a great influence on the evolution of IS as an academic discipline (Iivari & Lyytinen, 1998). The socio-political history and the dynamics of the Scandinavian societies together with a rapid and intense utilization of computers created the environment for establishing the 'Scandinavian school' (Dahlbom, 2003). The development of the Scandinavian school has been described by different authors. Nurminen (1988) identifies three perspectives covering a period of three decades of information technology use. The three perspectives are a system-theoretical, a socio-technical, and a humanistic perspective. The division of Nurminen (1988) is in accordance with Bansler (2000) as he makes a division into three traditions through an analysis of the Scandinavian research by identifying and defining the theoretical differences between the traditions. The three traditions, according to Bansler (ibid), are an information-theoretical, a socio-technical, and a trade-union tradition. For a map of the community of Scandinavian approaches of IS-research from the 1960s to the early 1990s, see the overview by Iivari and Lyytinen (1998).

When computers were first introduced as calculating machines during the 1960s they invited a system-theoretical perspective also labelled information-theoretical perspective as mentioned above. The system-theoretical perspective has connection to Taylorism with "The Principles of Scientific Management" and its rational and mechanical view on humans and organisations. It includes a

machine perspective that invites us to think of technology as something we use and it has also primarily a management perspective on work. The objectives of the system-theoretical perspective deals with business economics goals. Langefors was a leading pioneer addressing mainly two questions: what systems should do and how systems should be constructed (Bansler, 2000).

When computers began to be used more as information systems, the role and place of human beings in relation to these systems became a topic of discussion. Thus people began to speak of socio-technical systems within IS-research. The socio-technical perspective has its roots in the socio-technical tradition within Working Life Science from the 1950s and the Tavistock Institute of Human Relations in England. Two major inspirations can be identified for the development of socio-technical approaches in Scandinavia. First to mention are the British researchers developing socio-technical design principles and management philosophies within IS from the beginning of the 1970s. Enid Mumford, Manchester Business School, is one of the first main characters within this tradition. ETHICS (Effective Technical and Human Implementation of Computer Systems) is a well-known methodology based on the socio-technical theory (Mumford, 1983). Within Scandinavia inspiration came the Norwegian Industrial Democracy Project in the 1960's (Thorsrud & Emery, 1969) and the Norwegian researcher Rolf Höyer, was among the first to study IS development from a socio-technical perspective (Bansler, 2000).

A more radical view, the trade-union approach, appeared in the early 1970's expanding the ideological foundation, as described by Iivari and Lyytinen in their overview (1998; see also Bødker et al. 2000). The trade-union approach can be regarded as an attempt to seek a radical antithesis to the system-theoretical and socio-technical approach. One main contribution of the trade-union approach is its critical value orientation challenging the management to determine goals of information systems and to emphasise and magnify the concern for the role of users (Iivari & Lyytinen, 1998). The humanistic perspective (Nurminen, 1988) is, in our opinion, close to the perspective of the trade-union. Within the trade-union approach the tool perspective began to be common in use in the 1980s (e.g. Ehn, 1988). The tool perspective could be seen as a worker perspective from within the organisation, attributing importance to the individual worker and the cooperation with the other workers. Gradually during the 1980s and 1990s these ideas emphasized more and more that systems development also should be conceived as 'people'

development (Høyer, 2003). This trend can also be labelled 'the participatory approach'. The issue of participation is central to our study and we will extend our discussion on the subject below.

The traditions discussed above differ in their view of an organisation and of the social relations within an organisation. They also differ in their view on technique and technological progress. The three traditions or perspectives can further be seen as a dichotomy between people and technology. We also see that the role of ICT has changed during history from being more of a solution to being an enabler. This includes that the boundary between people and ICT they are interacting with has becomes difficult to set. The Scandinavian school is summarised in table 4.14 where the characteristics are mentioned in relation to the three decades between 1960 and 1990. After 1990 the Scandinavian school including its research, theory and methods, has been adapted to the 'digital society' including e-services, Internet and mobile solutions. For an in-dept of the development of the field after 1990 see e.g. Nilsson (2004).

Table 4.14. The Scandinavian School in summary

DECADES / CHARAC-TERISTICS	60-70	70-80	80-90
Perspectives	System-theoretical	Socio-technical	Humanistic
Traditions	Information - theoretical	Socio-technical	Trade-union
Foundation	Taylorism	Working Life Science at Tavistock Institute	Ideological with radical antithesis to the former
View on org. and social relations	Rational, mechanistic view Management perspective	Relation between people and technology	Emphasis the role of the user, worker perspective
View on technology	Machine perspective	Need perspective	Tool perspective
Focus (people or tech.)	Technology	People and technology	People
Pioneer	Langefors	Mumford, Höyer	Ehn, Bødker
Role of IS	Information systems as a solution	Information systems as a support	Information systems as an enabler

Finally, as a summary of the Scandinavian research approaches, can be characterised with six keywords on P: *Participatory, Plural, Pragmatic, Philosophic, anti-Positivistic* and *Practical.* The keywords are each exemplified with references to different authors.

- *Participatory* – there is an emphasise on user *participation*, working closely with users giving to them power and responsibility for developing their own systems (Bansler, 2000; Bødker et al. 2000; Ehn, 1988; Kensing et al. 1998)
- *Plural* – there is a *plurality* in theories, research approaches, topics, and outcomes (Kensing et al. 1998; Bansler, 2000)
- *Pragmatic* – there is a necessity to mobilise users in order to arrive at *efficient* systems (Bødker et al. 2000; Ehn, 1988; Høyer, 2003)
- *Philosophic* – there is one distinctive feature that has been its strong conceptual and *philosophical* orientation (Bansler, 2000)
- *anti-Positivistic* – there is a dominantly *anti-positivistic* and action-oriented research approach (Bansler, 2000; Kensing et al. 1998)
- *Practical* – there is the approach where a researcher actively associates her/himself with a particular *practical* outcome of the research tended to come from the Scandinavian countries (Galliers, 1985; Kensing et al. 1998)

The Participatory Approach

As noted above, in the beginning of the era of IS development, user participation was not an important issue and an information system was regarded as foremost a technical artefact. But a participatory tradition developed emphasizing participation by the individuals most affected by the system focusing on cooperation between three different stakeholders: users, managers, and IS experts.

The participatory approach traces its roots to Scandinavian trade unions, but its ancestry also includes Action Research and Socio-technical theory (Kensing et al. 1998). To mention there are over 60 different design methods all based on a participative practice (Tollmar, 2005). The participatory approach is expressed as a user perspective concerning the need for user involvement and user control of systems development (Høyer, 2003). The participatory approach can also be labelled 'appropriation' (Lee, 2003:315) or 'people development' (Høyer, 2003). This is in line with the trends within the development field with Participatory Rural Appraisal (PRA) as one example previously discussed in section 4.1.3.

Tollmar (2005) has presented a framework that combines complementary participative methods using an ethnographic approach that provides an understanding for everyday situations and the social context. We find this view as valuable in the context of developing countries.

But to have the people concerned participate in the IS development may be desired for ethical or ideological reasons, but findings show that participation is necessary even when there are no such ideological motives. The core question to be addressed moved from *what* systems should do to *what* information to provide. In order to provide the user with the requested information and to arrive at efficient systems it was necessary to mobilise the information users (Høyer, 2003). If one were to ignore this, the resulting system could not possibly be an adequate IS. "There is no other way one can adapt the data to the users so that the data provide information to those who are to use it", as Langefors expresses it (1995).

Summing up

In summing up this review of IS history we can conclude that the number of perspectives and approaches within the IS field can be both confusing and difficult, but also challenging and interesting. Robey (1996) claims that the diversity of the field must not be seen as a weakness and we agree on that. It is instead a challenging feature that attracts people who want to address various problems of interest to them. Diversity also advances the valued principle of academic freedom. In addition, a diverse field fosters creativity.

Diversity can be seen in the problems that researchers address within the disciplines, and in the methods used when collecting, analysing or interpreting data. Achterberg et al. (1991) claims that the post-modern thought implies pluralism in research methodologies and in the use of a broader perspective. This implies that we as IS researchers need to remain receptive to a range of potential new perspectives on the issues with which they are concerned.

The diversity could also be expressed as the two missions for the field of IS, according to Markus (2000). The first one is concerned with value aspects and focuses on the whole process by *which* the ICT investments can add value, not only a focus on the information system per se. This mission is closely connected with usage. If the IS is not used by the intended users in the

intended way there will be no added value. The second mission concerns the construction of ICT infrastructure. This is focused on *how* to structure and build with the purpose of best supporting an application. The second mission is a prerequisite for the other or as Markus (2000:196) puts it: "…a robust infrastructure is an essential precondition for achieving sustained value from IT applications." Or in other words, infrastructure is a necessary but not sufficient precondition for added value from an information system; instead we consider added value comes with usage. This gives us an indication of what IS failure and success is about and in the section below we will go deeper into this issue.

4.3.3. Success and Failure of ICT Projects

This section is based on IS literature with focus on factor-studies concerning success and failure in accordance with our research questions. Within IS literature, there are several studies dealing with this issue and it has been reported since the 1970s (e.g. Alter & Ginzberg, 1978; Lyytinen & Hirschheim, 1987; Boehm, 1991; Standish Group, 1994).

Lucas writes 'already' in 1975 that because of the concern over technology people seem to have ignored the fact that almost all information systems exist within a context. Lyytinen and Hirschheim (1987) discuss both development failures and use failures and ask for an integrated framework. There is still a lack of such a framework having both these aspects considered, focusing on the whole lifecycle, according to Markus (2000). We consider this to be true also for the context we are interested in, the context of developing countries. Our ambition is to develop a framework that considers both the development and the use aspect and we see this ambition as a part of our aim expressed in section 1.2.

There are different opinions about the best way of tackling the issues of failures and success in the IS literature. One can choose to study failure and to emanate from this in order to reach success. The CHAOS Report is one of the most cited reports concerning success and failure of ICT projects and they put it this way. "If you begin with luck, you learn nothing. However, if you begin with failure and learn to evaluate it, you also learn. […] Failure begets knowledge. Out of knowledge you gain wisdom, […] that you can become truly successful." (Standish Group, 1994:4). Another way is to study successful projects and by

that be able to answer 'why' they are successful. Or as Robert Kaplan puts it; 'the best way to reach success is to look at successful projects'.

We consider that both ways of tackling the issue give important input in the knowledge process. In the next section we will highlight a number of studies concerning success and failure of ICT projects in order to identify some general factors that influence success and failure. One can ask if it is relevant to look at general factors and we believe it is, to a certain degree. General factors can give an indication of what issues to consider; they can be used as a guide but we argue that the specific context must also be taken into consideration.

How to reach success?

It is an important task to find out *how* to reach success. But first we would like to define *what* a success is. A successful project could be expressed, according to Standish Group (1994), as "…completed on-time and on-budget with all the features and functions initially specified." Concerning frequency of success one often-cited study found that approximately 16 percent of IS projects are on-time and on-budget, but many projects are not the same compared to their original specification requirements (Standish Group, 1994). Hence, we can assume that the share of successful ICT projects is very limited. This is in line with the observation mentioned in section 1.1. Further, three indicators for assessment of success are suggested: *time*, *cost* and *content*.

So back to the headline again: *How to reach success?* This can be done by asking *why* projects succeed. According to Alter and Ginzberg (1978), concerning IS implementation, they argue that a successful implementation could be predicted by *identifying key uncertainties* and by developing adequate strategies during the different phases. The key is to plan the implementation in the early stage. This is in line with Standish Group (1994) as they explain the reason for success of building bridges in comparison to ICT projects. Their study is based on interviews with business executives in the Unites States. They argue that the key to successful bridges is in a plan with extreme details and with little flexibility. A more flexible model has been used to be rationale ending up in failure. So the key is planning and that includes *knowledge* about the certain issue. Three major reasons to succeeding mentioned by Standish Group (1994) are: *user involvement*, *executive management support*, and *clear statement of requirements*. Further mentioned reasons are *proper planning*, *realistic expectations*, *smaller project milestones*, *competent staff*

and *ownership*. The reasons mentioned can be synthesised in the following ten factors below, according to the two studies mentioned above.

Top-10-list for success (Alter & Ginzberg, 1978; Standish Group, 1994):

1. Identify risk factors
2. Proper planning
3. Adequate knowledge
4. User involvement
5. Executive management support
6. Clear requirements
7. Realistic expectations
8. Small project milestones
9. Competent staff
10. Ownership

This top-10-list for success could be condensed into three main issues. First, *planning,* including the factors: identifying risk factors, proper planning, and small project milestones. Second, *knowledge,* including the factors: adequate knowledge, and competent staff. Third, *participation,* including the factors: user involvement, executive management support, clear requirements, realistic expectations, and ownership. We can add the three suggested indicators for assessment of success mentioned above: *time*, *cost* and *content*. Hence an answer to the raised question How to reach success could be: *Success is a matter of planning, participation and knowledge concerning time, cost and content*. Let's move on to the next question, How to avoid failure?

How to avoid failure?

We will answer this question through discussing several interpretations of the concept 'failure' in the form of some of the Zachmanian interrogations; *who, why, what, when* and *how* (Zachman, 1987). The sixth question, *where*, is already answered by our choice of geographical context, that of developing countries.

We can state the fact that there have been and still is a tremendous problem regarding failed ICT projects (Standish Group, 1994; Schmidt et al., 2001). This is also true for developing countries, as stated in section 1.1. This can be noticed in spite of advances in technology and obtained experience. The issue

of failures has been studied for the last decades by several authors (e.g. Lucas, 1975; Keen, 1981; Lyytinen & Hirschheim, 1987; Lyytinen, 1988; Standish Group, 1994; Heeks et al., 1999; Lyytinen & Robey, 1999).

We will start asking *what* a failure is. The CHAOS Report (Standish Group, 1994) divides failures into three groups regarding the extent of failure and defines them as follows. The first group is labelled *Totally failed projects*. The second group, *Challenged projects,* could be defined as 'completed and operational, but over budget and over time offering fewer features and functions then originally specified'. The third group, *Impaired projects*, could be defined as 'a cancelled project at any point during the development cycle'. This approach is partially in line with Heeks et al. (1999) when they describe failures by identifying different forms of failures. They did identify a total of four main forms of failures. The first form, *Total failure,* defined as 'the system is never implemented or immediately abandoned'. This is identical with the first group from Standish Group. The next form, *Partial failure*, defined as 'the major goals are unattained or there are undesirable outcomes'. This could be seen as comparable with *Challenged projects*. Heeks et al. also add two more forms of failures related to a time perspective concerning long-time viability as well as replications. The third form, *Sustainability failures*, defined as 'the system succeeds initially but fails later' and the fourth form, *Replication failure*, expressed as 'a successful initiative cannot be repeated'. This discussion indicates that 'failure' is not a homogenous and simple concept. The different forms are summarised in Table 4.15 below.

Table 4.15. *What* is a failure? Different forms regarding extent

Total failure	The project is never implemented or immediately abandoned
Impaired projects or Partial failure	A cancelled project at any point during the development cycle The major goals are unattained or there are undesirable outcomes
Challenged projects	Completed and operational, but over budget and over time offering fewer features and functions then originally specified
Sustainability failures	The system succeeds initially but fails later
Replication failure	A successful initiative cannot be repeated

Connected to the above there is another way of looking at the issue of failure putting a time approach to the subject. Hence, the next question is; *when* does a failure occur, *when* during the life cycle? According to Lyytinen (1988) IS failures can be divided into two phases. The first phase refers to *development failures* and

the second phase refers to *usage failures*. But at the same time we believe it is important to look at failures from an integrated perspective, in accordance with Marcus (2000).

A further way to approach the issue is to divide failures into groups regarding *who* or *what* is the cause of the failure. According to Mursu (2002) there are three main groups of failures: *hardware component failures*, *software failures*, and *human factors*. She also mention two more groups that we will add to the list; *organisational* and *contextual* factors. None of the factors are excluding the others; hence failure can be caused by factors from all five groups.

It is also relevant to ask *why* projects fail. Accordingly to Lucas (1975) there are two main reasons why ICT projects frequently fail. Firstly, failure is a matter of coordination and co-operation between multiple stakeholders like *management, experts,* and *users*. Secondly, it is a matter of coordination and co-operation between multiple factors concerning *technical*, *behavioural, situational*, and *personal* matters. These matters are similar to the factors mentioned above by Mursu (2002) and we can condense them into three main groups: *technology*, *human* and *context*. Consequently, *failure is a matter of coordination and co-operation between multiple factors concerning human, technology, and context.*

The CHAOS Report also gives some suggestions about *why* projects fail (Standish Group, 1994) and highlights three main reasons: *time overruns*, *cost overruns*, and *content deficiencies*. These findings are in line with the factors that most failures in IS development refer to: cost overruns, project delays, and unmet user needs (Barki et al., 1993; Cule et al., 2000). This is also in line with the suggested indicators for assessment concerning success namely, *time, cost* and *content*.

Connecting the answer to the question of How to reach success: *Success is a matter of planning, participation and knowledge concerning time, cost and content*. A statement about failure: *Failure is a matter of coordination and co-operation between multiple factors concerning human, technology, and context it* could be expressed, using Lucas' words (1975), *Success and failure is a matter of coordination, co-operation and knowledge concerning time, cost and content regarding human, technological, and contextual factors.*

We stated in the beginning of this section that it is relevant to look at general factors to a certain degree. As stated, general factors can give an indication of what issues to consider, they can be used as a guide but they cannot be enough as the specific context must be taken into consideration. The discussion in this section indicates that success and failure are a many-sided phenomenon. We consider there is a need for a further articulation of the phenomenon and in the section below we will further review the concepts of success and failure.

4.3.4. Reconsidering the Concepts Success and Failure

Let's raise the question *How to reach success?* once more. One way to tackle the issue is to try to understand failure. This has to be done in a multidimensional way through a clarification of the concept, by looking at evaluation and failure assessment and through highlighting reasons and causes. In this section we will mostly refer to an article written by Lyytinen and Hirschheim (1987) where they developed a classification of IS failures based on empirical literature. They divided IS failures into dimensions, domains and types. All together they identified eleven principal failure classes and sixteen different IS failure types. They also identified twelve classes of failure reasons out from the empirical literature.

Clarification of the concept

According to the above observed complexity of failure we consider that the concepts of success and failure need a conceptual clarification. As the discussion above indicates that at least 50 percent of all information systems are classified as failures, this poses a considerable challenge to the IS community. It indicates that there are major problems connected to development and use of information systems and it points to the importance for the IS community to better understand failure. We believe that the concepts of success and failure are too vague, they are unarticulated and the literature deal with too limit notions of success and failure. Hence, we state there is an inadequate conceptual clarity of success and failure concepts.

A well-articulated concept of failure is also important in that it guides the perception and evaluation of an information system, or in other words, it affects how the evaluation process is conducted and it also affects the results the evaluation comes up with. This is in line with Lyytinen and Hirschheim

(1987) as they argue failure is a complex issue including both conceptual and practical confusion surrounding failure.

Hence, we believe there is a need for a detailed treatment of the failure concept. Spontaneously it could be regarded as a trivial matter, considering failure as self-evident requiring no further clarification. But we state that failure is not evident, it requires further clarification. At a first glance the concepts failure and success can be seen as opposite sides of the same phenomenon. They can be regarded as a concept pair that can be seen as mutual exclusive; a success is not a failure and vice versa. In other words, 'either it succeed or it fails'.

Another way to express the relationship between the concepts is as 'a strategy to reach success is to avoid failure'. This could hold true if there were only two ways of assessment: success and failure. But we argue that it is not that simple. We argue there is no general failure or success. Instead it is about a family of situations in which an information system has failed and not a singular constellation of facts.

As stated above we believe that knowledge about success can be used to understand failure. As well as with failure, there is no single definition of success and the process of measuring success is not clear. Whatever can be said about evaluating success can be used for understanding failure. But, according to Lyytinen and Hirschheim (1987:260), there are some differences between the evaluation of success and of failure. They mention three differences. First, the reasons for failure and success do not necessarily coincide and there is not only a quantitative but also a qualitative difference. Second, success might require changes or even abandonment of the IS. Third, success assessment emphasizes more on what occurred, while failure assessment focuses more on why something occurred.

As failure mostly causes more problems we will focus on trying to understand failure below. Let's take a look at the concept of failure and at different notions of the concept. According to Lyytinen and Hirschheim (1987) there are three principal notions of the term 'failure' in the literature. First there is the *correspondence* failure which concerns that 'objectives are not met'. Second there is the *process* failure which concerns a 'total failure as well as over time and over budget'. Third there is the *interaction* failure which can be described as a 'low level of use'. These notions correspond to the studies we have discussed above.

The authors consider the notions as traditional failure concept categories in the literature and by that they have been widely adopted. Further they argue that the identified notions in the literature all suffer from a conceptual weakness and of a too high rational view of failure. They argue the term has different senses depending on the specific perspective one adopts. Failure conveys a family of meanings and the notion of failure must involve a pluralistic component that takes into account the rich variety of existing perspectives.

They introduce a new notion of failure, the *expectation* failure. The traditional notions can be seen as special instances of expectation failure reflecting specific interests of a group, according to the authors. In other words, the expectation failure notion can be viewed as a superset of the other three. Expectation failures are multi-dimensional involving technical, economic, psychological, behavioural, political and time aspects, as well as scope of failure (Lyytinen & Hirschheim, 1987).

We agree with Lyytinen and Hirschheim (1987) and argue that success derives from receiving the expected, while failure derives from an inability to meet expectations. Hence, it is a matter of expectations and perceptions about the requirements, the features and function initially specified or as Lyytinen and Hirschheim (1987:264) puts is: "Failure is the embodiment of a perceived situation"

A reflection is that if there are so few successful projects maybe the requirements are wrong, or are the expectations too high? Or the wrong person (*who*) measures the wrong things (*what*), at the wrong time (*when*), with the wrong instrument (*how*). There is a need for clarification, specification, and criteria here. Actually, we believe there can even be both a success and a failure at the 'same' time, as we will show later.

A negative consequence of adopting an expectation failure notion as that being a pluralistic concept it involves a high level of complexity and does not lend itself to any straightforward procedure. We will take a deeper look at the issue of expectations below.

Expectation – a matter of evaluation and failure assessment

To deal with expectations we have to do some sort of evaluation. Further, failure assessment can be seen as a common part of the larger issue of IS evaluation. Failure assessment is in other words an integral part of a larger context, the larger context of any evaluation.

Any evaluation intervenes in the running of the organisation so failure assessment can be seen as an organisational process that affects the participants; hence it is political (Lyytinen & Hirschheim, 1987). This adopts a complementary view of failure in that it becomes important to understand the organisational arrangements and the evolutionary nature of evaluation processes, according to Lyytinen and Hirschheim (ibid). Additionally, failure assessment is not an individual process. Instead it must mirror the rich varieties of failures and assess failure in multi-dimensional terms.

Failure analysis is a complex interpretive accomplishment and involves the consideration of what failure concept criteria are used to decide on appropriate failure assessment. Failure assessment can be done in different ways including different failure concept criteria which all give the concept different practical implications. In other words, it gives an indication of how to assess failure. Below we will raise some different issues articulated by Lyytinen and Hirschheim (1987) on what failure concept criteria are used to decide on appropriate failure assessment.

If we put a *dimension perspective* to the concept we can talk about a summative and a formative dimension where *summative* assessment produce only an evaluation, telling how good or bad some aspects of the information system are, in other words focus on *what* occurred. While *formative* assessment provide diagnostic information which helps to explain *why* a specific situation was reached, why something occurred. The formative study adds a new dimension to IS assessment as it stresses the importance of studying those factors of the 'total systems' that contributed to the failure.

Additionally, when evaluating we need a *measurement scale*. This scale could be *discrete* indicating that when the rate of a specific factor is increased to a specific point, success turns into a failure and vice versa. Or it could be a *continuous* scale where there is a gradual shift from poor to good or failure to success. These two could be considered as two extremes of a continuum. Hence, failure and

success form a continuum from very low to very high. We believe that because many information systems are typically political compromises they are typically neither prominent success nor major failures.

Further, failure assessment is *value-laden* and *non-neutral*; it includes that some loses and others win. As stated before success derives from receiving the expected, but we argue that this is not necessarily the best. And as mentioned before, failure derives from an inability to meet expectations, which consequently is not necessarily negative. It depends on the viewpoint one takes; there is always someone or some group who gains from failure. A failure can also be a starting point for action by which someone can try to realize their interests.

There could also be different procedures or assessment *techniques* used: a more *formal* one or an *informal*, more unstructured, one which relies more on intuition, personal skills and tacit knowledge. These two could be considered as two extremes of a continuum where a mixture might be preferred.

Further the size of the role set of *assessment participants* is also of importance for the assessment, i.e. whether there are *limited* or *extensive* role sets. In other words, it is also dependent on who is doing the measuring.

The nature of the *assessment process* is also of importance. By this we mean there could be a *context-independent* or a *context-dependent* view. The latter implies a more pluralistic and contextual view of the evaluation process. One must consider which sort of failure assessment approach is appropriate for a given context. When studying the issue of failure a broad contextual approach including social, cultural, political and economic perspectives is recommended (Bussen & Myers, 1997). Because no simple tactic is possible to prevent failure more emphasis on understanding contextual features of the information system is necessary (Lyytinen & Hirschheim, 1987).

Taking into consideration the *time aspect* we can talk about a *static* view where an information system is a thing to be observed and once it had failed it will remain so. The opposite is a *dynamic* view in which IS failure is seen as a dynamic process that is reshaped by activities, perceptions and learning. In other words, a failure can be assessed as a temporal state, which we will come back to below.

Another aspect of time concerns the time frame which expresses the *time horizon* of the assessment and asks whether assessment looks primarily to the past, to the present or to the future. The assessment can hence fall into two main classes; an *ex post* analysis and an *ex ante* analysis. The former is established after a project is finished through a comparison with the original goal; this sort of analysis is an evaluation. The latter's main goal is to reshape the organisational contexts to fulfil the expectations and to deal with the problems.

The above discussed criteria for failure assessment are listed below:

- The dimension perspective should be *formative*
- The measurement scale should be *continuous*
- The nature of assessment is *value-laden* and *non-neutral*
- The nature of assessment techniques should be *informal*
- The role set of assessment participants should be *extensive*
- The assessment process should be *context-dependent*
- The temporal aspect of assessment should be *dynamic*
- The assessment time frame should be an *ex ante* analysis

The Paradox of Success and Failure

As indicated above, seen in a time perspective, there can be a temporary success or a temporary failure. A prospective is that a project can be regarded as a failure concerning on-time, on-budget, and specified requirements, but later on become a success as the stakeholders are content. The opposite is also a possible outcome. Many failures actually have met the requirements, but they have been considered failures because some other vital concerns have not been catered for (Lyytinen & Hirschheim, 1987). This is in line with the discussion about different forms of failure in section 4.3.3.

This paradox can be expressed using the terms *objective* versus *goal* seen in a time dimension where objective is measured in a long time perspective and goal in a short time perspective. We use the concept objective defined by Ackoff and Emery (1972:56) in the following way: "…a long-range intended outcome of a subject 'A' over a set of choice environments and a time-period…Thus an objective is a desired outcome that is not obtainable in the time-period being considered, but progress toward it is possible during that time-period, and it is obtainable at a later time."

Accordingly Ackoff and Emery (1972:56) define goal as: "…an intermediate intended outcome of a subject 'A' over a set of choice environments". We can illustrate the paradox of success and failure using a four lane diagram in accordance with Holmesland (2001), see Table 4.16 below.

Hence, we regard there to be four outcomes of a project seen in a time perspective. First, a *sustainable success* which implies both reaching the goal and the objective. In other words a success both in short time as well as in long time. Second a *sustainability failure* which implies reaching the goal but not the objective. In other words a success in short time but a failure in long time. Third a *partial success* which implies not reaching the goal but the objective. In other words a failure in short time but a success in long time. Fourth a *total failure* which implies not reaching neither the goal nor the objective. In other words a failure both in short time as well as in long time.

Table 4.16. The paradox of success and failure (adapted from to Holmesland, 2001)

GOAL – short time / **OBJECTIVE – long time**	**Success**	**Failure**
Success	**Sustainable success**	**Partial Success**
	Win-win situation	Off-time, off-budget, without all requirements Operation/use is a success E.g. Sydney Opera House
Failure	**Sustainability failure**	**Total failure**
	On-time, on-budget, with all requirements	Off-time, off-budget, without all requirements
	Operation/use is a failure	Operation/use is a failure
	E.g. Wasa, Titanic	E.g. 'Most' ICT projects

Expectation – a matter of values and stakeholders

There is no 'general' failure and any study of failure must concern itself with expectations. Some of the expectations are formulated explicitly and described in terms of requirements, goals, budget, and time limits. Lyytinen and

Hirschheim (1987) use the term *values* in a wide sense to explain what influences our expectations. Values are introduced by objectives, goals and standards (what should be achieved), and are shared within a context. Values are social and depend on cultural inheritance as well as economic and historical factors. But at the same time values can be fragmentary, inconsistent and remain largely unconscious. Further, values are conflicting and ambiguous and by that there can also be different points of view about failure.

We can conclude, in accordance with Lyytinen and Hirschheim (1987:261) that failure occurs when outcomes that would coincide with adopted values are not obtained. Another way to put it is like Samuelsson (1977): "The success of any system can only be measured in terms of the satisfaction of the user". Further, failure assessment only makes sense if values are clearly understood and values determine the criteria on what to evaluate. To summarise the discussion above we will cite Lyytinen and Hirschheim (1987:264): "Failure is the embodiment of a perceived situation".

Values are largely constituted in the realm of a community but finding values that are relevant implies a need to identify a group of people sharing a pool of values about features. In other words, there is no 'general' failure; instead failures pose problems for some group or someone. A failure signifies the gap between an existed and a desired situation for members of a particular group. The members of the group share an interest which is something that furthers a group's advantage. Further, values originate from the interests various members try to pursue. The common term used in literature is *stakeholder*. In IS literature most stakeholders fall into 3 groups, as observed above: user, management and expert. This classification is too coarse and in most cases inadequate, according to Lyytinen and Hirschheim (1987). In addition, the stakeholder concept is a dynamic one and it could be difficult to identify a stakeholder group. In addition, the number of stakeholders is likely to be considerable. In other words, success and failure are conditional concerning different stakeholders.

The stakeholders' interests are formulated through a number of expectations, i.e. the beliefs and desires concerning how the information system will serve the group's interests. An information systems failure can be defined as the "inability of an IS to meet a specific stakeholder group's expectations" (Lyytinen & Hirschheim, 1987:263). In other words, it means a gap between stakeholders' expectations expressed in some ideal or standard and the actual performance.

Further, the concept is pluralistic, since it assumes that failures depend on values of the specific stakeholder group (Bussen & Myers, 1997). It is also political as it sees many of the values to be in conflict. It can also be regarded as political since most failures are resolved through political means such as compromises and bargaining about competing priorities (Standish Group, 1994; Bussen & Myers, 1997).

Reasons for failure

We consider that there are a multiplicity of reasons for failure and a multi-causal nature of IS failure as discussed before.

Both success and failure can be seen as effects, results and consequences that are depended on several different reasons. These reasons can in turn be described using a number of factors, success factors and failure factors. We can also say that these failure factors hinder success. These factors need to be identified to be able to avoid failure. The most important factors for failure can be labelled critical failure factors. But a more commonly used term is risk factors.

Consequently the success factors are enablers for success. These factors need to be identified to be able to manage success. The most important factors for success can be labelled critical success factors or just critical factors. In our pre-study we used the concept Critical Success Factors.

These factors can be termed the reasons for failure. We have mentioned some of the factors above. IS failure reasons can be distinguished by the following criteria, according to Lyytinen and Hirschheim (1987:284). First, failure reasons are the factors and situations which lie outside the IS – they belong to the environment. Second, failure reasons are believed to have causal precedence over failures and are not assumed to be caused by any higher-order reasons. Third, failure reasons must have some 'causal' connection to failures.

Lyytinen and Hirschheim (1987) have divided the reasons for failure into two major groups: First, features of the IS, *hardware* or *software* related. Second, features of the IS *environment*. Features of the IS environment are further divided into three minor groups: *individual*, *organisational*, and *environmental* reasons. This is in line with the four groups of Mursu (2002): technology, human,

organisational, and contextual factors. Further, Lyytinen and Hirschheim (ibid) argue that individual reasons are mostly controlled, while organisational and environmental reasons are mostly uncontrolled.

Further, Heeks (1999) points to a major problem connected to reasons for failure as ICT projects imply change. If the project exactly matches its environment, it would not change that environment in any way. Yet the purpose of a new project is to support and improve functions so there must be some degree of change. Development, implementation and use of ICT is a human activity and it implies an intentional change process driven by more or less clear objectives (Mathiassen, 1998). But, on the other hand, if the project tries to change too much this brings with it a risk of failure. Success becomes more likely when change is limited. Overall, there is a trade-off between change and risk. Further, the change process needs to be managed and controlled properly. Mursu (2002:65) puts it this way, a successful project will be one "…that tends to match its environment in relation to technical, social and organisational factors; these latter include the perceptions of key stakeholders". It is important that initiatives that have radical effects also have strong political support from key stakeholder groups and evidence of gains for each group (Lyytinen & Hirschheim, 1987).

Failures tend to form a cyclical network of factors connected to mutual causality, as expressed by Lyytinen and Hirschheim (1987:281). By that the study of reasons can at most provide a multi-linear, multi-causal description of the failure. A more systematic failure reason analysis must proceed by taking into account interactions between several failure reasons and studying their dynamic properties.

Preventing before implementing

Once again we state that there is no 'general' failure and we believe that failures are neither random nor spontaneous events. Instead we think when analysing failure it is possible to reconstruct a systematic pattern of events that led to the failure. The advantages of a retrospective study are threefold, according to Lyytinen and Hirschheim (1987). First, it is possible to provide some *explanations* as to why the IS failed. Second, these reconstructions can be used for learning, in line with the systems approach, and hence in *preventing*. Third, these evaluations may help in *predicting* new failures in the future. In the

prevention process identifying risk factors is a key activity. A risk analysis is in other words a prediction for judging failure. The opposite of risk is opportunity or chance or prospect. Prospect is a positive prediction or prognosis with success as the positive result or effect or consequence.

The constituents of the concept pair 'risk and chance' are related to each other as they both deal with predictions and prognosis. An analysis concerning risk and chance is made before a project is started through a prediction about the future, often labelled *risk management*. There is an extensive amount of literature dealing with risk management, but we will not go deeper into this issue in this study.

We can state that failure analysis is an interpretive activity directed at understanding problems and creating actions to resolve and prevent them. In other words, *preventing before implementing* should be the strategy. This is in accordance with the system approach, as mentioned in section 2.2, implying that systemic methods are in themselves a learning process.

The former section implies that failures are difficult to manage as it involves several factors, external as well as internal factors, and explicit as well implicit factors. In other words, there is a multiplicity of reasons for failure. The factors influence each other as they are linked in a complex and sometimes subtle way. The complex relationships among these factors must all be considered. If any factor is ignored, the project is likely to fail. This is in line with Lucas (1975) as he states that failure is a matter of coordination and co-operation between multiple factors.

In accordance with the discussion above we can state that the degree of complexity is a matter of the four main issues: context, stakeholders, change, and factors. Hence, *success and failure are relative concepts regarding context, multiple stakeholders, change, and multiple factors*. Further this could be expressed as complexity concerning failure is a function of context, stakeholders, change, and factors. Related issues are *perspectives* on contexts*, values* of stakeholders, *matching* changes, and *relations* between factors. We can add two more issues or perspectives, namely *time* and *resources*, in accordance with Holmesland (2001). In addition, *relations* between factors indicate the need for a system approach.

All these issues influence each other as they are linked. A failure according to any of the mentioned issues will influence the final result. This implies a wide approach focusing on the whole lifecycle. This is in line with the system approach and the holistic view we apply in this study.

The mutual influence among the main issues can be illustrated using a Leavitt-like diamond (1965), see figure 4.5 Influencing issues of failure

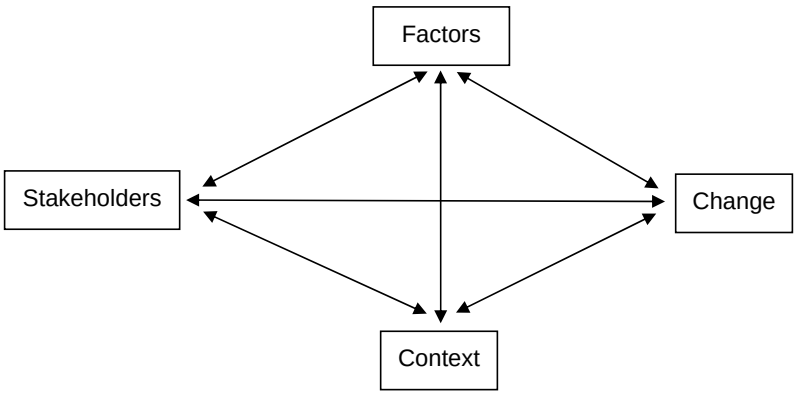

Figure 4.5. Influencing issues of failure

But to deal with complexity we need appropriate methods as failure is an extremely complex web of social, political and technical phenomena. And it is not possible to reduce it to only a technical complexity – that will fail. Hence, there are no simple failure resolutions available to resolve the problems that are included in failure. Instead failure is a many-sided phenomenon of immense complexity which defies any simple solutions. A way to deal with complexity is to apply a systems approach as failures constitute holistic, changing situations with many interacting elements. In understanding failures, the systems approach also reminds us of the importance of the larger environment including cultural, organisational, and economic issues in which stakeholders act and can be located. These environments form the 'ecology' of the problematic situation and connect IS failure to the overall organisational context (Lyytinen & Hirschheim, 1987). The systems approach also recognizes the incompleteness of our understanding of any situation (Checkland, 1981). As mentioned above we adopt a system approach for this study and we have discussed that in section 2.2.

Further, the complexity of failure assessment and the number of failure reasons implies that any attempt to explain failures cannot cover all aspects – one must reduce the number of aspects considered if any meaningful explanations are hoped for. But at the same time studies must not identify only one aspect of failing. Instead failures should be studied as dynamic processes covering some key aspects. The framework developed in chapter 5 will focus on factors as such, not the interdependence between them. Two aspects to include in the analysis are *who* the relevant stakeholders are and *what* the relevant environmental factors are.

4.3.5. Implications for ICT in Developing Countries

We can notice that there is no 'best way' for *how* to reach success or *how* to avoid failure, neither is there a general solution or a general answer to these questions. This is important to have in mind when planning ICT projects/activities in developing countries. Different situations demand different strategies and the relative values of factors are specific for the actual situation that determines a success or failure (Heeks et al., 1999). Extended a bit this could also be expressed as we did above, *Success and failure are conditioned by context, change, multiple stakeholders, and multiple factors,* a statement which deserves attention when planning ICT activities in developing countries. It is important to remember that the technology itself, the ICT artefact, is also conditional or as Orlikowski and Iacono (2001:132) puts it: "being on the Internet in China will be different from that in Saudi Arabia".

Hence, it must be recognized that the interdependencies, illustrated with the Leavitt-like diamond above, are situation-specific, which will determine success and failure and, hence, strategies for success. One strategy is to apply a failure prevention analysis as we stated above, *preventing before implementing* could hence be formulated as a strategy. Though, a negative consequence of this may be a slower development pace. But the pace must also be dependent on the actual situation and specific context. This could be relevant to take into consideration in developing countries.

Concerning the importance of *matching* of changes, as discussed above, we ask ourselves if there might be a problem with so called 'leap frog', previously discussed in section 4.1.4, introducing new ICT into a context e.g. a community not accustomed to the previous stages of the technology. As Heeks (1999)

points out ICT projects imply change but with too much change comes a risk of failure. We believe this must be taken into consideration when planning ICT projects in developing countries.

We stated in the beginning of this section that it is relevant to look at general factors. As stated general factors can give an indication of what issues to consider, they can be used as a guide but they cannot be enough as the specific context and actual situation must be taken into consideration. Hence, the statement *success and failure is a matter of coordination, co-operation and knowledge concerning time, cost and content regarding human, technological, and contextual factors,* we believe could serve that purpose. And by that it could be used as guidance for ICT projects in developing countries. The failure assessment indicators listed in section 4.3.4 could also be used for the same purpose. Our framework including the identified critical factors will also act as guidance while planning ICT projects and activities in developing countries.

When we compare the ten CSF from our pre-study with the Top-10-list for success (Alter & Ginzberg, 1978; Standish Group, 1994), we can state that there is a main difference between the factors. The ten CSF concern factors on a much more fundamental and elementary level such as poverty, lack of infrastructure and education, as well as lack of a postal system. The Top-10-list is developed within the context of Western countries where these issues no longer are a serious problem. The CSF are necessary in both contexts, but seen as obvious in a Western context. This is important to have in mind when discussing success and failure in developing countries. Factors and knowledge are difficult to compare between different geographical contexts.

When talking about ICT projects in developing countries the matter of *coordination* and *co-operation* for success is also of importance between different organisations. We believe there is too much focus from international aid organisations to put their own 'brand' on a project. Instead we think coordination and co-operation between organisations and their specific ICT projects could be both an effective and efficient strategy as well as resource saving strategy. We believe more of a systems approach could be relevant here.

The reflections emanating from our pre-study that ICT equipment was physically there but was seldom or never used. In other words, we saw a failure. The equipment had been donated from international aid organisations,

according to the respondents. Our pre-study can also be seen as a type of evaluation study with two types of outcomes, success and failure. According to the discussion in this section we can declare that it is not that simple. Hence, we can state that the concepts of success and failure are not suitable for the purpose of evaluating the outcome of a project or activity or an IS. Both concepts are much too simple to be used as evaluation 'tools'. It might even give the wrong impression, what appears to be a failure might instead be a *partial success* as *the paradox of success and failure* implies, as noticed above.

Evaluation is instead, expressed in line with the discussion held above, a matter of *expectations* and *perceptions* concerning *requirements* from different s*takeholders* depending on their existing *values*.

Regarding the multidimensional nature of failure it is therefore very unlikely that any information system is simply a success or a failure. We argue there are no such things as success and failure! The terms are not distinct enough to be used as a description of the objective of a project. Hence, there is a need for a more suitable concept. As we are especially interested in how success can be obtained and failure can be avoided in a long time perspective we refer back to Heeks et al. (1999) who include a time perspective using the term 'sustainability'. A success in a long time perspective can be labelled 'sustainable' as stated previously. Hence, success is included in sustainability, but sustainability contains more, we believe, which will be illustrated in the next section.

To conclude, this section creates understanding for the complexity of the concepts 'success' and 'failure' and by that also for 'sustainability'. In the next section we will discuss explicitly the issue of sustainability and sustainable development.

4.4. Sustainability Theories

Sustainability theories concern sustainable development and originated within the research fields of environment and ecology. On account of the reflections from our pre-study we find it logical and fruitful to include this theory field in our work. Further, sustainable development as a concept is prevalent in contemporary studies in the international debate.

Our understanding of sustainability theories will be advanced by both conceptual clarification and more attention to what the key issues are in the sustainable development approach. We describe the origin and the development of the concept of sustainable development as well as applications of the concept. We discuss what sustainability theories imply by looking at three different perspectives, and further we go deeper into and discuss ways of achieving sustainable development.

4.4.1. Key Concepts

Within this field the key concepts are 'sustainability' and 'sustainable development' which we want to highlight in this first section. We have noticed that the concepts of sustainability and sustainable development are mostly used as synonyms in literature without any real distinction between them. We will follow this practice in this thesis.

In fact sustainable development has for several hundreds of years been an area of interest for different sections of society. Its up-to-datedness has grown out of concerns over the fact that the present development course is not tenable as it drains natural resources and, indeed, the sustainable development debate we see today originated within the environmental movement. In section 4.1 we did mention this trend as the opposite of 'underdevelopment' and labelled it 'overdevelopment'. But it is important to stress that underdevelopment is also causing severe environmental problems. According to Gustafsson (2006) this is even more serious because poor peoples lack of "ghost areas" (resource fields on distance) restricts their resource supply ultimately when they destroyed the local natural resource base which they rely on for their survival. This base can be productive soil, valuable fish species in local waters, or groundwater resources. In the context of developing countries, 'sustainable development' is also defined as lifting people out of poverty and not only to protect the environment (Gustafsson, 2006).

Although the notion of 'sustainable development' has become a commonplace, its true meaning remains a mystery to many people. This has not prevented sustainable development from being raised in support of numerous economic and social agendas. The concept has become the trade-mark for organisations claiming to work for 'benign' progress. The concept has also made inroads into the development community and is widely used in the debate. It appears to be

fruitful as it has spread among researchers and consultants interested in development and ICT issues in developing countries. As it is difficult not to approve the concept and its implication of benign progress, this concept has today become both an intellectual necessity as much as a political necessity. Nearly every group that has adopted the sustainable development concept has given it their own particular definition. But at the same time it has become an 'essentially contested concept' or in other words "a concept that is likely to always be debated and disputed" (Karlsson, 2005:30). In the next section we present the original Brundtland definition of the concept 'sustainable development'.

One way to deal with the confusion of a phrase is to look at the etymology of its constituent words. From this one gets a hint of its 'original' meaning and we believe that this is fruitful to take a standpoint in and to build further on by analyses and theories. The etymology of 'sustainable' carries interesting and important implications for the way the word is used and we believe this usage includes several contradictions. The word 'sustain' is derived from the Latin 'sub-tenere', meaning 'to uphold'. We see this carries a passive connotation in it and gives the concept 'sustainable' an image of stability, persistence, and balance. Our reflection is that 'sustainable' is used in a more active sense together with 'development'. Development means change, progress and growth. Action means making a difference through intervening in order to change something. At the same time 'sustainable development' can be interpreted as a change that emanates from a need or demand. 'Sustainable' in the active voice suggests a disposition towards something, it carries a clear prescriptive message that something should and can be done. It also emphasizes the inherent capacity of the process to bring about some benign change. The concept implies a catalyst for this process. At the same time the concept indicates the direction and a guide to organise and support the process towards a desired state. The concept 'sustainability' also gives an image of stability and connectivity to the past but the world was never and is not stable. Places change and must be prepared for change. And such change is social and cultural as well as economic (Meier, 1980).

Hence, 'sustainable development' can refer to *a process which is being upheld or defended at the same time as it implies movement and improvement.* In other words, we believe that the idea of 'sustainable development' can be regarded as *normative* and *active* as well as *positive* and *passive.* The tension between *preserve* and *change*

that is inherent in the concept 'sustainable development' does not need to only bring about problems. We believe that this marriage can give a fruitful and exciting result in the form of challenges and possibilities. The concept of 'sustainable development' will be further analysed below.

4.4.2. History and Background

In this section we will take a brief look at the history of and background to the concepts of sustainability and sustainable development. We will do that through an ecological–environmental perspective as the impetus behind sustainable development came from biological sciences.

The ecological-environmental perspective

The current idea of sustainable development originated within the environmental movement out of concerns about the current development course is unsustainable and in fact a matter of 'overdevelopment'. Sustainable development was used the 'first' time in the Cocoyoc declaration on environment and development in the early 1970s (Redclift, 1992). It can be seen as a response to the environmental and social effects of the prevailing approach to economic growth. Arguments like increasing consumption of scarce resources, increasing pollution, population growth and growing imbalance in development between different countries were used in the debate.

From the early 1980s comes another example of the use of the concept. This is also from an environmental context, the World Conservation Strategy, presented by the UN Environmental Programme, the World Wildlife Fund and the International Union for Conservation of Nature and Natural Resources. In this formulation economic and social factors were highlighted as well as a time perspective: "For development to be sustainable, it must take account of social and ecological factors, as well as economic ones; of the living and non-living resource base; and of the long-term as well as short-term advantages and disadvantages of alternative actions." The strategy concluded that three priorities must be built into development policies. First the maintenance of ecological processes, second the sustainable use of resources, and third the maintenance of genetic diversity (UNEP/WWF/IUCNNR, 1980).

The concept started to have substantial impact after the World Commission on Environment and Development (WCED) published its report "Our common future" also known as "the Brundtland Report" in 1987. It was this report that gave the concept the prominence it has today. The WCED report set the benchmark for all future discussions on sustainable development. "Our common future" opened by declaring: "The Earth is one but the world is not" (WCED, 1987:43). The Brundtland Report called for sustainable development defined as: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs" The Report emphasis the global character of the problem, as well as the mutual dependence and the need for a mutual responsibility. Mostly only the first lines are cited, but we believe the subsequent lines have to be articulated as they specify the target group to put focus on. We will further discuss this issue below.

Since the Brundtland Report a whole series of events and initiatives has brought us to the wide-ranging interpretations of sustainable development that one sees today. One of the key events was the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro in 1992. At the Earth Summit representatives of nearly 180 countries set out 27 principles supporting sustainable development and agreed on a global plan of action, Agenda 21, and recommended that all countries should produce national sustainable development strategies (Sandbrook, 1995). According to Sandbrook, the practicalities of implementing Agenda 21 were unsurprisingly marked by conflicting interests of governments and people in industrial and developing countries.

The Brundtland Report never made explicit *what* is needed for desired development to take place. The World Summit on Sustainable Development (WSSD, 2002) made the definition of 'sustainable development' more concrete by founding it on "three pillars" of *economic growth*, *ecological balance*, and *social progress*. This definition indicates that sustainable development is a multi-perspective matter. It also highlights, we believe, the tension between preserve and change by using the terms balance, growth and progress.

The term 'environment' that from the beginning was connected to ecology is now used in a range of contexts. Redclift (1992) talks about the environment in the international economy as an internationalised environment and one which often exists to serve economic and political interests far removed from a specific physical 'location'. According to Redclift the concept has become the trademark of international organisations achieving environmentally 'benign or beneficial' development. Redclift also means that the concept serves as a catalyst over the relationship between economic change and the resource base in which it is grounded. The environment is not just what is outside the organisation. Mursu (2002) uses the concept 'eco-development' concerning organisational changes or development and concludes that this is dependent on three premises: *basic needs*, *self-reliance*, and *environmental* sustainability, with reference to the organisation itself and the environment it is acting in.

4.4.3. Different Perspectives within the Theory Field of Sustainability Theories

In this section we will examine some current perspectives. There is a considerable and ongoing debate about the concept sustainability and sustainable development in literature. Interpretations and implications of the concepts vary in different contexts and discourses. We choose to describe and analyse the field of sustainable development by using two different perspectives: a socio-economic, and a technological perspective.

The chosen perspectives derive from the views of sustainable development from the World Summit on Sustainable Development (WSSD, 2002) expressed as the three pillars of economic growth, ecological balance, and social progress together with the three dimensions of sustainability expressed by Mitchell, Carew and Clift (2004) as eco-centric (natural resources and ecological capacity); techno-centric (techno-economic systems); and socio-centric (human capital and social expectations). Other perspectives that are mentioned in the literature are cultural (Gustafsson, 1998), institutional, physical (Cearbhaill, 1998), and political (Woodhouse, 2000) perspectives.
Concerning the ecological-environmental perspective it was highlighted in section 4.4.2 and we will not go deeper into this issue.

The socio-economic perspective

The concept of sustainability tends to be rather confusing in the context of socio-economic development. The concept influences governance, business and economic and social activities at different levels and affects both individuals and societies. Nearly every group has adopted the concept and given it their own particular interpretation. Important to mention and to have in mind, in accordance with Copus (1998), is that within all socio-economic contexts sustainability may only be assessed in relative, not absolute terms. This is in line with the discussion we held about success and failure in section 4.3. This includes that the accomplishment needs to be planned out of the local prerequisites, needs and demands. Further it includes that results can only be measured in relation to the initial position

The concept of sustainable development has also made inroads into the business community. Perdan (2004) asserts that the understanding and acceptance of sustainable development within the business community has grown and there is a trend to integrate sustainability thinking into both corporate strategies and practice. Sustainable development suggests in other words that the lessons of ecology should be applied to economic processes.

One key event where the socio-economic perspective was highlighted was the World Summit on Sustainable Development (WSSD) in Johannesburg, in September 2002, where leaders and representatives of 183 countries reaffirmed sustainable development as central for the international agenda. They particularly emphasized the important linkages between *poverty*, *environment* and the use of *resources* expressed as the three pillars of (WSSD, 2002) economic growth, ecological balance and social progress as previously mentioned.

Global versus local

The concepts of sustainability and sustainable development have generated a vast amount of literature, often polarising discussions between ecologists/environmentalists, economists and other social scientists. The countless interpretations from different perspectives range from global dimensions down to the need for local communities to become more capable of managing their own destinies in regard to social, economic, physical and environmental concerns (Cearbhaill, 1998). Sustainable development is seen as

a polarisation in terms of globalisation and localisation (Amin, 1997), two trends which will dominate the early 21st century, according to World Bank (1999). We prefer to view globalisation and localisation as more of complements then polarised issues. The issue of globalisation and localisation has been discussed in section 4.1. Another way to put this is to talk about equilibrium. Sustainability generally implies some sort of harmony, equilibrium or balance between too much and not enough development (Williams & Van Patten, 1998). Hence there is a search for an equilibrium that can be thought of as social and economic development between local and global economies. This can also be expressed using the terms 'underdevelopment' and 'overdevelopment' as mentioned before.

In addition to conflicting economic interests which confront global management, there is an evident ideological tension between a more neo-liberal emphasis on market mechanisms and an alternative emphasis on local, participatory, and communitarian processes of management. The most well-known movement is Participatory Rural Appraisal (PRA) which we have discussed previously in section 4.1. In the concepts of 'local' and 'participatory' some people see a protection from the greater inequality and poverty that market forces may produce. So the struggle over the implications of sustainable development is also a struggle to legitimate particular models of social and economic development (Woodhouse, 2000). Within these differing discourses on sustainability, local versus global, we see there is an implied critique of modernity and Western lifestyle. Williams and Van Patten (1998:360) cite Harvey (1996:148) as being particularly clear on this point noting that the literature on sustainability "…is a debate about the preservation of a particular social order rather than a debate about the preservation of nature per se."

Local sustainable development

Local sustainable development is often opposed to urban and industrial development and is challenging the vision of a homogenising, urban-industrial global culture. But in other instances, the phrase 'local sustainable development' is used as a concept also in discussions on urban and industrialised areas of the world and not only in rural areas (Gustafsson, 2006). Another way to describe a local socio-economic development is to talk about 'people-centred' development (Woodhouse, 2000). Through the 1990s the influence of these people-centred development ideas is evident in widespread advocacy of

management which is local, participatory, rural and community-based, as mentioned above. This view of sustainable development can be found among writers, as Chambers (1983, 1997) and Woodhouse (2000). Chambers emphasises the need for priorities in development to be given to securing livelihoods for the poorest groups within communities.

In the context of local socio-economic development the meaning of sustainability is often constrained by the prefix 'self'. A self-sustaining economic development is one which is able to provide the population with an adequate quality of life on a long-term basis without requiring continued and substantial transfers from more prosperous regions, according to Copus (1998).

Redclift and Sage (1995) argue that if sustainable development is to mean anything it must be capable of translating into local action. Some authors, such as Leimgruber and Imhof, (1998) go as far as to say that the true scale for sustainability *is* the local level, where people interact and communicate and where each individual is affected by everybody's actions and decisions; expressed as local trade for local needs. This is in line with Woodhouse (2000) who states that the concept of sustainability is best understood in terms of the sustainability or non-sustainability of a community. Sustainable communities can be achieved only through a people-centred and local development, according to the author. Woodhouse (2000:160) even claims that authentic development enhances the sustainability of the community and this does not necessarily involve economic growth. It is increasingly recognised that development cannot be sustainable unless it works with, rather than against, cultural traditions. Traditions are a matter of a cultural capital that should be valued and which ideally should be passed undiminished to succeeding generations.

Remote areas with few activities would therefore offer ideal conditions for sustainable development, according to Leimgruber and Imhof (1998). Applying the centre-periphery terminology to this perspective, a region may be called ecologically central if it can function as a natural ecosystem with a minimum of interference. In that case it would not be economically and socially marginal. The centre-periphery theory has been discussed in section 4.1. Further, remoteness could be an ideal instrument for preserving the environment and ensuring sustainability on a local scale. Indeed marginal regions could be test

areas for sustainable economic alternatives, claim Leimgruber and Imhof (1998).

In contrast to this, Dahlgren and Lundberg (1998) claim that in order to become self-sustainable a local development strategy needs to be credible, legitimate and supported in the local context as well as by higher authorities. Further, Dahlgren and Lundberg (1998) have found seven success factors to local sustainable projects. They argue that action should be based locally, yet there is a need for outside regional support, together with local and regional co-operation and collaboration. They also state that economic and social factors are inseparable entities. Further, mobilisation of local resources, actors and operators, together with empowerment of people and communities and reappraisal of the local context. Finally, fostering of a local community identity enhances cultural coherence, and genuine participation conditioned by the participants.

We believe that different strategies vary according to situation in time, space and culture and according to who has the power and the position to define what is mainstream. In the end, this could be expressed as a question of the compatibility between large-scale and small-scale, global and local strategies. To make local ICT viable and economic sustainable on a small-scale level there is a need for an argumentation on large-scale level to regard ICT as national investments as obvious as roads and electricity. ICT should not foremost be a matter of a local entrepreneur, instead it should be seen as a "viable instrument for economic sustainability in the local sustainable development process" (Gustafsson, 2006) Governmental subsidies could support local ICT instead of handing-over all the responsibility to local entrepreneurs.

Production versus Consumption in the Equity equation

Sustainable development could also be explained as a polarization between production and consumption. We believe that one of the core principles of sustainable development is to achieve basic standards of material equity and social justice both within and between countries. Combating poverty and improving quality of life of the poor in rural and urban areas is hence an imperative of sustainable development and in line with the Brundtland Report. How we approach these issues will play a major role in determining whether we

move towards or away from more sustainable paths, according to Perdan (2004).

One of the keys to sustainability lies in decision processes based on the principle of equity, according to Perdan (2004). The question of equity could be interpreted as it focuses attention on the imbalances in political and economic power – between rich and poor countries and people, and among corporations, states, communities, and generations. The Brundtland Report underlined that benefits and burdens from development and environmental policies should be distributed fairly among the members of society and between generations in order to promote social and economic equity. Perdan notes that the Report repeatedly emphasised that a primary goal of sustainable development is greater equity over time, both within the current generation (intra) and between generations (inter). The basic issue could be expressed as whether or not activities are sustainable in the long run together with the challenges to confront over-consumption on the one hand and poverty on the other.

The Brundtland Report pointed out that meeting essential need requires not only economic growth for nations in which the majority are poor, but an assurance that those poor get their fair share of the resources required to sustain that growth (WCED, 1987). We believe that tackling the causes of poverty including environmental ones, is one of the world's major challenges in the 21st century. The Johannesburg Summit (WSSD, 2002) agreed on the target to halve the proportion of people living in extreme poverty by the year 2015. But quite *what* this target might mean is covered by the confusing ambiguity with which the term 'poverty' is used and by the many different indicators proposed to monitor poverty. There is no single definition of poverty and the term has been used to define the level of income obtained by households or individuals, as well as lack of access to social services (Maxwell, 1999). Yet, defining poverty is a start. But only by understanding causes can we begin to design, implement and evaluate programmes to alleviate poverty (Perdan, 2004). In some cases, the priority may be to improve access to services including ICT, according to the definition of poverty by Maxwell above. For a further discussion on poverty, see section 4.1.

The Technological perspective

Technological advance opens up new possibilities for sustainable development. As in previous times, today's technological advances raise concerns about their possible environmental, health and socio-economic impacts, both positive and negative ones. Oyomno (1996) also suggests that the use of ICT in developing countries can strengthen the management capacities, for example in public institutions, and thereby provide a rational basis for the attainment of sustainable development. Mursu (2002) states that especially in developing countries ICT is essential to promote socio-economic and human development. Concerning positive impacts on local development ICT has opened up enormous possibilities in regard to distance education and life-long learning in disadvantaged remote communities which could contribute to local sustainability (Cearbhaill, 1998). We can add to the above mentioned examples our own experiences previously discussed in chapter 3 Pre-study. We noticed that ICT could have strengthened the situation for both local entrepreneurs as well as for local individuals. The need for information about the existing market as well as the possibility to advertise local products could have been fulfilled by ICT. ICT could also be an efficient way to uphold social contacts with relatives far away.

Every technological advance also brings potential risks, some of which are not easy to predict. For instance concerns are raised about the potential contribution of ICT to growing inequalities and widening the gap between the rich and the poor both at national and global level, the so called digital divide.

To obtain a full picture of the risks and benefits of a technology, according to Perdan (2004) these assessments must be done on a life cycle basis. Furthermore, the full technology assessment must also take into consideration the context in which the specific technology is used. The trade-offs of technological change vary from use to use and from country to country. Different societies expect different benefits, face different risks and have widely varying capacities to handle those risks safely. Mursu (2002) argues that the understanding of the user community is the most important task in IS development. Walsham (2000) states that most IS research disregards societal issues and assumes that the results achieved in Western countries are universal. We consider both these statements to be true also for IS and ICT in general. This discussion is in line with the one held in section 4.3 concerning success and failure in relation to the issues of assessment, context and change.

Some authors (e.g. Mursu, 2002; Oyomno, 1996) declare that sustainable development is dependent upon sustainable technology in the specific context when other factors are considered as being equal. Sustainable technology is defined by Mursu (2002:79) in the following four paragraphs. First that improvements achieved by the technology are sustained and are enjoyed *over time*. Second that the technology itself is *usable* and *useful*. Third, that the possible changes in an organisation or in environment are *intended, manageable, far-reaching* and *humane*. Fourth, that further improvements are possible to conduct *smoothly*. We will add two more paragraphs to Mursu's definition derived from Oyomno, (1996) and Korpela (1992). Consequently, fifth, that the technology should be able to be used without dependence on *external assistance* (Oyomno, 1996). Sixth that the dependence of *imported hardware* should be restricted (Korpela, 1992). We consider this definition of sustainable technology could also be applied to sustainable ICT.

According to Oyomno (1996:22) and Mursu (2002) sustainable technology is functionally dependent upon three main variables. The first variable is the level of *demand* for the technology where demand can be seen as a measure of the extent to which the use of a certain technology is *required* in an organisation. A technology that is in less demand is less likely to be sustained. Technology demand is further defined to be functionally dependent upon the extent to which activities of the technology are *critical* to the proper functioning of the organisation. Further demand is also dependent on the expected *productivity* increase to the organisation as a result of using the technology. Finally, demand is dependent upon the *value* of the output from the technology to the organisation. As previously mentioned will we point out that it is a difference between *demand* and *need*. They could imply the same, but we cannot take that for sure. Hence there is a requirement to distinguish between need and demand and to analyse the possible difference.

The second variable mentioned by Oyomno (1996:22) and Mursu (2002) is *appropriateness* of the technology to the environment. The appropriateness of technology determines its acceptability and subsequent adoption and institutionalisation in a new organisational setting. Technology appropriateness can be divided into *cost-effectiveness*, *affordability*, and *suitability*. Cost-effectiveness can be defined in terms of quality of output obtained and the extent to which using technology enriches the activities of individual members of the organisation. Affordability can be studied in terms of financial and human

resource requirements of the technology and in terms of the adaptive changes required to fit technology into organisations. Technology suitability can be considered in terms of operational simplicity, flexibility, maintainability, and robustness (Oyomno, 1996).

The third variable according to Oyomno (1996:22) and Mursu (2002) is *availability* of local technological capacity. Local technological capacity is related to the extent to which an organisation is able to utilize effectively its new and existing technology. For continued beneficial use of a new technology, the essential precondition is the creation of an organisational resource base. A new technology may be useful and in high demand and yet inappropriate for sustained use. For example, it may be too expensive or too sophisticated to be supported and maintained on local organisation's resources. New technologies can be introduced into developing country organisations through technical assistance to facilitate their rapid installation and utilisation. However, persistent use of technical assistance, even years after the acquisition and installation of the technology, is a strong indication of a lack of adequate local technological capacity build-up for the technology in these organisations, according to Oyomno (1996). This is in line with the discussion held by Copus (1998) using the concept self-sustaining development.

We consider these three variables described by Oyomno (1996) and Mursu (2002) concerning sustainable technology in general as being also relevant to sustainable ICT in specific.

In this section we have described and analysed the field of sustainable development by using two different perspectives: a socio-economic, and a technological perspective. In the next section we will discuss how to deal with the complex concept of 'sustainable development'.

4.4.4. How to deal with the complexity of Sustainable Development

According to McGrew (2001) some of the political preconditions for sustainable development may be in place, and the principle of sustainable development and many of its objectives may be widely adopted but yet it remains an unrealised ambition. In contrast to the rapid progress in developing concepts of 'sustainable development', progress in implementing 'sustainable development' could be seen as slow. As WSSD demonstrated in 2002,

sustainable development remains largely theoretical for the majority of the world's population. We believe the agenda has to move from the question of 'What does sustainable development mean?' to the question of 'How do we achieve sustainable development?' It is also more of a question of *sustaining* development then *initiating* development.

In this section we will focus on the issue of achieving sustainable development and we will do that by discussing some ways of dealing with its complexity. Various means are available to facilitate putting sustainable development into practice. Some of these are well known; others are in experimental stages. Sustainable development requires however creativity and innovation at every level: social, economic, institutional and technical (Cearbhaill, 1998). We will highlight three different instruments that we believe are possible means to handle the complexity of sustainable development: the *systems approach,* the *expert view,* and the *capital concept.*

We will start by discussing some general viewpoints concerning *strategy* for 'sustainable development'. Achieving the goals and objectives of 'sustainable development' presents great challenges for all parts of society. At a policy level, a greater attention has to be paid to integrate the three conventionally separate domains of economic, environmental and social policy. Mitchell et al. (2004) interpret the concept of sustainable development as a set of constraints on what humans can do. Three types of constraints are recognized as techno-economic, ecological and social. All three sets of constraints must be satisfied in the long term for development to be sustainable. There must be a focus on the interrelationship between the constraints. This view on strategy implies a systems approach.

Institutional processes have to change too, starting to recognise that increasing public participation in decision-making is an important aspect of sustainable development (Perdan, 2004). Sustainable development increasingly becomes a shared concern and an UN agency stresses the need for shared and co-operative goals which address the needs of the poorest people. This viewpoint implies the issue of participation as well as poverty alleviation.

Dahlgren and Lundberg (1998) discuss sustainable development strategy and establish that large scale strategies need to be complemented with strategies for small-scale development. At the same time the authors see some basic

contradictions between strategies for the whole and strategies for the parts. They mean that when one refers to development in peripheral or marginal areas, in accordance with the centre-periphery terminology, this 'marginal development' can signal an intentional ambiguity. Besides taking place in areas defined as geographically marginal in some sense, the development is also considered to make only a marginal contribution to the world economy. Here we see the importance of a focus on self-reliance, as discussed above. Even if development is marginal in a global perspective it is certainty not marginal in a local aspect. Instead the periphery becomes the centre from a local perspective. At the same time we do not see the centre-periphery issue as contradictory. Instead we see them as complementary and also in line with a systems approach which is the issue to be discussed below. Sustainable development in marginal regions is important in the work to achieve balanced development both in a national, a regional, and a local perspective.

The Systems Approach

We introduced the systems approach in section 2.2 as our research approach. In this section we will give some arguments from different authors concerning the matter of a systems approach to tackling the complexity of sustainable development.

Recap on the work of Checkland (1981), a system is recognised as possessing emergent properties, attributes which cannot be discerned when a system is reduced or dissected into its components parts. Further, following the systems approach entails to recognise that in any system all parts interact, change and co-evolve with their environment (Leimgruber & Imhof, 1998).

Clayton and Radcliffe (1997) argue that sustainability requires a systems approach. They state that a more sustainable way of life means adopting a systems perspective in which both problems and solutions are multi-dimensional, dynamic and evolutionary. This argument is in line with other authors like Mitchell et al. (2004) as they argue that sustainability is an integrative principle, not a specific attribute. We interpret the opening lines in the Brundtland report "The Earth is one but the world is not" as a further example of a system view.

Further, Mitchell et al. (2004) argue all dimensions of the concept must be satisfied in the long term for the development of a system to be sustainable. Hence, we believe sustainable development requires a holistic view which implies a life cycle view of the whole system in order to deal with its complexity. In the next section below we will highlight the issue of experts. Synonymous to 'expert' in this discussion is both 'professional' and 'scientist'.

The Expert View

We believe experts have an important role in sustainable development in devising, designing and implementing ways to use the means represented by different resources. But this demands a re-examination of the professional role of scientists and experts, according to several authors (Mitchell et al., 2004; Azapagic et al., 2004; Dahlgren & Lundberg, 1998). This requires that the experts step away from the role of 'objective decision-makers' and take on more of a role of adviser of scientific and technical information. This role implies a new model of professional practice expressed as participation in 'open-decision processes' based more on a social contract rather than business imperatives.

The new role for experts implies that their knowledge and professional skills are unchanged, but this professional expertise needs to be deployed in ways which may be unfamiliar, taking on a broader social role. It will also be necessary for these open-decision processes to involve non-experts. It is primarily this new emphasis on participative decision-making which leads to a new paradigm for the role of the expert, according Mitchell et al. (2004). The authors state that this kind of process is needed when the decision is very significant and the uncertainty in the scientific information is high, but we believe the 'open-decision process' mostly is needed and we will discuss this further in a section below.

Hence, sustainable development imposes new responsibilities on the expert recognising that practical interpretation of sustainable development depends on the context. To listen to and to learn from the perspectives and the contexts of others is imperative. In other words, to position the expert analysis in the context of sustainable development. The experts are intended as 'vehicles' to develop a reflective approach to practicing as a technical expert, according to Azapagic et al. (2004). Recognizing this new way of thinking together with this

new role of expert has, in turn, implications for the education and training of scientists and professionals, according to Mitchell et al. (2004). Below we will continue with the third of our means to handle the complexity of sustainable development, namely the capital concept.

The Capital Concept

The third issue we will highlight is the capital concept. We believe that one way to deal with the complex concept of sustainable development is to apply the classical economic term in the form of capital. We will start with a brief overview of the use of the capital concept within the field of 'sustainable development'. Perdan (2004) discusses 'the constant capital rule' which means that the value of the overall capital stock must not be allowed to decline for the indefinite future. This is also referred to as 'inter-generational equity'. One interpretation of inter-generational equity is that the welfare of society as a whole may not be allowed to decline for the indefinite future. Perdan mentions two types of sustainability according to inter-generational equity and 'the constant capital rule', *weak* and *strong* sustainability.

'Weak' sustainability assumes that the forms of capital are completely substitutable for each other. It does not matter what form the stock of capital takes as long as the total does not decline. This opens the door to passing on to the next generation less of one kind of capital so long as there is more of another to balance it.

A statement from Redclift and Sage (1995:1), "We need to enlarge our view of 'capital' to include nature, if we preserve life forms on the planet" can be seen as an introduction to the other type of sustainability, namely strong. 'Strong' sustainability demands that the equivalent stock of natural capital is preserved for future generations. Hence most manufactured and human capital can be replaced but the loss of natural capital is often irreversible. Woodhouse (2000) parallels this discussion with the distinction between income and capital, whereby 'income' is the amount that can be consumed in a given period without being any worse off at the end of it. Consequently, if a resource can be used for various purposes without reducing its long-term value in those uses, this can be regarded as 'sustainable development'.

One way to deal with the complex concept of sustainable development is to apply a model using the term 'capital' as equivalent for different resources. In our analysis we will use a framework developed by Ashley and Carney (1999), the Sustainability Livelihood Framework. The idea of capital has in this framework five main forms, the five capital assets: financial capital, human capital, natural capital, physical capital, and social capital. Ashley and Carney (1999) illustrate the five capital assets with a pentagon as in figure 4.6. The authors do not give any explanation to their figure. We interpret it as they have put the most important capital on the top. Further, physical and financial capital can be seen as a platform with social and natural capital as intermediaries. The lines represent to us a connection between the different capital forms. All five parts of this model are connected to each other and a change in one will affect the others. Hence, a failure within one capital can result in a failure in the other capitals affecting the whole system in the form of a system break down, a system failure or a system unbalance. This is in line with the systems approach as well as with the Leavitt-discussion we held in section 4.3 about the mutual dependency between different factors.

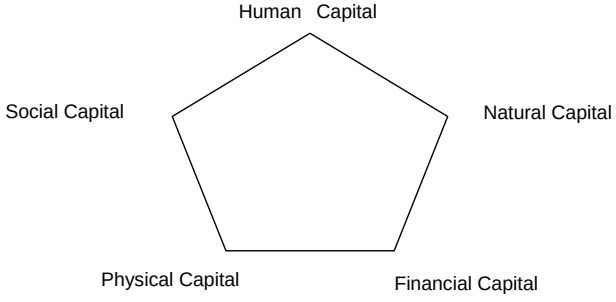

Figure 4.6. The five capital assets (Ashley and Carney, 1999:47).

In this section we have discussed different means of dealing with the complexity of sustainable development. Below we will continue with implications of 'sustainable development' for developing countries including the issue of ICT.

4.4.5 Implications for ICT in Developing Countries

In this section we will discuss implications of sustainable development on developing countries including the issue of ICT. We will do that by a deeper interpretation of 'sustainable development' using Zachman's (1987) questions, the '5W+1H questions' *who, why, what, where, when* and *how*. However, one should note that these questions are not on the same level. Some are more on a strategic level, especially *why* and *who*, and some are on an operational level like *how* and *where*. Further, *what* can be regarded as a conceptual aspect of the strategic why-question, while *when* appears as a situation-bound question and will therefore not figure in the general analysis below. The strategic questions, *why* and *who*, should be investigated and analysed first in order to know *what* to put the operational effort on, in other words, to know *how* and *where*.

Answering these questions will give us three key issues, *poverty alleviation, localisation* and *participation* that we consider indicate important implications for sustainable development in developing countries.

Poverty alleviation

As stated above 'sustainable development' implies change and that statement gives rise to the following questions. *Why* is there a need of change? *What* are the most central or significant things to change? *Whose* need must the change emanate from? We would like to answer these questions by addressing one of the key issues we have found within 'sustainable development' namely *poverty alleviation*. According to the Brundtland Report (1987) as well as the UNCTAD report discussed above, the need of the poor must get high priority and the WSSD 2002 particularly emphasised the linkage between poverty and the use of resources. Poverty alleviation can be seen as a matter of resource allocation. This is connected to one of the keys to sustainable development, the principle of equity, according to Perdan (2004). We argue that poverty alleviation is an answer to the most strategic questions, the *why*-question. With that follows also the answer to the *who*-question in the form of the poor. As example the Government of Botswana has formulated a vision to use ICT as a tool to alleviate poverty (Sebetela & Hon, 2003).

The term 'poverty' is confusing by the many different indicators proposed to monitor poverty. Hence, there is no single definition of poverty, as mentioned

before. The term has been used to describe the level of income obtained by households or individuals, lack of access to social services, as well as the inability to participate in society, economically, socially, culturally or politically (Maxwell, 1999). Different definitions imply different instruments to tackle poverty. In designing poverty programmes, it is obvious to respect the understanding of poverty articulated by poor people themselves. In some cases, this means implementing measures to increase income. But in others the priority may be to improve access to services, as stated in section 4.4.3. In developing countries the majority of the population lives in rural areas where access to services is limited and so also accesses to ICT, as mentioned before. We believe that ICT can have positive impact on poverty alleviation due to e.g. distance education and life-long learning in rural and remote communities.

A problem connected to poverty alleviation is economic sustainability of ICT projects together with financial viability of donated money. We believe there is a need for a new way of discussing ICT investments and ICT donations in developing countries and especially in rural areas. Maybe poverty alleviation cannot be conducted with respect to economic sustainability and financial viability. We will develop this further in the section concerning resource dimension below.

Localisation

Having answered the questions on a strategic level we will move forward to an operational one, the matter of *where*. Dahlgren and Lundberg (1998) discuss sustainable development strategy and establish that large scale strategies need to be complemented with strategies for small scale development. Redclift and Sage (1995) argue that if sustainable development is to mean anything it must be capable of translating into local action. Some authors, such as Leimgruber and Imhof (1998), go as far as to say that the true scale for sustainable development is the local level. Local sustainable development implies action based locally with mobilisation of local resources, actors and operators.
Woodhouse (2000:160) claims that authentic development enhances the sustainability of the community. Further development cannot be sustainable unless it works with, rather than against, local cultural traditions.

These statements indicate the key issue *localisation*. Localisation is a matter of managing a complex challenge. But at the same time, localisation takes

'sustainable development' down to a level where it is possible to handle and where one can move from visions to practice. We find localisation as a key issue concerning sustainable development in developing countries as most people live in rural and sometimes remote communities that need focus on local questions.

As discussed before, the meaning of sustainable development is often constrained by the prefix 'self' in the context of local development. According to Copus (1998), a self-sustaining economic development offer local people acceptable living conditions on a long-term basis without involving a continuous and significant aid from more wealthy areas. Self-reliance is also about enhancing a local community identity. But at the same time it is important to understand that self-reliance is not an isolated phenomenon. Instead it is about interdependence between other local communities and regions up to a national level (Max-Neef et al., 1991). This is articulated by Roode (2002) as 'horizontally interdependent and vertically complementary'.

As mentioned in the Introduction one main reason for failures of ICT projects in developing countries is that developers do not know enough about local factors that influence success of ICT projects (Mansell, 1999; Odedra-Straub, 1993). Localisation is also about handing over the power to define what kind of information is needed. ICT must be based on a deep understanding of the specific needs of the local community. The power to define is crucial for the localisation process of ICT. We believe that the most favourable way to create successful ICT is to connect them to already existing activities as well as to investigate local needs and demands. The localisation process also demands considerations of local skills and knowledge.

As localisation is about adopting local demand and needs, the participatory approach is a way of reaching and involving the individuals in the local community. Participation will be further discussed below.

Participation

Sustainable development is about action and change processes as stated above. The notion of action implies that an actor brings about some change that requires management and support. In other words, 'sustainable development' is about action, interaction, co-operation and collaboration. The difficulty comes

when agreeing *how* to apply the change process. One of the keys to sustainable development lies in the decision processes as stated above (Perdan, 2004). To listen to and to learn from the perspectives and the contexts of others is imperative, as well as to originate from local needs.

Hence, this approach includes increasing participation in the decision-making process. Consequently it implies an interaction between different stakeholders as a result of a negotiation. Negotiation is necessary as there never is a common opinion on needs and demands and negotiation must be a constantly recurrent process. In other words, the concept is about the result of a process based on *participation* which is our third key issue. This is in line with one of the seven success factors Dahlgren and Lundberg (1998) identified for local sustainability. The issue of participation has previously been discussed in section 4.1 and 4.3. We have previously discussed on a general level that a user perspective is crucial. This is also valid for the development process of ICT solutions on an individual level where user participation is a central issue to achieve sustainable development. To involve the local community in the planning and execution of an ICT project is also important for success and hence for sustainability. To be able to actively participate it is necessary that there is not a too hierarchical system with top-down decisions (Max-Neef et al., 1991).The participatory approach also entails special considerations of how to measure success rate.

Answering the Zachman-questions has given us three key issues, *poverty alleviation, localisation* and *participation* that indicate important implications for sustainable development in developing countries. We will include a definition of sustainable development from Redclift (1995:21) as it applies to this discussion as it highlights three dimensions of the concept: "Sustainable development invokes the concept of 'need' in the context of 'development' to meet problems of resource allocation in time and space".
How one looks at need and resource allocation in time and space varies between individuals, communities and nations. Below we will further discuss the dimensions of time, space and resource.

Time dimension

The concept of sustainable development has a futuristic nature as it implies change over time as well as improvement. It also implies persistence as the improvement is supposed to continue for a long time. But at the same time the

concept has a historical nature that must be regarded within the different perspectives. Forecasting future needs must be done with both fore sighting and back casting. The terms inter-generation and intra-generation are used to relate to the connection between people in time. Hence the time dimension is not only about change and stability, it is about both history and future, and it is also about now living generations, as well as both nonliving and coming generations. Further, as we pointed out above, time is a relative term. This can be exemplified by the difference between the time scales of a human being compared to that of a geological era.

When discussing sustainable development in developing countries we believe it is important to have a time perspective in mind regarding the history of colonisation and dependency. Dependency hampers the development process and this is true on all levels, both on an *inter*national level regarding the interrelations between one nation and another as well as on an *intra*-national level within a country (Khakhar & Roode, 2005).

Concerning ICT investments in rural areas there is a problem to recover it financially in an acceptable timeframe, given the low user densities of many rural areas. We believe that the degree and time-frame of pay-off for public services as ICT must be at least as long as in more wealthy countries. Instead, too often the situation is that ICT projects are financed over a short time frame. Including poverty alleviation in the discussion the demand for financial viability we believe should be seen as secondary to the strategic matter of poverty alleviation.

Further, we believe that the introduction of ICT in developing countries should be performed over a long time. Seen in a time-perspective the introduction should be performed step by step with 'small' changes over time as the time dimension for adaptation to a 'new' technology is crucial for sustainability. ICT can be viewed as 'new' in many cases in developing country context. And perhaps it should not be seen as a failure if the equipment is not fully used the first years. The effect can be positive in the long run just by having a computer there for people to see, to hear about and perhaps to use sometime. Hence, the benefits of a singular ICT project must be seen in a long-time perspective when people get accustomed to the 'new' technology.

Space dimension

The concept of sustainable development implies a space dimension and also a polarisation between different levels of space. This could be expressed as global versus local, industrialised countries versus developing countries, large versus small, rural versus urban, and centre versus periphery. Considering questions within and between nations the use of the pre-fixes 'intra' and 'inter' could be relevant. 'International' is already commonly used, but we venture that 'intra-national' is also a relevant concept concerning relations between different regions as well as different social and cultural groups within a nation. Besides, a new technology as ICT has to be culturally appropriate to its novice users in order to be adopted.

A further reflection concerning the space dimension is the concept that from the beginning was connected to environment and ecology is now used in a range of context. The 'environment' is not only nature; it can also refer to an organisation and the environment it is acting in both indoors and outdoors as discussed above. In other words, environment is both a physical as well as mental issue localised both indoors and outdoors. This employment of the concept 'sustainable development' suggests in other words that the lessons of ecology have been applied to both economic and social processes. This is in line with the Human Environment Model (Khakhar & Roode, 2005) where six different social contexts constitute the environment for an innovation. For successful adoption and use of an innovation it is important to take all the social contexts into consideration. The social contexts constitute the 'human environment' according to Khakhar and Roode (2005), where the human environment must be seen as whole.

Another reflection concerning the space dimension is that there is a need for a focus on rural development as the majority of people in developing countries live in rural and remote areas. The discussion about localisation above has clear connections to the space dimension.

Resource dimension

The concept of sustainable development implies a resource dimension and also a competition between different interests. One key term within the resource dimension is equity. This key word is highlighted in the debate concerning who

can access, use and manage resources. The question of equity focuses attention on the imbalances in political and economic power – between rich and poor countries and people, and among corporations, states, communities, and generations. The Brundtland Report strongly underlined that benefits and burdens from development and environmental policies should be distributed fairly among the members of society as stated in the section about poverty alleviation.

Different resources like human resources including knowledge resources, and financial resources, are crucial to take into consideration when discussing ICT in developing countries. An ongoing debate is about the financial resources needed for rural areas and on return on investments (ROI). We question as stated above, the relevance of discussing ROI if the goal is alleviating poverty. Instead we think that the investment should be measured in social and human terms on a long-term basis if ICT is viewed as a tool supporting new public services. It can be assumed that long-term use of ICT has long time effects on society, both on community level as well as on individual level.

For measuring the effects of ICT activities a common variable is income. By using this variable no direct consideration is taken to that social life can be improved by use of ICT. In rural areas it can of course be essential to be able to get in contact with a hospital or to be a part of a learning process. If the goal is to alleviate poverty and not only to generate income on short time basis, ICT can offer services which can improve lives for people both in short time as well as long time perspective. A problem connected to poverty alleviation is economic sustainability of ICT projects together with financial viability of donated money. We believe there is a need for a new way of discussing ICT investments and ICT donations in developing countries, especially in rural areas. Maybe poverty alleviation cannot be conducted with respect to economic sustainability and financial viability.

Human resources are also essential for ICT in developing countries as educated people with social, economic and technical skills are needed both for developing, implementing and maintaining the ICT equipment and for supporting the use of ICT. According to Castell (1999) an adequate level of general education and especially technical education is essential for productive use of ICT. It must not be forgotten that development does not emerge from

technological development. Instead human development is a prerequisite for a sustainable development (Khakhar & Roode, 2005).

Finally, we believe it is crucial not to measure sustainable development in quantitative measurements, but as based on qualitative principles like respect for basic needs interpreted as *poverty alleviation*, self-reliance of local communities expressed as *localisation* together with a *participatory* approach. Further, we believe that it is a continuous negotiation and planning process that itself must be the goal as well as objective of sustainable development. This *negotiation process* must as well include the dimensions of *time*, *space*, and *resource*.

In this section 4.4 we have discussed 'sustainable development' from a theoretical perspective. In the next section 4.5 we will focus on 'sustainable development' from an empirical perspective using three different studies as examples of ICT and sustainability.

4.5. Three Studies with Focus on ICT and Sustainability

The intention with this section is to discuss ICT use in developing countries by focusing on three empirical studies which can be categorised as having a sustainability perspective. The three reviewed studies are:

- Batchelor, Norrish, Scott and Webb (2003) 'Sustainable ICT Case Histories';
- Caspary and O'Connor (2002) 'Providing Low-Cost Information Technology Access to Rural Communities in Developing Countries: What Works? What Pays?';
- Mursu (2002) 'Information Systems Development in Developing Countries – Risk Management and Sustainability Analysis in Nigerian Software Companies'

The three studies are distinguished from each other concerning the context in which they have been performed. The study of Batchelor et al. (2003) can be described as a project technical report and the study was funded by UK Department for international development (DFID).

The study of Caspary and O'Connor (2003) can be described as a working paper from Organisation for Economic and Co-operation and Development

(OECD) and its research programme on Globalising Technologies and Domestic Entrepreneurship in Developing Countries.

The study of Mursu (2002) is an academic dissertation from University of Jyväskylä, Finland. The study is a part of a research project where a complete service chain of systems development (from university of education, software engineering and systems development, and to use of information technology) is being examined in Nigeria.

The three studies approach sustainability and ICT use in a varied way which are described more in detail in the following three sections. A summary of the studies and identified characteristics (premises for the sustainability concept, aim of the study, main observations, and contributions) are presented in section 4.5.4.

4.5.1. Batchelor et al. (2003)

The first study is the one by Batchelor et al. (2003:3) which consists of twelve case studies performed as field studies in several developing countries such as Uganda, India, and Honduras. They had the 'complexity of sustainability' as a core premise behind the research and furthermore they stated that sustainability was taken to mean more than 'ongoing financial cost recovery'.

The case studies concerned the work of organisations, more precisely they considered the work of organisations where ICT could enhance ongoing development activities; the ICT activity could be replicated without sizeable investment; and lastly, there should be a measure of sustainability. The authors state that the aim was to identify "ICT role in achieving development goals" and the purpose was to "Compile and disseminate selected case histories and income-generating models to show how Non Governmental Organisations (NGOs) are successfully and sustainable mediating ICT to their wider, non-connected communities" (Batchelor et al., 2003:1).

The authors adopt an approach for the twelve case studies which differentiates between different kinds of sustainability which are useful in relation to ICT. These are economic sustainability, achieved when a given level of expenditure can be maintained over time; social sustainability, achieved when social exclusion is minimised and social equity maximised; institutional sustainability,

achieved when prevailing structures and processes have the capacity to continue to perform their functions over the long term. The analysis process was based on bringing together these definitions and approaches for looking at the sustainability of ICT.

For analysis they used the framework of Batchelor and Norrish (2002:2), see figure 4.7. The two authors developed the already existing framework called 'Sustainable Livelihood Framework' which emanates from Ashley and Carney (1999), presented in section 4.4. Batchelor and Norrish (2002) approached the sustainability of ICT by exchanging one capital from the 'Sustainable Livelihood Framework', 'natural capital', for 'content capital'. They emphasise that content capital is a crucial issue that needs to be considered concerning ICT case studies. In Batchelor et al. (2003:31) the authors state that ICT involvement with long term development goals can not be achieved without the five capital assets.

Within the framework it is considered that sustainable systems, whether livelihoods, communities or national economies accumulate stocks of assets and that they increase the capital over time. The contrast is unsustainable systems which deplete or run down capital, spending assets as if they were income. The result is that there is less for future generations, also discussed in section 4.4. We have used the framework developed by Batchelor and Norrish (2002) in our analysis in chapter 5. The framework is used according to the five capital assets and the factors are categorised according to these.

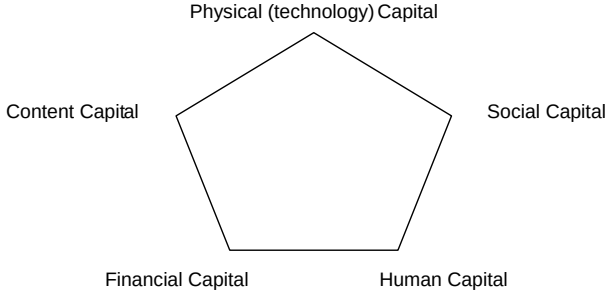

Figure 4.7. The capital assets including the Content Capital (adapted from Batchelor and Norrish, 2002:2; the origin is from Ashley and Carney, 1999:47).

Batchelor and Norrish (2003:31) describe Content capital as "...the information communicated by the ICT". Financial capital is the "mechanisms for (re)covering costs and replacing equipment" and they see Human capital as the "human resource training and skill development". Further they claim that Physical capital is the "choice of technology...the infrastructures which enable the technologies to operate" and lastly that Social capital is "social and institutional arrangements that will keep the ICT being used for its intended social benefits".

The fieldwork started out from twenty potential case studies but they were reduced to twelve as not all fulfilled the criteria for the research as discussed initially. The data was collected during field visits to the different areas of the organisations. The data consisted of factual data provided by the case studies projects, together with data and opinion stated by the stakeholders. The stakeholders were categorised in four groups: people directly involved with the project, such as project team and users committee; users and beneficiaries; people who had an overview of the project, such as national, regional, and local government staff, NGOs, and donor; and lastly people affected by the project, for instance private sector or other vendors.

Eleven sustainability factors were considered in the case studies. The factors were decided after a hypothesis had been made concerning each factor. The factors are: objectives, target groups, intermediaries, policy environment, institutional arrangements, key linkage, the project process, capacity, technology, and finance and development benefits. During the research process Batchelor et al. (2003:25) found four other issues which were not identified initially, they are: language, illiteracy, content, and information flow. The premise was that all the factors would have to be in balance for a project to be in some form sustainable.

The case studies resulted in a list of factors based on the collected data which either promote or limit the projects "efficiency and reach" (Batchelor et al., 2003:26-27). Concerning the group of limiting factors, Batchelor et al. (2003) identified technological and socio-economic hindrances. The technology was a limiting factor to the projects efficiency and reach.

The study also identified factors that hindered the ICT activity. This is influenced by two factors: not enough or poor quality equipment; and poor ICT infrastructure (restricting efficiency).

A much wider range of factors appeared concerning socio-economic hindrances, for instance the language was one factor meaning that users would benefit from more content in local languages. Also the self esteem of users, which implied that people did not think they had the capacity to use technology, particularly women. Thefts were one of the causes that centres failed. Another example is that low purchasing power of users implied that they did not have the possibility to use the ICT.

Batchelor et al. (2003) found several factors which helped to promote success of the projects. These factors were also divided in a technology category and in a socio-economic category. The study identified technology factors that contributed to the success of the ICT activity: the use of 'off the shelf' technology; and locally tailored software or the creation of local content development. The use of market available equipment support network in terms of training in the use of equipment and repairs. Links with trainers within the country enabled most organisations to avoid bringing in expertise from overseas.

The socio-economic factors identified by Batchelor et al. (2003) were expressed as elements and they concern for instance appropriate content, commercial models, entry process to target group, support from local authorities. A fact was that they found that intermediation by an ICT familiar person enhanced the ICT use. But gender did not seem to be an issue within any of the cases, except in one. The situation in one Internet café showed that the men could only access the facilities through their wife's or a female member of their family. This implied that there was a lack of men using the computers. How this affects the traditional social roles was not noted. Though, in another case it was noted that the use of technology during PRA (PRA was discussed in section 4.1, and 4.3) exercise did not create barriers to either men's or women's participation.

When Batchelor et al. (2003) consider the project processes in the cases they find strong support for the premise that direct provision of ICT services to the poor should be a part of some greater community mobilisation. Some of the

factors that helped success are social mobilisation issues e.g. support from local authorities, close connection to communities, entry processes to target group, communication and networking. In all cases the process of the project was an opportunity for more involvement by staff and clients. However a key theme running through all the projects is that there is a conscious effort to involve the client community in the detailed planning and execution of the project in order to tailor the information to the target group needs.

The institutional form of arrangement does not seem to be critical to the success of the project. Neither does it seem that there is a need for a special policy environment. Some sort of capacity building is almost always needed. Where there is strong technical competence there is generally a need to build capacity on project processes. Where project processes are the focus there is a need for technical capacity. In some cases linkages can overcome this using the links to either gain capacity or build it in other institutions.

The cases support the idea that ICT can facilitate disintermediation[6] – to a certain extent. There are examples of how ICT has removed some of the gatekeepers of information, making the information more available to the poor and their supporting NGOs. The cases also suggest that full disintermediation is not possible as many users require assistance in the technical operation of ICT. A better term might be re-intermediation where technical people must intermediate ICT use (access) but are not gatekeepers as such of the information.

Batchelor et al. argue that technology has nothing special that ensures project success. And there are few if any opportunities for standardisation. Technology is constantly changing and a central prescription of a standard technical package would probably negatively affect the project. They claim that none of their case studies show any indication that standardisation is necessary.

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[6] The term disintermediation can be described as 'removing the middleman'. The term is a popular buzzword used to describe many Internet-based businesses that use the World Wide Web to sell products directly to customers rather than going through traditional retail channels. By eliminating the middlemen, companies can sell their products cheaper and faster. Many people believe that the Internet will revolutionize the way products are bought and sold, and disintermediation is the driving force behind this revolution. (http://www.webopedia.com/TERM/D/disintermediation.html)

The use of second hand technology was a noted hindrance for many of the projects. There was an increased need for maintenance and repair, and often the technology was out of date leading to other difficulties e.g. inability to run current software. Moreover, the cases suggest that the cost of the technology can be minimal and the cost of the technology as a part of the whole was not raised as an issue in the case studies. Most cases show that ICT are part of a bigger developmental program or system, and the costs of the technology therefore are small compared to the total project budget.

Batchelor et al. (2003) conclude that the developmental benefits of the projects support the presumption that ICT can be a useful part of an overall developmental action. The benefits range from good governance to good mental health to income generation i.e. influencing all parts of the livelihood system and as such are worthwhile. Further, ICT can do more than directly enhance income options for livelihoods. In many cases the new opportunities offered by the ICT have affected the whole system of developmental activities.

The research has not conclusively proven that an ICT activity directed at increased income for poor can, on its own, generate cost recovery inclusive of set-up and replacement costs i.e. achieve economic sustainability. The case studies do suggest that this is beginning to happen in some cases, and the prospects for the future are encouraging. More importantly, the case studies clearly show elements of institutional and social sustainability and they show significant developmental impact.

4.5.2. Caspary and O'Connor (2003)

The second study is a literature review performed by Caspary and O'Connor (2003) focusing on studies concerning low-cost telephone and Internet access to low-income rural communities with a particular emphasis on whether they are likely to prove financially sustainable. The authors have chosen literature where studies have been performed in different developing countries, for instance Bangladesh, Botswana, Zimbabwe, India, Peru, Mozambique, and El Salvador. The authors address issues such as: How effectively is financial sustainability addressed? (added supply costs versus the low incomes); and How do various organisational models of low-cost rural ICT provision compare in terms of both affordability and sustainability?

Caspary and O'Connor (2003) take some facts as prerequisites. They take the potential economic benefits of ICT access as given. They refer to Canning and Pedroni (1999) when they state that telecommunications access contributes positively and significantly to economic growth. Concerning the enormous gaps in ICT access between urban and rural areas in developing countries, Caspary and O'Connor (2003:8) mean that there are technical difficulties in providing ICT access to rural populations in developing countries. The reason is that ICT access in rural areas often raises the unsubsidized costs beyond what they are for typical urban users. The added supply costs on the one side confront the low incomes, hence ability to pay, on the other. Furthermore, the private returns of investments in rural telecommunications are not essentially more attractive than that of investments in rural roads. Both face the same problem of a high fixed investment cost that is difficult to recover in an acceptable timeframe, given the low user densities of many rural areas (Caspary & O'Connor, 2003).

Consequently, the authors focus on whether there are prospects to supply ICT access to low-income communities at low cost and at the same time on a financial sustainable basis. The task of providing ICT access is subject to particular challenges in rural areas of developing countries. They point out that the challenges are many, for example, remoteness, which leads to high start-up costs, high maintenance cost and a lack of electricity. This leads to that ICT equipments require generators and voltage stabilizers and the low population density have negative impacts upon costs and there is a lack of relevant human capital, especially technicians for maintenance and repair. Costs are raised since the equipment used must be extremely robust.

Caspary and O'Connor (2003:27) propose that a starting point for successful ICT provision in low-income communities is that the ICT project provides services that users need and demand at a price they can afford, and has a pricing model that ensures long-term financial sustainability. They explain this as a 'demand-driven approach' which they divide in five different areas: *making the content accessible*; *developing useful local content*; *linking ICT projects with microfinance programmes*; *participatory approaches*; and *training*. The areas are described below:

By 'making the content accessible', Caspary and O'Connor (2003) mean that there is a need to use innovative models to extend service provision in forms that are widely accessible. For example it can involve a mix-and-match

technological approach; AM radio to broadcast information downloaded from the Internet to the rural population as in Kothmale Community Radio in Sri Lanka, where the language was identified as one crucial factor.

'Developing useful local content' is according to Caspary and O'Connor (2003) a need for providing relevant local content. The problem is that it is much more difficult to recover costs of content development than of access provision. Most users on the Internet expect free content and who will develop local content which not will be sold? The probable solution is that NGOs and government has to develop local content. The probable solution here is that once a critical mass of local users has been achieved most local content provision should be run as a commercial enterprise with tailor-made information and for advertisers that are willing to pay for access to target online communities.

They give an example concerning local content creation from a rural area in India, the 'Info shops'. Information requirements were identified and then volunteers from the village created a local database comprising: government programmes, cost and availability of farming inputs, a directory of insurance plans, pest management plans, a directory of local hospitals and medical practitioners, and a directory of local veterinarians, cattle and animal husbandry programmes. Caspary and O'Connor (2003:28) stress that many projects fail for lack of commitment to ongoing maintenance.

Caspary and O'Connor (2003:28) describe another important area, 'linking ICT projects with micro-finance programmes' which implies that telecenters can be linked to business incubator services like micro credit programmes if there are potential synergies between the two kinds of institutions. They give an example from East Africa and the organisation PRIDE Africa[7] which extends micro-credit to small entrepreneurs. The organisation uses the Internet to communicate cost-effectively, send and receive valuable information, and to market its services via its own web site. The benefits are: fast and easy access to information available on the Internet, bypass the high costs of communicating by telephone, the inefficiency and unreliability of sending information through the postal service.

[7] More information about PRIDE Africa can be found on http://www.usaid.gov/regions/afr/leland/micro.htm (20-01-2006)

'Participatory approaches' is according to Caspary and O'Connor (2003) that local communities need to be involved in the design of universal access programmes by participating in decisions about particular information access outlets, also discussed in section 4.1, and 4.3. They refer to Kenny (2001) when they describe that the most effective way of ensuring the economic success of ICT in rural areas is to encourage local participation and create social institutions in support of new technologies. Furthermore, Caspary and O'Connor (2003:29) refer to Paisley et al. (1999) when they explain three different needs: communication (who wants to communicate with whom, why and how), information (what information is needed, by whom, when, where, for what purpose etc.), education and training (who needs what, when, where, and how would they prefer to have it delivered to them).

The last area Caspary and O'Connor (2003:29) explain about in the demand-driven approach is 'Training'. They stress that one of the keys to a successful development lies in training people to use, as well as maintain, the system. They argue that training for telecenter staff has so far concentrated on how to operate computer hardware and software. They argue that training needs to be understood more broadly to include: reaching out to the community and to build and make a telecenter demand-driven, the training of how to operate the telecentres and training in the production of locally relevant materials from generic information.

Caspary and O'Connor (2003:12) believe that the aim of universal telecommunications and Internet access in developing countries is a remote one and they see four main challenges to deal with before ICT can be supplied to low-income communities at low costs and at the same on financial sustainable basis. The challenges can be listed and they are: remoteness that leads to high start-up and maintenance costs; the low population density leading to high costs; lack of human capital which implies that technicians for maintenance and repair are needed, which in turn results in raised costs as the equipment used must be extremely robust; finally the low earning capacity among the people which in next step mean that a tiny minority can afford to use ICT.

But there are some promising new examples of providing ICT to rural areas. Caspary and O'Connor (2003) give examples of three broad organisational models for low-cost ICT access which are discussed in their study: Grameen

Village Phones in Bangladesh[8]; Telecentres[9] (and variations on that concept); and n-Logue Multi-Tiered Franchise Business Model[10] in India.

Grameen Village Phones business model is in short a person leasing and managing phones from Grameen Telecom. The phones are made available to users in the village on a fee-paying basis. Caspary and O'Connor (2003:13) state that the 'shared access' business-model creates relatively high cash flow. They present a study performed by Telecommons Development Group (TDG) which show that village pay phone system yields significant economic benefits for the users. The same study estimates the full value of a single phone call for Village Pay Phones users in terms of consumer surplus based on the estimated travel cost between the village and the capital of Bangladesh, Dhaka. The cost of the travel ranges from 3.7 to 7.1 times the cost of the phone call.

Caspary and O'Connor (2003) describe an additional advantage with the Village Pay Phones which is that Grameen Bank already has an existing network for the difficult logistics of bill collection. This is normally difficult to handle.

About gender issues the authors refer to a more recent assessment based on a sample of 350 Village Pay Phones owner/operators and users made by Aminuzzuman (2002). The female owner/operators have experienced social and economic empowerment by virtue of the income the phones bring to their households. On the other hand, it was shown that it was the male household members who interfaced with the users, in other words the owner is not usually the operator; the owner is a woman; the operator is a man; small fraction of users are women, approximately 22 percent. Consequently the effect of Village Pay Phones on women's social and economic status has been rather modest. But still the women who do operate and use Village Pay Phones are convinced

[8] Grameen Telecom uses mainly two methods of extending phone access: First the provision of phones directly to potential subscribers; Second the leasing of phones to Grameen Bank members (Grameen Bank is well known for its successful microfinance programme targeted at poor rural women of Bangladesh.) who then provide telephone services on a fee-for service basis to the rest of their community – the Village Pay Phone (VPP) system

[9] Telecenter is another model of ICT provision in rural areas in developing countries. A telecenter combines phone access with access to other ICT, mostly the Internet and a telecenter is a common point of access for multiple users.

[10] n-Logue Multi-Tiered Franchise Business Model is a third model of providing Internet Connectivity in small towns and rural areas, using the corDECT WLL Digital Enhanced Cordless Telecommunication (DECT) Wireless Local Loop (WLL) technology and it is developed keeping the economic realities of a country like India in mind.

that this has a positive impact on their economic and social status (Aminuzzuman, 2002).

In spite of all the advantages with Village Pay Phones Caspary and O'Connor (2003:15) present different problem areas referring to Cohen (2001). The constraints to the Grameen Telecoms can be found for instance in infrastructure, and that the telecommunication market has been unclear controlled by a monopolistic government provider; the enterprise constraint is that the Village Phones venture would not be feasible without access to the credit and bill collection services provide by the Grameen Bank. Another constraint is the discount, which is fifty percent the rate charged to Grameen Telecom for a phone call.

Caspary and O'Connor (2003) provide a description of several types of telecenters. They state that some types of telecenters have proven to be more successful than others. For example, small family-run internet access centres have been successful in many countries, but those centres are concentrated in urban areas and they are not in the business of offering local content, as in the case for NGOs, government and donor-supported centres. Another type of telecenters is the ones used in schools and universities which use the already existing physical infrastructure. The advantage is that those institutions can be extended at modest cost to accommodate the telecenters and the ICT-relevant training can be integrated in the mainstream curriculum. The disadvantage is that this type of telecenters has little impact on people with no formal education, and thus on people in rural areas. A challenge for these telecenters is to be connected to the rest of the society by opening their doors to the public at the end of the school day. Important to note is that few large telecenters are financially sustainable without ongoing external support (Caspary & O'Connor, 2003).

Caspary and O'Connor (2003) explains about the n-Logue Multi-Tired Franchise Business Model and refers to Howard et al. (2001) when they mean that this business model takes the franchise concept above the level of the retailer.

Prahlad and Hammond (2002) mean that a three-tier franchise business model enables rapid expansion and the decentralised model pushes the delivery and management of Internet services closer to the end user. They state that each tier

consists of independent, financially self-sustaining entrepreneurs operating interpedently with one another. At the top tier is n-Logue responsible for overall management of the network. The company facilitates relationships between upstream partners, such as banks, governments, hardware and solution providers, as well as with its business franchisees. On the second tier are the Local Service Providers who are responsible for managing their project at the local level. In coordination with n-Logue the Local Service Providers invests and sets up an access centres that will provide the last-mile solution. On the bottom tier there are the local entrepreneurs that are recruited by the Local Service Providers to invest in and set up Internet kiosks in their villages.

Caspary and O'Connor (2003) sum up the discussion about the three broad business models for low-cost ICT access and they point out that there is *little empirical evidence on the comparative financial sustainability of these models*. n-Logue and Village Pay Phone models seem to have one considerable cost advantage over most telecenters by not only providing shared access at the point of the end user, but also shared resources including bandwidth at the nodes. Further up in the system they are able to offer lower prices.

Caspary and O'Connor (2003) conclude that there are several benefits with ICT in rural areas in developing countries. Further, they show that telecommunication access is necessary if not sufficient to permit the rural poor in developing countries to extend the market for their goods and to ensure that they are as well-supplied as other market participants with price and other vital information.

There are limiting factors and Caspary and O'Connor (2003) state that without roads and electricity the benefits of extending ICT access would be greatly diminished. Conversely, where these elements of infrastructure are in place those benefits can be multiplied. They follow this line when they argue that the energy supply is a prerequisite for the deployment of any modern telecommunication and ICT system. Still this remains a fundamental problem for ICT access in the rural areas of developing countries where approximately 2 billion people are without electricity.

According to the authors the shared access will be the dominant model for some time. Franchise models of shared-access provision would appear to have the most favourable financial prerequisite. Through standardisation and

demand aggregation, they offer the prospect of reaping economies of scale in hardware and software procurement as well as in provision of technical support, and enhanced bargaining power in negotiating interconnection fees and leased line prices. Such models provide opportunities to small entrepreneurs, at the same time creating incentives to both cost containment and rigorous financial management. If innovation is not to be hindered, the franchise model needs to allow for flexible local variation in implementation.

In terms of services, access to credit, is one of the most valuable accompaniments. Also, small entrepreneurs may benefit from ICT-enabled business support services and training in small business software applications. NGOs and local government agencies may perform a useful public service in initial local content development and thereby increasing the utility of ICT access to the point where a critical mass of users attracts private entrepreneurs into web-based services (Caspary & O'Connor, 2003). Caspary and O'Connor (2003) emphasis that besides the strictly economic benefits, there can be important social benefits of maintaining long-distance contact with family members working abroad or in the city. The experience of Bangladesh women who make up the majority of village phone operators for the Grameen network suggests that social status can be enhanced by virtue of control over a valuable resource – information access.

Finally, Caspary and O'Connor (2003) argue that the most important contribution government can make is through establishing a conductive regulatory environment for telecom competition. An adequate regulatory framework and well-designed contractual bidding process for supplying less profitable segments of the market should go a long way towards attracting private investments.

4.5.3. Mursu (2002)

The third study is the one by Mursu (2002) which is a mixture of different data collecting methods. They are: a literature review focusing on information system development in general; a theoretical analysis of the special requirements in Africa and Nigeria; and a survey and case studies aiming at tracing existing practice and problems among Nigerians software companies. Mursu's study is a part of the INDHELA-Methods project 'Methods for Informatics Development for Health in Africa'. The project was established to develop a

'Made in Nigeria' information systems development methodology which addresses the special needs of Nigerian systems developers (2002:14).

In this section the main part is about the Nigerian case studies which focus on the identification of factors for sustainable information systems use among Nigerian IT experts in software companies, categorised according to Oyomno's (1996) model discussed below (Mursu, 2002:294). Important is also the risk study that presents risk factors, concerning the socio-economic context, categorised according to Schmidt et al. (2001), also emphasized by the IT experts software companies in Nigeria (Mursu, 2002:170). Mursu (2002:13) claims that sustainability implies the ability to identify and manage risk factors threatening the long-term viability of the information systems, or information systems activity.

The overall objective for the study is to indicate how risks in information systems development projects can be identified as well as how sustainability of an information system can be facilitated by improved information systems development methods (Mursu, 2002:17). Mursu (2002) develops a framework which she uses when she presents the sustainability factors collected from IT experts in Nigeria. The sustainability factors are identified out from that they have an impact on the sustainability of information system use in organisations. The author uses the concept of 'sustainability' of information system to illustrate the successful use of the same.

Mursu (2002:235) argues that information systems should be sustainable, affordable, and they should have an ethical and socio-economic justification. To achieve those goals one key is user participation and she refer to Korpela et al. (1998) when she suggest community involvement in information systems development, she also wants to involve the management into the process. This is particularly important in developing countries because of the existence of a hierarchical administrative culture (Korpela et al., 2000; Mursu et al., 2001).

Mursu (2002) gives examples of other studies, Waema (1996) and Heeks (1999), that emphasise the problems in the socio-economic context of developing countries, related to information systems development and implementation. The most visible problems that affect the activity directly are poor energy supply, and erratic and unreliable communication network. The problems with the energy supply imply that companies must put a lot of effort in to guarantee

steady electricity generation; they need generators and stand-by generators. The lack of fuel forces them to buy fuel from the black market, which is extremely expensive. Unreliable communication networks blocks quick access for people and makes it difficult to arrange activities.

Mursu (2002) discusses how the lack of resources for ICT investments is a problem in many organisations in the society in question. Mainly big companies can afford to invest in software applications, e.g. banks, insurance companies, and oil companies, hence smaller companies have to struggle to survive and they do not have enough resources for ICT investments.

Accordingly, Mursu's (2002) interest is in constraints in systems development, and more specifically risk factors of software development, as well as risk factors of information systems use, for which she has chosen a concept of sustainability as a metaphor for appropriate, useful and sustained information systems solutions in a user organisation. These two aspects should go hand in hand and be taken care of by project management in order to ensure a successful systems development process. She lists the risk factors and they concern the political climate as well as the economic situation. The weak IT[11] awareness is another risk factor, as is the erratic and unreliable communication network and energy supply, undeveloped tertiary institutions, and the poor copyright/intellectual property right protection. All factors are classified within the risk category of socio-economic context. This category is included into the original categories by Mursu (2002:168).

She discusses that in less wealthy countries the long-term viability of information system is crucial, but the required infrastructure and support activities are often lacking. Furthermore, she claims that the development process and methodology should consider the appropriateness of the technology to the application environment and the availability of the local technological capacity to sustain its beneficial use. The point is that the new system would not be abandoned when the development project has ended (Mursu, 2002:234). About the information systems development methods she stresses that many methods are limited as they only focus on inside elements of the project, leaving environment and stakeholders outside of the analysis. The methods by Kontio (2001) and Cule et al. (2000) are exceptions emphasising contextual factors as well.

[11] IT was the term used by Mursu.

Since information systems development involves several stakeholders with different goals, and the process is also very much of a work development process, risks for sustained use of information systems should be considered during the process, according to Mursu (2002).

The result is that she extended the risk management model by Cule et al. (2000) to include sustainability analysis, see Mursu (2002:240) for a description of the model. The definition of Oyomno (1996) was applied for sustainable technology. In short, Oyomno's (1996:22) definition is that sustainability of technology is functionally dependent upon three main variables: the level of demand for technology; the appropriateness of the technology to the application environment; and the availability of local technology capacity to sustain its beneficial use.

According to Mursu (2002:241) sustainability analysis is a tool to use in the information system development process. She explains about that sustainability analysis should be performed in the very early phase of the project, but also in the middle of the project, and at the end. The precondition for success of such analysis is user participation.

Mursu (2002) argues that if we like to see the real contextual characteristics and problems of systems development in Nigeria, there is a need to extend the viewpoint to a more societal and economical level. The sources of the problems cannot all be located inside the companies, they can be found in society as well. When Mursu (2002) analysed the activity level of the case studies she conducted at three software companies in Nigeria, their activities and most of the problems are not that different when compared to more industrialised countries. The problems faced during the process concentrated mainly on under specification of requirements and inexperienced users and their management.

Mursu (2002) is not satisfied with her study as she states that the question of the sustainability of information systems use remained unclear answered based on the empirical results. She obtained several sustainability factors during the first round of the risk study, which are from IT experts' viewpoint. The factors are divided according to Oyomno's (1996) model. The different categories are: the level of demand of technology; the appropriateness of the technology to the application environment; the availability of local technological capacity to

sustain its beneficial use, development process. Some of the categories and a selection[12] of the factors derived by Mursu (2002:294) are presented below. Within the category 'The appropriateness of the technology to the application environment' and in the group of 'suitability' the user friendly applications are discussed. A factor within this group is simplicity of systems which have effects on that they are used for a long-term basis. Another factor is about availability and support and that post implementation support capabilities are necessary for long-term usability. Factors focusing on documentation are that good documentation of the technical aspect as well as a user's manual must be done, insufficient technical documentation can seriously affect support capabilities, and lastly is the proper documentation of programs: proper documentation of program allows for continuity, ease of maintenance even when the original developers are not available. In the category 'The availability of local technological capacity to sustain its beneficial use' is the group 'organisational commitment'. Here are the committed and result-oriented users one factor, as is the committed and result-oriented management, and in the 'user training' group is the factor proper training of users which leads to that users will be self-supporting.

All IT experts she interviewed were critical against university education being concentrated too much on technical issues and programming, instead of the subject information systems (as social systems) and business thinking. The interviewed also mentioned problems in the teaching about old literature which did not cover the trends common in the industrialised countries, further they stressed that there should be more interaction and cooperation between universities and industry.

Concluding, she argues that most information system research in Africa concerns the constraints of ICT introduction, and the failures to gain socio-economic development or even operational effectiveness in user organisations. The importance for ICT for development and the emphasis of the difficulties in information systems implementation and use confirmed that when developing information system equal emphasis should be placed into the use of information system.

[12] We have made a selection of the factors derived by Mursu (2002:294). The factors should hold information important for the aim of this work.

4.5.4. A Summary of the Three Studies

Finally we present a summary of the three studies in table 4.17. The three studies are presented focusing on identified characteristics such as 'premises for the concept of sustainability'; 'aim of the study'; 'main observations'; and lastly 'contributions of the study'.

Table 4.17. The three studies on ICT and Sustainability in developing countries.

	Batchelor et al. (2003)	**Caspary & O'Connor (2003)**	**Mursu (2002)**
Premises for the sustain-ability concept	The sustainability is taken to be more than financial cost recovery.	The financial sustainability is taken to be when low-cost telephone, and in some cases Internet, access is provided in rural areas.	The sustainability is taken as a metaphor for appropriate, useful IS solutions in user organisation with a long-term use of information system.
Aim of the study	To show how NGOs are successfully and sustainable mediating ICT to the surrounding, non-connected community.	To find whether low-cost telephone and Internet access to low-income rural communities are likely to prove financially sustainable.	To find if there is a need for a new comprehensive perspective for sustainable development for Information system.
Main obser-vations	ICT can support developmental activities. There are no proofs that ICT activities on their own can generate cost recovery, but the studies indicate that this is beginning to happen. Concerning the technological tools the authors have nothing that ensures project success.	Access to ICT is crucial if not sufficient to permit the rural poor to extend their market for their goods and for the people to be supplied with price and other vital information. The willingness to pay for rural telecoms services is high and can be commercial viable. A complementary infrastructure of electricity and roads are important if the ICT access will be beneficial. Another important component is access to credit.	The infrastructure is the biggest constraint to effective work. The university education needs to be improved. The government should work on strategies for harnessing IT for development (socio-economic development), but also the project management in the software companies should work actively for promoting development in the country!

Contri-butions	Economic sustainability: Not conclusively proven in the case studies. Social sustainability and institutional sustainability: Clearly elements of this are found in the case studies.	Financial sustainability: The willingness to pay for telephone services points to its potential commercial viability. The franchise models of shared-access provision are the most favourable economics. Such models provide opportunities to small entrepreneurs as they create incentives to cost containment and financial management.	There is a need for a comprehensive perspective for sustainable development for information system. The IT is not a solution for appropriate and sustainable IS, but the technology needs to be ethical and socio-economic justified and its development needs user participation (p. 254) and to develop a framework where the sustainability model is an essential part for managing a development process. Further, to use this model in an evaluation of sustainability factors in IS use among Nigerian software companies.

The three studies together with the pre-study (chapter 3) have exemplified practical implications, mainly from rural areas, of numbers of factors influencing ICT use in developing countries. The studies with theirs factors constitute inputs to the next chapter, chapter *5 A Framework for Analysis of Factors Important for Sustainable ICT*, which aims at categorising factors according to the framework of Batchelor and Norrish (2002), here presented in 4.5.1.

In addition to the factors, the three studies and the pre-study have been used for identifying examples which we treat as indications for each factor. Also subcategories have been derived from the studies, as described in chapter *2 Research Design and Method*.

4.6. Contribution of this Chapter to the Framework

In this section we would like to mention how chapter 4 has contributed to the development of our framework or in other words: How have the theories and the empirical findings influenced the framework?

In summary we can state that the previous sections have contributed in different ways to our work with the framework as they are different in their content, the first four sections consisting of four different theory fields and the final section consisting of secondary empiric data.

Sections 4.1–4.4 have in general contributed with factors, and input to subcategories, and categories as well as verification of previously identified factors and also by verification of the categories in the original framework. The sections have contributed by a conceptual clarification and a widening view of terms such as e.g. poverty, diffusion and technology transfer, success and failure, and sustainable. They have also given an understanding for the concept 'failure' both in development projects as well as ICT projects. The sections have also contributed to the discussion held in chapter 5, e.g. concerning participation and sustainability.

Further the sections have contributed with an understanding for the complexity of sustainable ICT use and for the need of a system thinking and holistic view. It has given a wider understanding of technology development including that technology is never a neutral tool nor is it the only solution. There is a need to take account of the social, cultural and economic context as well as a need for a systemic view.

The sections have also contributed with the need for a contextual understanding. Developing countries are not a homogenous group which has to be considered when developing a generic framework. There is not a need for a blue print solution instead there is a need for different kind of processes with focus on different levels as local, regional and national. Hence this indicates a spatial dimension and perspective.

The sections have also illuminated the need for a time perspective including a historical understanding and differences in time scale.

The section has also given 'resources' a wider meaning and have also illuminated the need for different types of resources e.g. data and information and communication tools, as well as the need of hybrid solutions.

Section 4.5 has mainly contributed with three main parts; the original framework of Batchelor and Norrish (2002), several factors from developing country context and the indications for the factors as well as input to the subcategories, and by verifying the identified factors, subcategories, and categories.

5. A Framework for Analysis of Factors Important for Sustainable ICT

In this chapter we will describe the development of our framework. In section 5.1 we present the five capitals, Human capital, Social capital, Financial capital, Physical capital, and Content capital, together with the factors we have identified. The presentation contains extensive discussions around these factors. After this we take the analysis a bit further, in section 5.2, by a re-classification of some subcategories and factors.

5.1. Categorisation of Factors

The categorisation of factors uses the research framework developed by Batchelor and Norrish (2002), presented in section 2.3.3 and in section 4.5.1. Except for the Batchelor and Norrish definitions of the categories we use the definitions of Perdan (2004) since he explores the concept of sustainable development which focuses on a more practical interpretation.

The way of categorising factors is clarified in chapter 2, where also the coding system is described. But there is a need for further comments concerning the categorisation of factors dealing with the development of ICT.

We have noticed that the findings of Mursu (2002) concerning information systems development do not belong to any of the categories, the five capital assets in the framework, defined by Batchelor and Norrish (2002). Anyhow we believe they should be considered when discussing sustainable use and viability of ICT activities. Batchelor et al. (2003) discuss development of ICT issues more generally, for example they mean that in cases where the information is tailored to the target groups ICT use improves, but as mentioned above they do not specify those examples under one particular factor or issue. Nor had Caspary and O'Connor (2003) any particular factors or aspects concerning development of ICT. In this section specific factors in the process of development of ICT are presented as we treat them as possible factors which can influence ICT use directly or in the long run.

5.1.1. Category HUMAN CAPITAL

The category HUMAN CAPITAL is defined by Batchelor et al. (2003:31) as human resource training and skill development. Perdan (2004:25) uses a broader description as he sees it as "the form of knowledge, skills, health, ability to work, and cultural endowment". We have not noticed any particular factors or indications pointing to either health or ability to work, therefore these aspects are not included in the analysis. On the other hand, we have identified several factors within CULTURAL ENDOWMENT, KNOWLEDGE, and SKILL which are three of the four subcategories. The fourth subcategory is USER ASSISTANCE; this category was defined when we identified one essential factor which was not mentioned under or had connection to any of the three other subcategories.

Within this category we have found nine factors belonging to the four subcategories, see figure 5.1. The nine factors are: **Self Esteem, Social Power, Basic Education, ICT Education, User Training, Maintenance Training, Production Training, Management Training,** and **Intermediary** (in the meaning of a person acting as an intermediary). Below we will discuss each factor and we start the discussion by describing the subcategory and then move on to clarifying the factors. The complete classification of all subcategories, factors, and indications is presented at the end of this section, table 5.1.

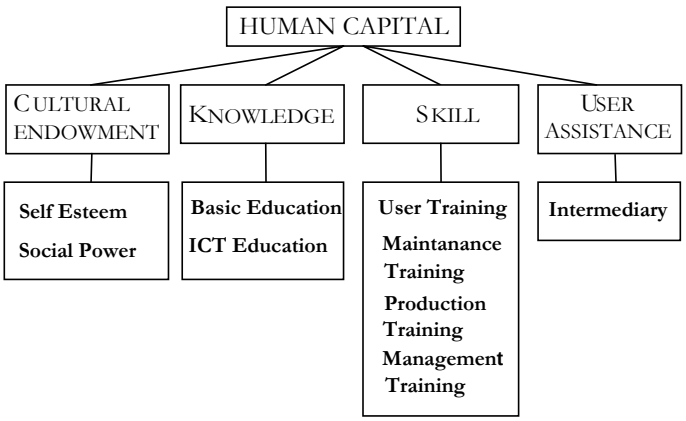

Figure 5.1. The category HUMAN CAPITAL and its subcategories and factors

We have classified the subcategory CULTURAL ENDOWMENT [H.1] as a HUMAN CAPITAL and we rely on the original definition of Batchelor et al.

(2003) and Perdan (2004). CULTURAL ENDOWMENT can be seen as including a talent or ability. According to our pre-study cultural characteristics are important to consider in the ICT development process (Wicander & Sundén, 2004:145). Also Mursu (2002:179; 183) highlights the role of culture when she discusses 'risk factors' and the difficulty of generalising results from different cultural settings. We found two factors, **Self Esteem** [H1.1] and **Social Power** [H.1.2] belonging to culture. Batchelor et al. (2003:26) have identified self esteem of users and social power conflicts to be issues of socio-economic hindrances; and we interpret the two issues to be factors within Cultural Endowment.

Self Esteem was indicated by a negative indication from Batchelor et al. (2003:26); they stated that a low level of self esteem concerning the capacity to handle the technology influenced sustainable use of ICT [H.1.1-a]. This was most obvious among women. A way to overcome the problem of low self esteem is indicated by the experience of Bangladesh women, who made up the majority of village phone owners for the Grameen network as reported by Caspary and O'Connor (2003:14) [H.1.1-b]. This experience resulted in empowerment and we believe it would also increase the level of self esteem among the owners/operators as well as among female users and other women within the community who could also be seen as presumptive users. Worth mentioning is that even if the owners were the female household members it was the male household members that interacted with the users. The imbalance in the use of ICT and in the interaction with ICT users can be caused by gender factors. For example Batchelor et al. (2003) identified gender to be one important issue. Here we treat gender as an underlying cause for the factor **Self Esteem**.

The analysis above indicates several factors which all should be considered when implementing ICT in developing countries. Though there are even more aspects to take into consideration if a broader sustainability development approach is used. We have found several connections between our identified factors and the sustainability development approach. The factor Batchelor et al. (2003) identified concerns self esteem dealing with ICT, but we believe that self esteem in a broader sense has great implications for sustainable ICT. Participation in the decision-processes is an important aspect of sustainable development, which we believe also increases self esteem among local people. The issue of participation is thoroughly discussed in next section (5.1.2) as

Participation is one of the factors within the subcategory TEAMWORK in SOCIAL CAPITAL.

We consider that self esteem is a major part of sustainable development and also of sustainable ICT both on an individual level as well as on a community level. The experience from organisation changes can be regarded as relevant for a local community including the local culture where one of the premises for sustainable development was self-reliance (Mursu, 2002). We believe self-reliance is about enhancing a local community's identity. This is in line with Cearbhaill (1998) as he argues that there is a need for local communities to become more capable of managing their own destinies regarding sustainable development. Among the success factors from Dahlgren and Lundberg (1998), mentioned in section 4.4, fostering a local community identity enhances cultural coherence and hence community self esteem. Empowerment of both people and communities and reappraisal of the local context were prerequisites for success. Showing respect is increasing the self esteem of the people and community. Within sustainable development it is important to include strategies for local self-reliance (Dahlgren and Lundberg, 1998). This could also be expressed as egalitarian development as mentioned by Hettne (1990) in section 4.1 as one of the objectives of the multiplicity paradigm expressed as "redistribution with the purpose of satisfying fundamental human needs via control over the whole life situation".

Further, being able to participate and set the norms is essential as defining the needs will increase self esteem both individually and on a community level. Chambers (1995) define poverty in section 4.1 as consisting of different dimensions, among which social inferiority, powerlessness and humiliation are related to self esteem. Concerning poverty it is also a matter of self esteem, to increase self esteem includes hence poverty alleviation. And showing respect for the way poverty is articulated by poor people themselves is a way to increase self esteem among poor people. This is in line with the Freirian theme mentioned in section 4.1 that poor people can and should be enabled to analyse their own reality (Freire, 1970; 1974).

From a development perspective, described in section 4.1, concerning self esteem on an aggregated level as a community level, it is of importance that communities are not seen and treated as passive objects, which is a risk, according to Hettne (1990) in an ambition striving for modernity. Being an

object and even worse, a passive object is not a good prerequisite for self esteem. Passive object implies dependence which in itself implies lack of self reliance and hence self esteem. We believe this is a common effect of development aid from donors with large subsidies of huge investment development projects. The community should be seen as the subject and as the central actor to define contents of the development process, according to Järvelä and Kuvaja (2001) in section 4.1. This is much in line with the view of the multiplicity paradigm within the field of development theories, described in section 4.1. The multiplicity paradigm highlights qualitative principles labelled endogenous development like self-reliance of local communities implying to reach optimal local 'small scale' self-reliance (Hettne, ibid). In 'Small is Beautiful – A study of economics as if people mattered' Schumacher (1973) argues for giving control to communities at local level to be able to become self-sustaining.

Social Power was also indicated by a negative indication from Batchelor et al. (2003:26) expressed as people who were traditionally in the position of social power and felt that their power had been threatened by innovations like ICT [H.1.2-a]. Another example of differences in social power between people is within a hierarchical administrative culture in organisations [H.1.2-b]. This is the situation in many developing countries and one way to overcome the hierarchical culture is to involve management in the information system development (Mursu, 2002:235).

At the same time it is important to have in mind that sustainable development includes change, change for equity which might mean that traditional social power structures must be transformed, discussed in 4.4. Williams and Van Patten (1998) see sustainable development as a struggle between two competing issues; who has the power and how to deepen responsibility. To have the power is a responsibility and a challenge to change the traditional power structure from the familiar and present to the less familiar and future. Knowledge and education are also connected to the challenge to change traditional power structures. It is also connected with being able to take responsibility for sustainable development.

We identify education as a concept belonging to the subcategory KNOWLEDGE [H.2] (the term is taken from Perdan's definition of this category). Knowledge was emphasised in our pre-study as an important prerequisite for using ICT in a

satisfying way. We defined it to represent both basic education in reading, writing and counting, and specialised education in ICT. Therefore, in this work we have defined two educational factors: **Basic Education** [H.2.1] and **ICT Education** [H.2.2]. The two perspectives of education are crucial as basic knowledge in reading, writing and counting affects the possibility to use ICT efficiently. ICT education is also important as it enhances the ICT use (in the pre-study we defined a critical success factor to be 'Users literacy', this was used as an umbrella term for both Basic Education and ICT Education, Wicander & Sundén, 2004:143).

In line with the argumentation above a well-trained population which is numerate, literate, and has technical professional skills is a good base for positive absorption (Chooi et al., 1995). A problem with technology transfer and education is that technological creativity is concentrated in larger firms in developed countries due to that the multinational corporations generally seek to satisfy their own goals rather than those of host countries.

Batchelor et al. (2003) note that illiteracy is one of the socio-economic hindrances and they expressed that illiteracy, both the written and the computer were issues to consider [H.2.1-a]; [H.2.2-a]. Therefore we see this as an indication of **Basic Education** [H.2.1] as well as of **ICT Education** [H.2.2]. In our pre-study we give examples of the importance of education when we discuss the value of education and how this can affect the handling of computers in a positive way. Anyhow, the problem of illiteracy could be partly overcome by use of icons which can result in a positive influence on the use of ICT (Batchelor et al., 2003:26), see section 5.2 and the factor **Universal Access** [I.2.2] where we hold a longer discussion about this. But to handle a computer efficiently the user must have basic knowledge in reading and writing [H.2.1-b] (Sundén & Wicander, 2004), which is a positive example of **Basic Education**.

In other words, a sustainable use of ICT demands a basic level of education. On the other hand ICT education influences a sustainable use of ICT. We also highlight computer education and that the absence of this gives limited knowledge concerning ICT [H.2.2-c]. This was clearly a negative indication of the factor **ICT Education** [H.2.2]. Another negative indication on this factor is a statement from Mursu (2002:170) when she discuss that tertiary institutions lack the facilities required to prepare students for a solid IT future [H.2.2-b]. This highlights the situation in many developing countries and we treat this as a

negative indication of **ICT Education**, even if it can also be seen as an institutional problem.

As mentioned in section 4.2 knowledge is important in the diffusion of innovation process and especially for the sub-process of adoption (Rogers, 2003). Knowledge can imply that users of ICT (or adopters as mentioned in section 4.2) can re-invent the technology, which means that users can customise and shape the technology to fit their specific requirements. The re-invention of the technology is one of the promoting aspects which increase the use of ICT. Another connection between diffusion and knowledge can be made when considering the education level of the ICT user (or presumptive user) and the 'change agent'. Rogers (2003) explains that in many situations a 'change agent' is used to spread the innovation, but she/he often fails due to the fact that the change agent is more competent than the client. An ideal situation is that the participants in the diffusion process have the same level of education. Knowledge is also key in the technology transfer process since a country's absorptive capacity is dependent on general knowledge being disseminated throughout the indigenous population (Chooi et al., 1995:199), see section 4.2. This is in line with Baumol and Blinder (1997) discussed in section 4.1 as they articulate the need for technological knowledge as one of the primary needs for low-income countries when it comes to how technology can serve in development.

Seen from an overall development perspective one of the main hindrances for development is lack of education (Baumol & Blinder, 1997; de Vylder, 2002). Within the development discourse the multiplicity paradigm resulted in a widening of the concept development into 'human development', see section 4.1, and the establishment of a Human Development Index highlighting literacy as fundamental to socio-economic development.

Another subcategory within the HUMAN CAPITAL is SKILL [H.3]. The term SKILL is taken from the definition of this category and we define different focuses on training to be factors representing it. The four different factors are: **User Training, Maintenance Training, Production Training,** and **Management Training**.

Within **User Training** [H.3.1] we have identified two negative indications and one positive indication. Mursu (2002:237, 296) points to inadequate user

training effecting ICT use negatively [H.3.1-a]. On the other side she claims that proper training of users can lead to them being self-supporting [H.3.1-b]. Our indication is almost the same as the one exemplifying **ICT Education,** we stress that the absence of this gives limited knowledge concerning ICT [H.2.2-c]. Here we particularly emphasise that the absence of computer training in schools and local administration has a limiting effect on ICT use [H.3.1-c] (Wicander & Sundén, 2004:144).

A solution for simplified ICT training can be derived from Caspary and O'Connor, (2003:17) as they suggest that ICT facilities could be placed in schools using the already existing physical infrastructure and ICT-relevant training can be integrated in the mainstream curriculum. A connection to the rest of the society could be reached by opening their doors to the public at the end of the school day and then offering education and training to the public. Using already existing infrastructure for electricity and telecommunication is brilliant; we discuss this further in section 5.1.4 under the subcategory INFRASTRUCTURE. Concerning university education, Mursu (2002) states that there is a need for university education to be improved, moving from technical issues to IS as social systems including business matters. She also noticed another problem concerning university education which is that the literature is not updated.

Further, in the subcategory SKILL the two factors **Maintenance Training** [H.3.2], and **Production Training** [H.3.3], are identified by us as factors and we have derived them from two positive indications given by Caspary and O'Connor (2003:29). They put forward that training in maintaining the system is crucial for a successful network development [H.3.2-a] as well as that training in the production of locally relevant materials is essential [H.3.3-a]. This shows that the knowledge and skills that are needed are not only a technical matter. It is not only to keep ICT running but also a matter of planning for future changes of the resources (Batchelor & Norrish, 2002:31).

'Mutual adaptation', previously discussed in section 4.2, connects with the above statements as it emphasises the learning in the receiver organisation so that people can master the still evolving technology (Gilbert, 1992:406). This is in line with Caspary and O'Connor (2003:29) when they argue that education and training need to be understood more broadly to include reaching out to the community, the training of how to build and make the ICT facility demand-

driven, the training of how to operate and training in the production of locally relevant materials from generic information [H.3.4-a]. This is one positive indication of the factor **Management Training** [H.3.4] interpreted from Caspary and O'Connor (2003:29).

As discussed earlier in section 4.1, poverty can be defined as a lack of access to social services and an inability to participate in society, section 4.1 (Maxwell, 1999). Perdan (2004) suggests that poor people should take part in the implementation process of ICT, but to do so relevant knowledge is needed. Education and training are connected to a participatory approach, **Participation** which is one of our factors within the subcategory TEAMWORK in the SOCIAL CAPITAL, section 5.1.2. Without knowledge and skill it is more difficult to take part in a participatory process. Education and training are a matter of who needs what, when, where, and how would they prefer to have it delivered to them (Caspary & O'Connor, 2003:29 in Paisley et al. 1999). From a technology transfer perspective education and training in developing countries is often a neglected area (Odedra, 1990), section 4.2.

The matter of knowledge and participation is also stressed by Dahlgren and Lundberg (1998) when they state that knowledge and education are needed if genuine participation is the goal. At the same time because knowledge is needed in the development of ICT, implemented ICT also has consequences on the learning process as sustainable ICT can enhance distance education and life long learning in rural communities (Cearbhaill, 1998).

Sustainable technology is dependent on local technology capacity (Oyomno, 1996) which is related to the extent an organisation or community can utilize effectively its new technology, as discussed in section 4.4. We see this closely related to education, knowledge, training and skills, and the need for an adequate local capacity built-up.

An additional aspect of knowledge and skill is awareness. The term awareness is used in our pre-study (Wicander & Sundén, 2004) as well as by Mursu (2002). Worth mentioning is that we do not treat awareness as one separate subcategory; instead we understand it to be influenced by factors within the two subcategories KNOWLEDGE and SKILL. Nevertheless, it is important to highlight awareness together with ICT maturity as ICT maturity can influence awareness. We emphasise the connection between illiteracy and ICT maturity

and we express this matter in our pre-study as: "there is a relation between illiteracy and ICT illiteracy" (Wicander & Sundén, 2004:144).

Thus, we understand that awareness is affected by many of the mentioned factors, such as **ICT Education, User Training, Maintenance Training,** and **Production Training**. In the pre-study we stressed the matter of ICT maturity as we defined this to be one of the ten critical success factors. In our research district there was no computer education, neither within the school system nor within the local governmental administration. This resulted in limited ICT awareness concerning capability. Also lack of proper ICT exposure and policy affects ICT awareness in a negative way. Those two indications of limited ICT awareness in turn influence the users ICT maturity poorly, which is of importance in a wider perspective of ICT usage. Additionally, without awareness and maturity it is difficult to participate.

We can assume that the observability, which is the degree to which the results of an innovation are visible to others, also influences ICT maturity. In section 4.2 Rogers (2003) states that the easier it is for people to see the results of an innovation, the more likely they are to adopt it. An evidence of the observability is the clustering of visible innovations and peer-to peer networks. Another aspect which can affect the ICT maturity is the time period, the third main element in the diffusion of innovations process in section 4.2, between a technology is available to it being adopted (Rogers, 2003). For a technology to be adopted often takes a long time period, a reason for this can be that individuals must get used to the technology which in turn positively effects ICT maturity.

As mentioned in section 4.4 the true meaning of sustainable development remains a mystery to many people hence knowledge and education concerning this matter should be a part of the curriculum. Referring back to Cearbhaill (1998) in section 4.4 sustainable development requires creativity and innovation at every level, but we can argue that to be creative and innovative you need knowledge and education.

The technology transfer takes place through different channels as mentioned in section 4.2 and according to Odedra (1990) education and training, and technical assistance are important for the transfer to take place. Also Chooi et al. (1995) claims that to reach successful adoption of technology a general

background level of basic education is needed with more training in the fields of technical skills. About the implications for developing countries Odedra (1995) continues by stating that much of the technology transfer to developing countries is equal with donations from international aid organisations and the problem is that those organisations do not put enough focus on the education and training, and technical assistance. She further claims that technology is often given to the receivers with no training and the person responsible for technical assistance is usually neglecting the transfer of skills to users (Odedra, 1990). Chooi et al. (1995:198,199) stress that general knowledge is crucial for the technology transfer; key is that this general knowledge is disseminated throughout the indigenous population. A population which is numerate and literate is a good base for absorption of technologies.

Heeks (2001) also points to the importance of knowing how something works. This enables users of the technology to adapt it to local conditions, or even to go beyond that and develop something new that is even better. It is not only the knowledge of how technology works which promote re-shaping it. Also the triability of a technology has effects on how easy it is to develop it further. Triability is the degree to which an innovation is experimented with on a limited basis and it is one of the characteristics of an innovation mentioned by Rogers (2003), section 4.2. According to him the diffusion process is enhanced if the ICT is flexible in nature and inspire the adopter to re-invent it, further this also supports the adoption to be sustained.

We have classified USER ASSISTANCE [H.4] as a subcategory within HUMAN CAPITAL as it is a matter of individual competence (or rather the absences of competence). Within this subcategory we have identified **Intermediary** [H.4.1] to be one important factor; we refer back to Batchelor et al. (2003:4) as they also identified intermediaries to be a factor. We found one positive indication belonging to **Intermediary** which claims that users need assistance to access information due to that they may not have keyboard skills, their literacy may be low and they may require items to be read aloud to them, and key information may not be in a local language [H.4.1-a]. Those people may require assistance to search for the information, or to fill in forms on screen (Bachelor et al., 2003:9).

In section 4.2 we highlight that the major source of learning in developing countries is by 'doing' or by several informal ways such as from family members or from friends (Platt & Wilson, 1999). This can be seen in a

sustainable development perspective, where intermediaries can be viewed to be a prerequisite for sustainable use of ICT within the community as intermediaries make it possible to reach the poorest groups, as mentioned in section 4.1. The drawbacks can be that an intermediary does not promote sustainable individual use of ICT. The potential risk is that the intermediaries act as gatekeepers and widen the gap between information rich and information poor leading to growing inequalities. In spite of the possible drawback intermediaries can affect the ICT maturity in a positive way since they give people opportunity to use ICT, regardless of the level of education and training.

Referring back to Cearbhaill (1998) in section 4.4 sustainable development requires creativity and innovation at every level. This advice must emanate from local needs and demand. One way to deal with this is to use intermediaries; we believe it is not possible in a short perspective to make everyone a user. Participation in the decision-processes is an important aspect of sustainable development which can also be done by using intermediaries. Local sustainable development implies action based locally with mobilisation of local resources including intermediaries. Sustainable technology implies that the technology should be able to use without dependence on external assistant (Oyomno, 1996) and this can include the use of intermediaries, cf. section 4.4. We believe that intermediaries can facilitate utilisation of ICT equipment.

Changes in an organisation must be far-reaching according to Mursu (2002). Relating this finding to a community, an intermediary can help get ICT far-reaching as well as to utilise effectively the new technology which is correlated to local technology capacity.

An intermediary as discussed above can be an individual, a person within the community as in one of the different sub roles identified in section 4.1. But an intermediary can also be an institution such as community-based organisations (Wilson & Heeks, 2000) or telecenters (Ernberg, 1998). Batchelor et al. (2003) and Caspary and O'Connor (2003) indicate that organisations like NGOs could act like an intermediary as well as a catalyst to personal use of ICT. The use of ICT with access assistance by intermediaries is a 'new' situation in many areas. Previously people had to travel to offices and wait for a particular official to ask for the required piece of paper. Intermediaries create new possibilities by assisting people to use ICT. Batchelor et al. (2003:9) point to a positive effect

which is that ICT can be accessed by 'everyone' and that increased transparency implies lowered corruption.

A categorisation of the identified subcategories, factors and indications are presented in table 5.1.

Table 5.1. The category HUMAN CAPITAL and its subcategories, factors and indications.

HUMAN CAPITAL		
SUBCATEGORY	FACTOR	INDICATION (BY EXAMPLE)
H.1 CULTURAL ENDOWMENT	**H.1.1 Self Esteem**	a. (-) "*...a belief that they* [themselves] *do not have the capacity* to use technology, particularly women"[1:26]
		b. (+) "...female owners/operators have *experienced some social and economic empowerment* by virtue of the income the phones bring to their housholds"[2:14]
	H.1.2 Social Power	a. (-) "...traditional holders of *power* threatened by innovations"[1:26]
		b. (-) "…particularly in developing countries since the existence of a *hierarchical administration culture*"[3:235]
H.2 KNOWLEDGE	**H.2.1 Basic Education**	a. (-) "Another issue is *illiteracy*, both computer and *written*.[1:25]
		b. (+) "...to handle a computer efficiently the user must have a *basic knowledge in reading and writing*"[4:144]
	H.2.2 ICT Education	a. (-) "Another issue is *illiteracy*, both *computer* and written.[1:25]
		b. (-) "Tertiary institutions: *tertiary institutions* in country today lack a lot of facilities required to *prepare student for* solid *IT future*."[3:170]
		c. (-) "...no *computer education* - resulted in a limited knowledge concerning ICT"[4:144]
H.3 SKILL	**H.3.1 User Training**	a. (-)"Inadequate *user training*"[3:296]
		b. (+) "Proper *training of users*: users will be self-supporting[3:296]
		c. (-) "…absence of *computer training* in schools and local administrations."[4:14]
	H.3.2 Maintenance Training	a. (+) "*Training*. Clearly, one of the keys to a successful network development lies in training people to use as well as *maintain* the

		system."[2:29]
	H.3.3 Production Training	a. (+) "*Training in the production* of locally relevant materials."[2:29]
	H.3.4 Management Training	a. (+) "…*training needs in the telecentre context* ought to be understood more broadly to include *reaching out to the community and strategically building a clientele* that can make a telecentre demand driven"[2:29]
H.4 USER ASSISTANCE	**H.4.1 Intermediary**	a. (+) "Many rural *people need assistance to access information on the ICT*. They may not have keyboard skills, their literacy may be low and they may require items to be read aloud to them, key information may not be in a local language, they may require assistance to search for the information, or to fill in forms on screen."[1:9]

5.1.2. Category SOCIAL CAPITAL

The category SOCIAL CAPITAL is described by Batchelor et al. (2003:31) as "social and institutional arrangements that will keep ICT being used for its intended social benefits". Perdan (2004:25) emphasises that it is "the institutions and structures that allow individuals and groups to develop collaboratively". We have identified three subcategories relevant to the discussions about social capital: SOCIAL ENVIRONMENT, POLICY ENVIRONMENT, and TEAMWORK. The subcategory TEAMWORK stretches the original definition of SOCIAL CAPITAL a bit further as it consists of *the way of working in a group* in the development of ICT.

Within SOCIAL CAPITAL we have identified twelve factors belonging to the three subcategories, see figure 5.2. The factors are: **Local Mobilisation**, **Local Capacity**, **Identifying Needs**, **Ownership**, **Public Security**, **Postal Service**, **Telecom Market Regulation**, **Publishing Laws**, **Participation**, **Key Linkage**, **Explicit Objective**, and **Leadership**. We will discuss each factor and we start the discussion by describing the subcategory and move further with an explanation of the factors from the identified indications. A complete classification of all subcategories, factors, and indications is presented at the end of this section, table 5.2.

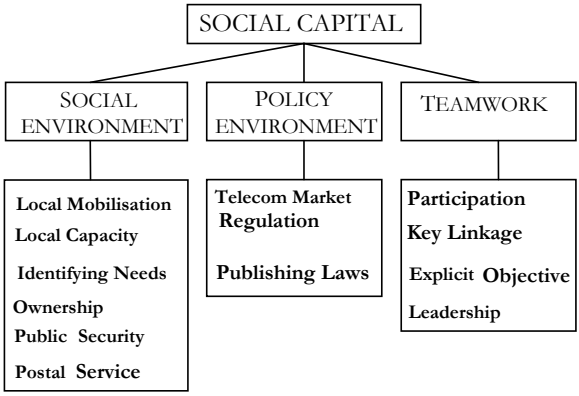

Figure 5.2. The category SOCIAL CAPITAL and its subcategories and factors

To start with we have classified SOCIAL ENVIRONMENT [S.1] as a subcategory within the category SOCIAL CAPITAL as it can be seen to consist of social resources which can affect the individuals and groups ICT use. This is in line with the above description of Batchelor et al. (2003) and Perdan (2004). Within this subcategory we have identified six factors **Local Mobilisation**, **Local Capacity**, **Identifying Needs**, **Ownership**, **Public Security**, and **Postal Service**.

The factor **Local Mobilisation** [S.1.1] was mainly indicated by Batchelor et al. (2003:28-29). They consider that direct provision of ICT services to the poor should be a part of some greater community mobilisation [S.1.1-b]. Moreover, they also point to the impact that support from local authorities and close connection to communities has on ICT use [S.1.1-a]. It is also important to involve the client community in the detailed planning and execution of the project [S.1.1-d]. Lastly, they state that an entry processes to target groups can imply successful ICT use [S.1.1-c]. A target group is the people who actually use and benefit from the project itself and this group may be distinct from the intended final beneficiaries according to Batchelor et al. (2003:7). We treat the above examples as positive indications of **Local Mobilisation**.

The above examples are in line with Mursu (2002) when she discusses the positive effects organisational commitment has on ICT use. She takes this a bit further when she argues that all parties should be involved, developers, users, and those who pay [S.1.1-g]. She also claims that it is important to involve the

community in information system development [S.1.1-f]. Mursu's argument is in line with the ones in section 4.3 where we discuss stakeholders, expertise, and management. We have found another positive indication of **Local Mobilisation** which is according to Caspary and O'Connor (2003) that local communities need to be involved in the design of universal access programmes by participating in decisions about particular information access outlets [S.1.1-e]. They mean that the success of ICT in rural areas is dependent on local participation. The indications mentioned above point to **Local Mobilisation** as an important factor to consider. Universal access is another crucial factor which can influence the ICT use and we discuss this later in section 5.2 [I.4.1]. Furthermore, Dahlgren and Lundberg (1998) have found seven success factors among which local and regional co-operation and collaboration together with empowerment of people and communities and fostering of a local community identity can enhance cultural coherence.

The second factor within the subcategory SOCIAL ENVIRONMENT is **Local Capacity** [S.1.2], local capacity is discussed by Batchelor et al. (2003:i) and they mean that sustainability involves local capacity as one crucial factor among others. Mursu (2002:295) emphasises local capacity by treating 'the availability of local technological capacity to sustain its beneficial in-house department' as one category of sustainability factors. We define **Local Capacity** to represent both technical expertise and implementation support and we have found support for identifying this as one important factor from six examples derived from Batchelor et al. (2003), Mursu, and from our pre-study (Wicander & Sundén, 2004).

The first example we treat as a positive indication is a Batchelor et al. (2003:27) statement; links with trainers within the country enabled most organisations to avoid bringing in expertise from overseas [S.1.2-a]. They classified this as one technology related factor which helped to promote the success of projects. Further, they gave two negative examples of the factor **Local Capacity**. The first one focuses on lack of technical capacity in an organisation [S.1.2-b], which they defined to be an example of the issue, lack of technical personnel. The second negative example from Batchelor et al. (2003:26) stresses that loss of technical personnel has a bad influence on ICT use [S.1.2-c]. They have defined it to be an example of socio-economic hindrances within the 'issue loss of technical personnel'.

Mursu (2002:295) gives two positive examples of **Local Capacity**. The first one stresses that post implementation support capabilities are essential for long-term usability [S.1.2-d]. The second example emphasizes the available support/ maintenance and that availability of human resources is needed to support the product [S.1.2-e]. She has defined both examples to be sustainability factors indicated by IT experts in Nigeria. The first example is categorised by Mursu under the category "The availability of local technological capacity to sustain its beneficial use In-house department", and the second one is categorized to represent "The appropriateness of the technology to the application environment".

During our pre-study in Zambia we experienced that the situation became difficult if the ICT equipment in the offices was broken. The reason was that if the computer needed to be repaired the official had to take it by car to Lusaka. The official claimed that someone in Lundazi should be able to repair the computer [S.1.2-f]. Worth mentioning is that the capital of Zambia is 800 km away (Wicander & Sundén, 2004:144).

In the technology transfer process to developing countries it is important that the international donor organisations provide training in technical assistance, the problem is that this is often a neglected area (Odedra-Straub, 1995). A further problem is when the technical assistance is present in developing countries the people who are supposed to support local capacities often neglect transfer of knowledge, section 4.2.

The third factor within the subcategory SOCIAL ENVIRONMENT is **Identifying Needs** [S.1.3]. We noticed that this was an issue of concern in our pre-study as we stress the importance of identifying and analysing the needs of the local area and the users demand (Wicander & Sundén, 2004:145). Also Mursu (2002) and Caspary and O'Connor (2003:29) emphasise this matter. One goal and objective must be to avoid asymmetric information as discussed in section 4.1 by de Vylder (2002) and Wilson and Heeks (2000). Asymmetric information is, among other factors, caused by the inability of poor people to voice their need and demand. In this process the activity of identifying needs is crucial. This is also related to the infological equation by Langefors (1995) discussed in section 4.3, where we state that the frame of reference has consequences for the interpreted data and hence for the information obtained.

We have identified three positive indications within the factor **Identifying Needs**. To start with Caspary and O'Connor (2003:29) explain three different needs: communication (who wants to communicate with whom, why and how), information (what information is needed, by whom, when, where, for what purpose etc.), education and training (who needs what, when, where, and how would they prefer to have it delivered to them) [S.1.3-a]. These questions could do well in any kind of requirement analysis initiating IS development. Further, they recognise these questions to ensure the local participation approach in the planning process. We discuss in the same way when we mean that the development process, of ICT, should start by investigating the socio-economic and cultural characteristics within the area. We also put forward that it is crucial to identify and analyse the needs of the local area together with the users demand [S.1.3-c] (Wicander & Sundén, 2004:145). In addition the study of customer requirements can be added, this is a sustainability factor indicated by Mursu [S.1.3-b] (2003:294).

Identifying Needs is important if the goal is to achieve a satisfying technology transfer and the factor **Local Mobilisation** [S.1.1] can enhance the possibilities of identifying needs. In section 4.2 we highlight that technology transfer is a two-way exchange where two or more parties participate in a communication process where the aim is to create a mutual understanding about the meaning of the technology (Rogers, 2003:150). It is only people at the grassroots that can tell whether they have the economic and technical resources to allow the technology to function and what technology they need for what purpose Mayanja (2003). Identifying the needs of the local people and community is also a perquisite for adaptation of the technology to fit the specific local conditions. In a wider perspective, discussed in section 4.2, the adaptation influences to what degree the technology will be adopted.

Standish Group (1994) discusses that identifying clear requirements is a general success factor, which Barki et al. (1993) and Cule et al. (2000) express as unmet user needs, and Lyytinen and Hirschheim (1987) as expectation failure, see section 4.3. Important to mention is that need and demand must not always be the same. There could be a need without an articulated demand and vice versa. This must be taken into consideration resulting in two different analyses. Hence, the challenge is to make possible for local people to analyse their own reality and to be able to articulate needs and demands as discussed in section 4.1 by Chambers (1995) and Freire (1970; 1974).

In section 4.4 we discuss the importance of allowing individuals and groups to develop collaboratively and that social capital can be seen as an intermediary in a system of different capitals. Sustainable development can be expressed as social progress, what is needed, (WSSD, 2002) and social expectations (Mitchell et al., 2004). The factor **Local Mobilisation** is important if this is to happen and it is a prerequisite for local sustainable development. Local sustainable development implies action based locally with mobilisation of local resources, actors, and operators, as stated in section 4.4. Further, ICT and sustainable ICT can be a tool, a way to diminish the growing imbalance in development that, according to Perdan (2004), poses risk to communities. The Brundtland Report (WCED, 1987) emphasis mutual dependence but also mutual responsibility.

The fourth factor belonging to SOCIAL ENVIRONMENT is **Ownership** [S.1.4] and it was identified by Batchelor et al. (2003) to be an important area within the project process, which they identified as one factor. We classify **Ownership** to be a factor within the subcategory SOCIAL ENVIRONMENT. **Ownership** of the ICT as well as of the information is crucial, but as Batchelor et al. (2003:14) exemplify it is important for communities to own the output of the ICT, this is even more important than owning the ICT [S.1.4-a]. They also indicate that it is not always positive to let the community participate and we have used this as one negative indication of **Ownership**. They mean that in the development community generally the premise that participation by users of a service in its planning and implementation lead to a greater sense of ownership and therefore a greater sustainability has gained considerable momentum. However, the case studies offer very little evidence to support this premise [S.1.4-b]. Ownership is also regarded as a general success factor by Standish Group (1994), mentioned in section 4.3.

Woodhouse (2000) means that the struggle over the implications of sustainable development is also a struggle to legitimate particular models of social development. Within a community sustainable development must emphasis the poorest groups, according to Chambers (1983, 1997). This is in line with the Brundtland Report (WCED, 1987) which stress that the poor get their fare share of the resources to sustain their growth, as stated in section 4.4.

Considering the factor **Local Capacity** the technical expert role must include a broader social role and it is also necessary to involve non-experts in the open-decisions process and to listen to and learn from the perspectives of others

(Mitchell et al., 2004). This point to the importance of both **Local Mobilisation** and **Identifying Needs** when involving technical expertise, but it is also preferable that this is localised. To broaden the perspective the connection to the factor **Participation** [S.3.1] is obvious, presented later in this section.

The above mentioned factors could also be labelled 'localisation' as they are all focused on changes on a local level (Naisbitt, 1994). We have concluded in section 4.4. that localisation in Naisbitt's sense, is a key issue embedded in sustainable development. This is in line with de Vylder (2002) as he declares that all development must emanate from the local prerequisites, resulting in different kinds of development processes in different regions. By that it belongs to the multiplicity development paradigm, discussed in section 4.1, where the local community have been seen as central actor to define contents of development (Järvelä & Kuvaja, 2001).

The fifth factor within SOCIAL ENVIRONMENT is **Public Security** [S.1.5]. We have noticed that this is an area of importance in two data sources: first in our pre-study where we discuss the unsafe postal system; second in Batchelor et al. (2003) where they identify security and theft to be issues representing socio-economic hindrances for ICT use. According to Batchelor et al. a hindrance for ICT use were thefts within the ICT centres [S.1.5-a]. Another aspect is thefts within the postal services which made people transport ICT equipment personally [S.1.5-b] (Wicander & Sundén, 2004). This is both time consuming and a financial waste. Both examples are negative indications to **Public Security**.

The last factor within SOCIAL ENVIRONMENT is **Postal Service** [S.1.6]. This factor is not so frequently discussed; in spite of this we have defined it as a factor. The reason is that during our pre-study we noticed how important the delivery system is for the ICT use. Ordered spare parts for ICT equipment (as well as ink cartridges and other consumer goods) must be delivered on time with no delays. One of our respondents claimed that the delivery time (postal service) could range from a couple of days up to several months [S.1.6-b]. Another negative example of **Postal Service** can also be found in our pre-study when we state that the postal service was not frequent and this resulted in difficulties with the delivery of ICT products [S.1.6-a]. In summarising the two factors **Public Security** and **Postal Service,** it is clear that the postal service

influences both factors, on one hand the risky issue of losing the item due to theft, on the other the irregular deliveries due to poor service system. The postal service has nothing to do with the thefts within ICT centres.

In the sustainability development approach, discussed in section 4.4, the Brundtland Report (WCED, 1987) also mentions the key concept of 'limitations' imposed by the social organisation on the ability to meet the needs. Furthermore, poverty can be defined as a lack of access to services as well as to participate in society (Maxwell, 1999). Those statements correspond well to the situation described above, as concrete examples of the factors of **Public Security** and **Postal Service** where the delivery system was both insecure and offered irregularly deliveries.

We have classified POLICY ENVIRONMENT [S.2] to be the second subcategory within SOCIAL CAPITAL. We rely on Batchelor et al. (2003:4) and that they identified policy environment as important, they also classified it as a factor. Further, we define policy environment to be the result of governmental institutions. This subcategory has two factors of importance for us, **Telecom Market Regulation** and **Publishing Laws**. For the first factor we have found two positive indications and one negative, we start with presenting the negative indication. The telecom market is important and it relies on functioning infrastructure, furthermore it is a constraint if the market is unclear and controlled by a monopolistic government provider [S.2.1-c] (Caspary & O'Connor, 2003). Caspary and O'Connor (2003) emphasise the weight of establishing a conducive regulatory environment for telecoms so that private providers do not have to pay crippling charges for network interconnections and leased lines [S.2.1-a]. Further, they state that a telecommunications-sector reform programme can lead to increased access to telephone and internet services [S.2.1-b].

Publishing Laws, the second factor within POLICY ENVIRONMENT is discussed by Batchelor et al. (2003:11) and by Mursu (2002).Two negative indications point to **Publishing Laws**. First is that some laws pertaining to publishing were not clear when applied to an internet site and one project registered as a magazine to overcome the possible perplexity [S.2.2-a]. Second is the poor intellectual property right protection [S.2.2-b], defined by Mursu (2002:170) as a risk factor.

In the previous discussion about sustainable development we state that the policy environment strongly affects the possibility to access services and participate in society and is hence a part of poverty reduction. According to McGrew (2001), political preconditions for sustainable development must be in place, challenging the social conditions that work against sustainable development.

At a policy level greater attention has to be made on integrating conventionally separate domains and to use more of systems thinking. Within systems thinking all parts interact, change, and co-evolve with their environment (Leimgruber & Imhof, 1998). Dahlgren and Lundberg (1998) argue for a sustainable development strategy and that large scale strategies need to be complemented with strategies for small scale strategies. According to Copus (1998) there is always a confliction between different interests. A local sustainable development must be able to survive without requiring continued and substantial transfer from more prosperous regions, see section 4.4.

A policy framework is needed to support a successful absorption of imported technology to developing countries, mentioned in section 4.2. The policy framework should, according to Chooi et al. (1995) identify the levels of technology which are necessary and which can be integrated with minimum effort and provide maximum long-term benefits. This has a connection to the two factors within POLICY ENVIRONMENT, **Telecom Market Regulation** and to **Publishing Laws** as those factors need to be adjusted to promote technology transfer with a long-term goal.

The third subcategory within SOCIAL CAPITAL is TEAMWORK [S.3]. We treat it to represent specific structures containing social resources; more precisely it stands for issues concerning the procedure of 'in the fields' IS development. TEAMWORK has similarities with a project process, which is one factor defined by Batchelor et al. (2003). We have identified four factors within this subcategory: **Participation**, **Key Linkage**, **Explicit Objective**, and **Leadership**.

The first factor is **Participation** [S.3.1] and we have taken it from one example from Batchelor et al. (2003:16) where they state that a participatory planning process enhances the project as a whole [S.3.1-a]. Mursu (2002) specifies this a bit further when she claims that it is important to involve the users in the

design phase [S.3.1-b]. We also stress that participation is important, particularly in the development of ICT applications [S.3.1-c].

We can state that participation is a complex concept that can be interpreted in different ways in different contexts. Although the notion of participation has become commonplace its true meaning remains a mystery to many people (Cornwall, 2002). This has not prevented participation from being raised in the debate and in support of numerous development agendas. The concept has become a trademark for organisations claiming to work for a 'benign' progress. As it is difficult not to approve the concept, it has today become both an intellectual as well as a political necessity. The concept of participation can be analysed on different levels. On a global level, as pointed out in section 4.1, low-income countries have only a marginal participation in the globalisation process (de Vylder, 2002).

In section 4.1 Chambers (1997) highlights professionalism, distance and power as the main reasons to developmental failures. A participation approach like PRA is a means to manage development processes and has gained a lot of interest. We believe that PRA could be a possible method for local ICT-projects. But there are also challenges and problems related to participation such as language, social power, illiteracy, trust, risk, relevant knowledge etc. As discussed by Wilson and Heeks (2000) in section 4.1 risk adversity by the poor themselves can impede an ICT project. But the author emphasises a participatory technology development process as one of the parts within their recommended strategies.

ICT itself can also be seen as an enabler to participation, as articulated by Göransson (2000), cf. section 4.1. Participation is also a key concept within the IS discourse, including the Scandinavian School, as discussed in section 4.3 and user involvement is identified as a general success factor by Standish group (1994).

The factor **Participation** is also critical considering the diffusion process as Rogers (2003) claims that adopting an innovation is not a passive phase of implementing a standard technology. Many adopters want to participate actively in the development of a technology to fit their unique needs. This is a sort of re-inventing the original technology and it enhances the diffusion process. It also enables the adoption to be sustainable, see section 4.2.

Batchelor et al. (2003:iii) present **Key Linkage** [S.3.2] as one factor and so do we. Networks within and between projects are crucial for successful ICT use, as well as linkages between institutions and clients. Within this factor we have noticed three positive indications derived from Batchelor et al. (2003:13, 27). First is the interdependence of projects on other institutions and projects within the country that make them work. [S.3.2-a]. A second indication points to ICT use being essential in maintaining contact between the different actors [S.3.2-c]. (They have classified the two indications to belong to a factor called 'institutional arrangement', but we classify them to be indications of the factor **Key Linkage**). The third example is that links with trainers within the country enable organisations to avoid bringing in expertise from overseas [S.3.2-b].

Key linkages and networks are categorised as one type of institution within a strategy technology development, as discussed in section 4.1 by Wilson and Heeks (2000). But at the same time they highlight a problem as they state that networking is most likely to take place among those where mutual trust exists, with the consequence that such networks are relatively 'closed'.

Oyomno (1996) argues that sustainable technology is dependent on the level of demand, see section 4.4. Also the appropriateness of the technology is crucial, including its acceptability, adoption and institutionalisation. Persistent use of technical assistance is a strong indication of a lack of adequate local technological capacity build-up. One meaning of sustainable technology is that the technology should be able to be used without dependence on external assistance. This can be related to the examples indicating positively on the factor **Key Linkage** where we state that interdependence of projects on other institutions and projects within the country are important. Further we mean that links with trainers within the country enable organisations to avoid bringing in expertise from overseas.

Key Linkage can also be important considering the essence of the diffusion process according to Rogers (2003) which is the information exchange through which one person communicates a new idea to one or several others (cf. section 4.2). One of the indications of the factor **Key Linkage** is about the contact between different actors which is promoted by the ICT component. One can assume that this contact can support the diffusion of new ideas (way of working with ICT) and new technology (information about ICT equipment, not yet available in, for example, rural areas).

A third factor within TEAMWORK is **Explicit Objective** [S.3.3]. Also Batchelor et al. (2003) identify 'objective' to be a factor. We refine the definition a little bit by using the term 'explicit' together with 'objective'. Only one indication was localised, namely the positive statement of Batchelor et al. (2003:28). They claim that clear objectives among stakeholders are needed to ensure that organisational aspects of the activity are effective [S.3.3-a].

The last factor within the category SOCIAL CAPITAL and within the subcategory TEAMWORK is **Leadership** [S.3.4]. Leadership is discussed by Batchelor et al. (2003) and they state that champion leadership has positive impacts on ICT use. They have given one example which stress that there is an identifiable champion who has overcome the inevitable difficulties presented by pioneering new ways of working [S.3.4-a].This is a positive indication of **Leadership**. Batchelor et al. (2003) consider champion leadership to be a matter of capacity (capacity is one of theirs factors) and they identify champion leadership as one socio-economic success issue in increasing ICT use.

Concerning the factor **Leadership**, it has an important role as opinion leader, which is one of the factors which affect the diffusion process (Rogers, 2003), previously discussed in section 4.2. An opinion leader is a person who is able to influence informally over individuals attitudes in a desired way. Hence, the role of the leadership is both to act as a champion and to act as an opinion leader. Rogers (2003:28) also presents another important role in the diffusion process which is an individual that tries to influence peoples' decision process but is not a full professional, this individual acts as an 'aide'. The important thing with an aide is that she/he is similar to the client regarding different attributes, for example the level of education. The ideal role of leadership then includes both the role of champion and the role of opinion leader. Connected to leadership is the importance of executive management support articulated as a general success factor by Standish Group (1994) in section 4.3.

We have earlier in this section discussed that the factor **Local Mobilisation** is important if the two-way process of 'mutual adaptation' is to be supported, 'mutual adaptation' is discussed in 4.2 and in 5.1. The 'mutual adaptation' is discussed by Gilbert (1992:454) as one aspect which completes the technology transfer process. It is a two-way process which highlights the interaction between the receiver of ICT and the sender of ICT (Vozikis et al., 1992). Here

the factor **Participation** is crucial, as well as the factor **Key Linkage** which enables the contact between different actors.

Another dimension of knowledge is knowledge within the expert group as discussed by Chambers (1997) in section 4.1 and Perdan (2004) in section 4.4. Both authors articulate a need for a more democratic and participative learning process, as well as for a more democratic and participative decision process.

We have summarised the identified subcategories, factors, and indications within the SOCIAL CAPITAL in table 5.2.

Table 5.2. The category SOCIAL CAPITAL and its subcategories, factors and indications.

SOCIAL CAPITAL		
SUBCATEGORY	FACTOR	INDICATION (BY EXAMPLE)
S.1 SOCIAL ENVIRONMENT	**S.1.1 Local Mobilisation**	a. (+) "...*support* from *local authorities*, close connection to communities."[1:29]
		b. (+) "...direct provision of ICT services to the poor should be a part of some greater community *mobilisation*."[1:29]
		c. (+) "Some of the factors that helped success are social *mobilisation* issues e.g. ... entry processes to target group" [1:29]
		d. (+) "...there is then a conscious effort to *involve* the client community in the detailed planning and execution of the project."[1:28]
		e. (+) "Local *communities need to be involved* in the design of universal access programmes by participating in decisions about particular information access outlets." [2:29]
		f. (+) "...community *involvement* in information system development." [3:235]
		g. (+) "Commitment of all *involved* is a serious success factor. The developers, the users and those who pay for the project…"[3:296]
	S.1.2 Local Capacity	a. (+) "Links with trainers within the country, enabled most organisations to avoid bringing in *expertise* from overses"[1:27] b. (-) "Lack of *technical capacity* in organisation"[1:26]
		c. (-) "…lose trained *technical people*"[1:26]

		d. (+) "*Post* implementation *support* capabilities are necessary for long-term usability." [3:295]
		e. (+) "Available *support/maintenance*. Availability of human resources to support the product"[3:295]
		f. (-) "If the computer is broken we have to *take it by car to Lusaka* [capital of Zambia 800km away]. Someone here in Lundazi *should be able to repair the computer*"[4:144]
	S.1.3 Identifying Needs	a. (+) "This means in particular helping communities *define their needs* in terms of i) communication (who wants to communicate with whom, why, and how); ii) information (what information is needed, by whom, when, where, for what purpose, etc.); and iii) education and training (who needs what, when, where, and how would they prefer to have it delivered to them)."[2:29]
		b. (+) "Study of customer *requirement*" [3:294]
		c. (+) "The development process [of ICT] should start by *investigating the socio-economic and cultural characteristics within the area. The process should continue by identifying and analyzing the needs of the local area and the users demand.*"[4:145]
	S.1.4 Ownership	a. (-) "The communities that ended up using it would have been unlikely to conceive it, and do not own or retain the equipment. …the question is not so much their *ownership* of the ICT but their *ownership* of the outputs."[1:14]
		b. (-) "In the development community generally the premise that participation by users of a service in its planning an implementation lead to a greater sense of *ownership* and therefore a greater sustainability has gained considerable momentum. …The case studies offer very little evidence to support this premise"[1:14]
	S.1.5 Public Security	a. (-) "…failure of other centres due to *theft*."[1:26]
		b. (-)"...the postal service was not reliable and there was always a risk of *losing the item*"[4:145]
	S.1.6 Postal Service	a. (-) "...the *postal service* in the district was not frequent and this resulted in difficulties with delivery of ICT products. [4:145]
		b. (-) "…the delivery *time* [postal service] could range from a couple of days up to several months."[4:145]
S.2 POLICY ENVIRONMENT	**S.2.1 Telecom Market Regulation**	a. (+) "...establishing a conducive regulatory environment for *telecoms and ISP competition*, so that private providers do not pay crippling charges for

		network interconnections and leased lines"[2:35]
		b. (+) "…dramatic increases in access to telephone and internet services through a *telecommunications-sector reform programme*. Such a programme to be successful, ought to rest on four pillars: privatization and liberalization ; legal and regulatory mechanisms to promote competition; complementary public investments; support for business planning"[2:32]
		c. (-) "The primary constraint has been a distorted *telecommunications market* controlled by a monopolistic government provider."[2:15]
	S.2.2 Publishing Laws	a. (-) "…that some *laws* pertaining to *publishing* were not clear when applied to an internet site. They registered as a magazine to overcome the possible confusion."[1:11]
		b. (-) "Poor copyright/intellectual *property right protection*"[3:170]
S.3 TEAMWORK	**S.3.1 Participation**	a. (+) "…*participatory* planning processes enhance the project as a whole, although this seems to be more in terms of tailoring the ICT activities to the information needs..."[1:16]
		b. (+) "*User* involvement at design phase."[3:295]
		c. (+) "The development of ICT applications *together with the user is key*."[4:145]
	S.3.2 Key Linkage	a. (+) "...it is the *interdependence* of projects on other institutions and projects within the country that make them work."[1:13]
		b. (+) "*Links* with trainers within the country, enabled most organisations to avoid bringing in expertise from overses"[1:27]
		c. (+) "...the ICT component is essential in maintaining *contact* between the actors."[1:13]
	S.3.3 Explicit Objective	a. (+) "The *objective* of the action is important."[1:28]
	S.3.4 Leadership	a. (+) "…there is an identifiable *champion* who has overcome the inevitable difficulties presented by pioneering new ways of working"[1:16]

5.1.3. Category FINANCIAL CAPITAL

The category FINANCIAL CAPITAL is defined by Batchelor et al. (2003:31) to be "mechanisms for (re)covering costs and replacing equipment". Perdan (2004:25) claims that it is "the value of which is simply representative of the other forms of capital". We add that it is economical value we are discussing

here as the term value could be used in many different contexts with different definitions. Further we widen Batchelor et al.'s (2003) definition of FINANCIAL CAPITAL. They emphasize 'recovering' and 'replacing' whereas we stress that the initial funding is also important to take in to consideration.

We have identified two subcategories; FINANCIAL SUPPORT [F.1] and LOCAL ECONOMY [F.2] which we consider relevant in discussions about financial capital. FINANCIAL SUPPORT deals with economics on national or international level. LOCAL ECONOMY unites factors representing business economics aspects operating on a local level. There is a relation between financial support and economical factors (Lyytinen et al., 1998); see section 4.3. The problem with over budget, too ambitious budget and cost overruns was reported by several authors (Standish Group, 1994; Barki et al., 1993; Cule et al., 2000; Holmesland, 2001; Lyytinen & Hirschheim, 1987).

Within this category we have found five factors belonging to the two subcategories, see figure 5.3. The five factors are: **Funding, Loan Market, Bill Service, Commercial Models,** and **Purchasing Power**. Below we discuss each factor and we start the discussion with describing the subcategories and move further with a clarification of the factors from the identified indications. A total classification of all subcategories, factors, and indications is presented at the end of this section, table 5.3.

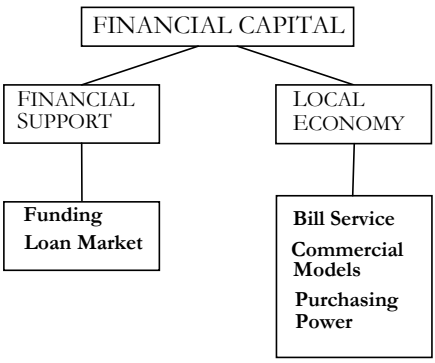

Figure 5.3. The category FINANCIAL CAPITAL and its subcategories and factors

We have identified the subcategory FINANCIAL SUPPORT [F.1] to be one of the two subcategories within FINANCIAL CAPITAL and we rely on Batchelor et

al. (2003:5) for this. They identified finance to be one factor to consider in discussions about donor funding. We identified FINANCIAL SUPPORT to be a subcategory uniting the two factors **Funding** and **Loan Market**.

Funding [F.1.1] was discussed in Batchelor et al. (2003); Mursu (2002); and in our pre-study (Wicander & Sundén, 2004). With the factor **Funding** we are concerned with the question of who pays for the investment, including the set-up of the equipment and added supply costs. **Funding** was indicated by four negative indications. Reluctance of donors to fund ICT activities was a fact that Batchelor et al. (2003) observed in their studies concerning NGOs. They also observed reluctance from donors to support ongoing ICT activities [F.1.1-a]. An interesting result from their study was that the cost of ICT equipment could be minimal and that the cost of the equipment as a part of the whole was not even raised as an issue. Since the ICT equipment was a part of a bigger developmental programme or system, the costs of the ICT equipment therefore were small compared to the whole. Hence, affordability should not be the problem concerning NGOs and their ICT activities.

We also made the observation that there was reluctance from the government to finance ICT activities (Wicander & Sundén, 2004). We noticed that lack of funds was a major obstacle to ICT implementation and to the necessary upgrading of ICT accessories and spare parts. Neither the national government nor the local ministries had the means to invest in this area [F.1.1d] (Wicander & Sundén, 2004). This is in line with Mursu (2002:170, 227) when she states that it is the political climate in the country, including the economic situation which does not allow for ICT improvement and investment [F.1.1-b]. She also means that inadequate funding is one risk area [F.1.1-c].

These problems with funding consequently have a negative impact on sustainable ICT, while the contrary, adequate funding, naturally has a positive impact, as discussed by Mursu (2002). We see that a broader perspective is needed here where also possible actions are discussed. Mursu argues that the government should work more on economic strategies for ICT activities. This is supported by Caspary and O'Connor (2003) and they suggest that the government could contribute to extended ICT use by attracting private investments through establishing a favourable regulatory environment for telecoms competition with a well-designed contractual bidding process for supplying less profitable segments of the market. (In section 4.4.4 we have

already pointed to the fact that ICT projects in rural areas in developing countries are financed over a too short time frame compared to more wealthy countries.)

In the case that the initial funding is arranged there could be further problems concerning funding for maintenance, repair and support. Cost of maintenance must include the cost of acquiring and maintaining software (Mursu, 2002). During our pre-study we found that there was a lack of funding for spare parts, as well as a lack of funding for Internet subscriptions. This matter is further discussed below together with the factor **Purchasing Power**. Further Batchelor et al. (2003) also stress the importance of a mechanism for (re)covering costs and replacing equipment costs. The authors also point to the fact that the use of second hand technology led to enlarged costs due to an increased need for maintenance and repair see section 5.1.4.

Technology transfer to developing countries is in many cases equal with aid and assistance of international organisations. The problem can be that this kind of technology transfer serves the donor interest (Odedra-Straub, 1995). According to Huq (1995) technology transfer is a large scale import of technology from developed countries which often involve technology of the wrong kind and scale. Further, these welfare gestures can postpone the urgent situation of a social dynamic that can enable developing countries to move towards a greater self-reliance, as mentioned in section 4.2.

Related to funding is also the view of technology. There is a risk that technology is viewed as the solution in official development aid, as discussed in section 4.1, resulting in major investments in infrastructure projects (Wilson & Heeks, 2000), but with low focus on sustainability. At the same time, one of the main hindrances for development is the lack of physical capital, as mentioned in section 4.1 by Baumol and Blinder (1997). Further, there is a risk that funding from aid organisations results in a dependency situation with low self-esteem and self-reliance as a consequence, as discussed in section 4.1, which hence affects sustainability in a negative way.

The second factor we identified within FINANCIAL SUPPORT was **Loan Market** [F.1.2]. Caspary and O'Connor (2003) highlight the importance of a functioning loan market as an enabler for ICT in rural areas in developing countries. Further, they give two examples which we treat as positive indications on **Loan**

Market. First they claim that access to credit, micro or otherwise, is crucial for attaining a successful provision of ICT [F.1.2-a]. Second they stress the significance of linking ICT projects to microfinance programmes [F.1.2-b]. They suggest this is one of the issues in their so-called demand-driven approach, see section 4.5.2.

We find the factor **Loan Market** connected to the factor **Funding** as the possibility to get access to credit, as mentioned by Caspary and O'Connor (2003), this heavily influences the ability to finance an ICT activity. They observed a positive effect on funding when there was a possibility of linking the ICT activity to an existing microfinance program like Grameen Bank.

The concept of sustainable development has been an issue for discussions among economists, see section 4.4. The Brundtland Report (WCED, 1987) stresses mutual responsibility which could be applied to funding of ICT activities and according to Williams and Van Patten (1998) the challenge is to extend our responsibility to the less familiar, future and distant. This could include serving economic interests far removed in physical location.

Applying the centre-periphery terminology, a local community that is self-sustaining will not in that sense be economically marginal (Dahlgren & Lundberg, 2004). It could indeed be a test area for sustainable economic alternatives (Leimgruber & Imhof, 1998). But in order to become self-sustaining a local community must be supported by higher authorities (Dahlgren & Lundberg, 1998). Action should be based locally but yet there is a need for outside support, which includes financial support.

One of the keys to sustainable development lies in decision processes based on equity and the question of equity focuses attention to the imbalance in economic power (Perdan, 2004). The benefits and burdens from development should be distributed fairly among the members of society and between generations in order to promote economic equity (WCED, 1987).

About technology Oyomno (1996) means that sustainable technology is dependent on the appropriateness of the technology to the application environment and that includes cost-effectiveness and affordability in terms of financial resources, as discussed in section 4.4. Therefore, a new technology can be inappropriate if it is too expensive to be supported and maintained on local

resources. Another problem regarding technology transfer and ICT equipment in developing countries is that these countries usually accept equipment which is not of high quality. These countries also tend to have limited foreign exchange reserves which in turn reduce the ability to import required parts (Odedra-Straub, 1995), discussed in 4.2.

The second subcategory within FINANCIAL CAPITAL is LOCAL ECONOMY [F.2]. This category concerns financial matters that do not belong to FINANCIAL SUPPORT as we are convinced of the importance of a local financing focus. We have found three factors belonging to LOCAL ECONOMY: **Bill Service, Commercial Models,** and **Purchasing Power**.

The matter of **Bill Service** [F.2.1] was exemplified by Caspary and O'Connor (2003) and they found that an existing network for the logistic of bill collection had a positive impact on the viability of an ICT activity. Moreover, they also state that the difficult logistics of bill collection prevent commercial telecom operators to extend access to low-income rural communities [F.2.1-a]. We have taken this as a negative indication on **Bill Service**.

The factor **Commercial Models** [F.2.2] was provided by both Batchelor et al. (2003), and Caspary and O'Connor (2003). Batchelor et al. (2003:27) consider commercial models to be a socio-economic factor in successful projects [F.2.2-a]. Further, Caspary and O'Connor (2003) found that the use of existing commercial models increased the viability of an ICT activity. One of the most famous is the one supported by Grameen Bank. Concerning commercial models the franchise models of shared access provision were the most positive ones concerning financial viability [F.2.2-b]. Such models provide opportunities to small entrepreneurs as they create incentive due to cost containment and financial management. We have treated both examples as positive indications on **Commercial Models**.

Caspary and O'Connor (2003) indicate that ensuring the economic success of ICT in rural areas encourages local participation. They also state that the 'shared access' business-model creates a relatively high cash flow to the owner. Different benefits concerning the three-tier model, described in section 4.5.2, is that the top tier is responsible for the overall management like relationships with banks. The second tier makes the investment for the access centres and on the bottom tier the local entrepreneurs invest in Internet kiosks. Another type

of business model is the telecenter but this has not attained commercial viability in the cited study. An example is given from South Africa where the majority of the 70 telecentres closed after four years, and only three percent make enough money to cover their costs. Also Wilson and Heeks (2000) as well as Ernberg (1998) argue that telecentres requires huge investment and large on-going subsidies to be sustainable in deficient areas, see section 4.1.4. The multiplicity paradigm emphasising 'another' way for development (Hettne, 1990; Chambers, 1997), section 4.1, which can include developing appropriate business models as well as pricing systems.

The factor **Purchasing Power** [F.2.3] was identified by Batchelor et al.(2003) as they noticed that low purchasing power of the users had a negative effect of sustainable use of an ICT activity [F.2.3-a]. Their study showed that ICT activities could not generate cost recovery on its own. In our pre-study we found that financing of ICT complement is a Critical Success Factor and one of our respondents argued that he could not pay the Internet connection [F.2.3-c] (Wicander & Sundén, 2004). We use those two examples as negative indications of **Purchasing Power**. On the other hand Batchelor et al. (2003) stated that the willingness to pay for telephone services was high and hence in the future the service had the possibility of becoming commercial viable. This is in line with Caspary and O'Connor (2003) as they refer to studies estimating that poor people are willing to pay a relatively high amount of their disposal income for ICT access [F.2.3-b], and which we identified as one positive indication of **Purchasing Power**.

Concerning purchasing power it is important to point out the need of the chosen technical solution being economically justified in relation to the purchasing power of the target group. This is in line with Mursu (2002) as she discusses appropriate IS and its solutions. Both Batchelor et al. (2003) as well as Caspary and O'Connor (2003) point to the fact that ICT activities can generate income for poor people and can contribute positively and significantly to economic growth and hence enhance their options for livelihood. Examples mentioned by Caspary and O'Connor (2003) are to extend the market for goods and to ensure that poor people are as well-supplied as other market participants with price and other vital information.

Following this, increased income will raise the purchasing power for ICT under the assumption that the observed willingness to pay for ICT services is still

high. Connected to this matter is the need of a pricing system that the intended users can afford, as commented by Caspary and O'Connor (2003). Further, the authors show that using ICT yields economic benefits to the users. An example from Bangladesh estimates the full value of a single phone call for users in terms of consumer surplus based on the estimated travel cost between the village and the capital of Dhaka. The cost of the travel ranges from 3.7 to 7.1 times the cost of the phone call within Bangladesh. Accordingly, the economic benefit would rise with increased distance or for phone calls abroad under the premise that the fee is in proportion to the distance. Another example from East Africa shows that the use of the Internet bypasses the high costs of communicating by telephone (Caspary & O'Connor, 2003:29). Hence, access to ICT results in lower costs for information, as discussed in section 4.1.4 (Wilson & Heeks, 2000:414; Ngwainmbi, 1995; de Vylder, 2002).

It is important when discussing purchasing power to include the discussion of poverty and poor people. Chambers (1995, 1997) states that it is a risk to reduce poverty and hence purchasing power to a measurement of income and money. According to Woodhouse (2000) sustainable development of a community does not necessarily involve economic growth. Further the Brundtland Report (WCED, 1987) stresses that it is not enough with economic growth, but an assurance that poor people get their share of the growth. Poverty can be defined as the level of income as well as the ability to participate economically (Maxwell, 1999) and different definitions imply different instruments. By understanding causes it can be possible to design, implement and evaluate programs to alleviate poverty (Perdan, 2004).

Related to purchasing power is the fact that ICT as a communication means has become cheaper all the more, as mentioned above. This influences indirectly on purchasing power in a positive way. Wilson and Heeks (2000) argue that information and communication are the main potential areas for low-income countries as it normally lowers communication costs substantially. Further, it is important that people with low purchasing power pay for what they need and demand and not what the sources want to produce. Otherwise there is a risk of providing "…a flood of noise: digitised, Westernised irrelevance" (Wilson & Heeks, 2000).

A complete presentation of the subcategories, factors and indications is given in Table 5.3.

Table 5.3. Category FINANCIAL CAPITAL and its subcategories, factors and indications

FINANCIAL CAPITAL		
SUBCATEGORY	FACTOR	INDICATION (BY EXAMPLE)
F.1 FINANCIAL SUPPORT	**F.1.1 Funding**	a. (-) "…lack of willingness for donors to *fund* ICT support activities."[1:26]
		b. (-) "Political climate in the country, including economic situation: the poor economical state of the country does not allow for *IT improvement and investment*"[3:170]
		c. (-) "...risks areas were...inadequate *funding*"[3:227]
		d. (-)"…the lack of *funds* is a major obstacle to ICT implementation and to the necessary upgrading of ICT accessories and spare parts. Neither the national government nor the local ministries had the means to invest in this area"[4:145]
	F.1.2 Loan Market	a. (+) "In terms of services, *access to credit*, micro or otherwise, is one of the most valuable accompaniments."[2:35]
		b. (+) "Linking ICT projects with *microfinance* programmes"[2:28]
F.2 LOCAL ECONOMY	**F.2.1 Bill Service**	a. (-) "One cause of reluctance on the part of commercial telecoms operators to extend access to low-income rural communities is the difficult *logistics of bill collection*."[2:13]
	F.2.2 Commercial Models	a. (+) "*Commercial models*"[1:27]
		b. (+) "Franchise *models of shared-access provision* would appear to have the most favourable economics"[2:7]
	F.2.3 Purchasing Power	a. (-) "*Low purchasing power* of users"[1:26]
		b. (+) "Surveys of rural households' *willingness to pay* for telephone service point to its potential commercial viability"[2:7]
		c. (-) "I am not able to *pay* the connection"[4:143]

5.1.4. Category PHYSICAL CAPITAL

The category PHYSICAL CAPITAL is described by Batchelor et al. (2003:31; 38) as "choice of technology may well be important. As are infrastructures which enable the technologies to operate" another description is "basic infrastructure for the supply of energy, shelter, water, transport and communications, productions equipment". Perdan (2004:25) uses the concept 'built capital' instead of 'physical capital' and he claims that it represents "machinery, buildings and infrastructure". We have not noticed any particular factors or indications pointing to that buildings are an issue to consider, therefore this aspect is not included in the analysis. None the less, we suspect that buildings and how they are designed are important matters to include in an ICT implementation plan. In fact also the localisation of the buildings is crucial to reflect on. But, alas, we have found no indication of this in the empirical material or in the analysis in the works we rely on. On the other hand, we have identified several factors within machinery which we have renamed TECHNOLOGY, which also is one of the two subcategories. INFRASTRUCTURE is the other subcategory and it corresponds well to the line in the definition above which illustrates the basic infrastructure. Further we have found that shelter and water mentioned in above definition are also beyond this analysis.

Within this category we have identified six factors belonging to the two subcategories, see figure 5.4. The six factors are: ELECTRICITY, TELECOM NETWORK, TRANSPORT NETWORK, HARDWARE, SOFTWARE, and DOCUMENTATION. We will discuss each factor and we start the discussion by describing the subcategory and move further to an explanation of the factors identified from the indications. A comprehensive classification of all subcategories, factors, and indications is presented at the end of this section in table 5.4.

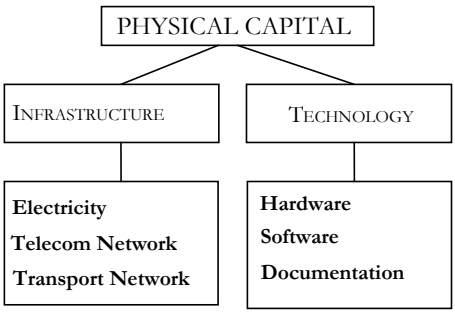

Figure 5.4. The category PHYSICAL CAPITAL and its subcategories and factors

When defining the subcategory INFRASTRUCTURE [P.1] we have considered arguments from the four data sources which all claim the importance of this matter. Batchelor et al. (2003:6) identified infrastructure as one issue that hindered ICT use. It was also noted as crucial by Caspary & O'Connor (2003) and by us as one 'problem area' in our pre-study (Wicander & Sundén, 2004:142). Mursu (2002) pointed to the importance of well functioning infrastructure declaring that infrastructure was the biggest constraint to effective ICT activities. Mursu (2002) among others (Waema, 1996; Heeks, 1999) emphasises that the required infrastructure is often lacking, with the consequence that long-term viability of an ICT activity is not a reality. We found three factors within the data sources belonging to Infrastructure: **Electricity**, **Telecom Network**, and **Transport Network**.

Consequently, **Electricity** [P.1.1] was identified to be an important issue in all four data sources and it is obvious that it is a matter of quantity and quality. In our pre-study we identified it to be one of the ten Critical Success Factors (Wicander & Sundén, 2004:143). Caspary and O'Connor (2003) state that complementary infrastructure, such as electricity is important if the extended ICT access will be beneficial. They observed in their study a lack of energy supply including electricity. Batchelor et al. (2003:18) state that infrastructure which enable the technology to operate is one of the keys and by that they mean that the power supplies are unreliable [P.1.1-a].

The problem is not only lack of electricity. It is also a matter of poor quality of the electricity network. We found in our pre-study that the electricity supply was interrupted constantly and ICT users could only expect a supply of electricity for three to four hours per day [P.1.1-d].We summarise the problems

with electricity supply by stating that the electricity supply within our research area was both insufficient and unstable [P.1.1-e] (Wicander & Sundén, 2004:143). Another problem is when the power supply to a computer system not can be guaranteed [P.1.1-c] (Mursu, 2002:170). These four examples were identified as negative indications for **Electricity**. The problem with poor quality implies that the energy companies must put an effort to guarantee steady power supply using for example stand-by generators.

With energy supply in place the benefits of ICT could be increased. Still this remains a fundamental problem for ICT access in developing countries where approximately two billion people lack electricity. This is due to the expense associated with extending the grid. Hence, there is a need to investigate other ways to solve the question of power supply for ICT activities. Caspary and O'Connor (2003) suggests the possibility of locating ICT activities at existing institutions like schools and thereby be able to use the on hand energy supply [P.1.1-b]. This is one positive indication on **Electricity**.

The second factor within the subcategory INFRASTRUCTURE is **Telecom Network** [P.1.2]. Telecommunication was identified by Caspary and O'Connor (2003:35) to be crucial and they emphasise that there are difficulties in providing ICT access to rural populations in developing countries. Moreover, they claim that telecommunication access is not necessarily sufficient to permit the rural poor in developing countries to extend the market for their goods and to ensure that they are as well-supplied as other market participants with price and other vital information [P.1.2-b]. We see the second statement as one positive indication of **Telecom Network**. We observed during our pre-study that there were few fixed lines available, those that were available were of poor quality. This results in occupied lines as well as repeated interruptions when accessing to the Internet [P.1.2-d] (Wicander & Sundén, 2004). Batchelor et al. (2003:26) discuss the problems with telephone connections and that this is both a technology and infrastructure problem. [P.1.2-a]. Furthermore, erratic and unreliable telecommunication network can even hinder some projects due to the fact it blocks quick access and makes it difficult to arrange activities, according to Mursu (2002) [P.1.2-c]. We consider these three examples as negative indications to the factor **Telecom Network**.

Caspary and O'Connor (2003:17) suggest the possibility of locating ICT activities to existing institutions like schools and thereby be able to use the

obtainable telecommunication net. This issue has already been discussed above as well under the factor **ICT Education** in section 5.1.1 but focusing on the gains offering ICT training in existing institutions such as schools.

Further, the authors argue that the most important action must come from the government through establishing a conductive regulatory environment for telecom competition, see also the discussion held under the subcategory **Policy Environment** [S.2], section 5.1.2. An adequate regulatory framework and well-designed contractual bidding process for supplying less profitable segments of the market should go a long way towards attracting private investments, including underserved areas. In the end, this is likely to be the most direct path towards the goal of 'universal service'. An example can be mentioned from Bangladesh where a primary constraint to the Grameen Telecoms has been an unclear telecommunication market controlled by a monopolistic government provider. The Bangladesh telecom regulatory regime is seemed both antiquated and anti-competitive by Caspary and O'Connor (2003). This is also discussed under the factor **Telecom Market Regulation**, section 5.1.2.

The factor **Transport Network** [P.1.3] was identified by Caspary and O'Connor (2003) as one issue to consider. They emphasise that a complementary infrastructure, such as roads are important if ICT access will be beneficial [P.1.3-a]. Conversely, with this other element of infrastructure in place these benefits can be multiplied. This example is a positive indication of **Transport Networks**.

We have classified TECHNOLOGY [P.2] to be the second subcategory within PHYSICAL CAPITAL. Technology was identified by Batchelor et al. (2003:5) to be a factor. Further, during our pre-study in Zambia we recognised technology to be one of the problem-areas influencing ICT use (Wicander & Sundén, 2004:146). We have identified three factors belonging to TECHNOLOGY: **Hardware**, **Software**, and **Documentation**. In section 4.2 we found support in Rogers (2003) for treating the three factors **Hardware**, **Software**, and **Documentation** together under the subcategory **Technology.** He describes technology to be a mixture of hardware and software and he claims that computer software consists of coded commands, instructions, manuals and other information which support the use of it.

Factors related to technology and technical solutions have been mentioned as main reasons for failures in the IS field (Mursu, 2002; Lucas, 1975); see section 4.3.

The first factor **Hardware** [P.2.1] is discussed by Batchelor et al. (2003), Caspary and O'Connor (2003), and Wicander and Sundén (2004). The choice of technology may well be important, according to Batchelor et al. (2003:27, 29). Their study identified that the use of 'off the shelf' technology contributed to the success of the ICT activity [P.2.1-b].

On the contrary, they found that second hand technology was noted to be a hindrance. Second hand technology implied that there was an increased need for maintenance and repair and often the technology was out of date leading to other difficulties, like inability to run current software [P.2.1-c].Their study points to the importance of using market available equipment as this implies that training in the use of the equipment is possible [P.2.1-a].

Further, Batchelor et al. (2003) argue that there are few if any opportunities for standardisation. None of their case studies showed any indication that standardisation was necessary. Technology is constantly changing and a central prescription of a standard technical package would probably affect the project negatively [P.2.1-d]. We have used these four examples as indications to **Hardware**.

The last example above is in line with Caspary and O'Connor (2003) as they mean that there is a need to use innovative models to extend service provision in forms that are widely accessible which can involve a mix-and-match technological approach [P.2.1-e]. For instance, they refer to the use of AM radio to broadcast information downloaded from the Internet to the rural population like on Kothmale Community Radio in Sri Lanka. We see this as one positive indication of **Hardware**.

This is further confirmed by the discussion in section 4.1.4 where local solutions of mediating information are recommended by several authors (Fuglesang, 1972; Ngwainmbi, 1995; Wilson & Heeks, 2000) including traditional ways integrated into a hybrid adapted and adjusted to local conditions. This is in line with the definitions of ICT as articulated in section

4.3 where ICT include non-digital means (March & Smith, 1995). Further, our definition of IS includes both 'new' ICT as well as 'old' ICT.

In the perspective of technology transfer discussed in section 4.2 Odedra-Straub (1995) has an argument connected to the above discussion as she means that developing countries usually accept equipment which may not be the most appropriate, or of the highest quality. Instead if the equipment was standardised it would reduce the range of spare parts needed.

Further solutions connected to equipment are indicated by the n-Logue model, described in section 4.5. The company facilitates relationships to hardware and solution providers. About the selection of equipment, n-Logue uses the headquarters staff expertise to choose high-quality hard- and software and certify its reliability to the kiosk owners. On the second tier the Local Service Providers invest and set up access centres that will provide last-mile solutions. On the bottom tier there are the local entrepreneurs that are recruited by the Local Service Providers to invest in and set up Internet kiosks in their villages. The 'kiosk packages' consist of: a subscriber wall set, a computer, a printer, and a backup battery. (Caspary & O'Connor, 2003) Both n-Logue and Village Pay Phone models can provide shared access at the point of the end user, but also shared resources including bandwidth at the nodes further up in the system make them able to offer lower prices (Caspary & O'Connor, 2003).

In our pre-study we point out that hardware (in the pre-study we use the term 'ICT' technology needs to be adapted to the physical environment [P.2.1-g]. Often this means robust ICT equipment considering the high temperatures, high humidity and dust in the area [P.2.1-f] (Wicander & Sundén, 2004:145). These two examples are the last indications related to **Hardware**. But we also consider that high temperature, humidity, and dust should also be important conditions to take into consideration when planning the buildings where the ICT is located. These assumptions are not based on any of the data sources.

The second factor within the subcategory TECHNOLOGY is **Software** [P.2.2]. Software is recognized to be a matter of importance in three of the four data sources. Mursu (2002) uses the term 'system'. We have categorized **Software** under Technology as we emphasise the connection to **Hardware**. To start with Batchelor et al. (2003:29) saw a problem with running software which was out of date [P.2.2-b]. Another problem was identified by us in our pre-study, when

we observed that the costs for software licenses in developing countries cannot be of Western dimensions [P.2.2-d].

Those two examples constitute negative indications of **Software**. Mursu (2002:294) presents that simplicity is important and that simple design and implementation have been proven to be most successful on a long-term basis [P.2.2-c]. Another aspect of **Software** is development and content. Batchelor et al. (2002) mean that a common feature of success from a technology point of view was development of locally tailored software or creation of local content [P.2.2-a]. The examples of Mursu (2002) and Batchelor et al. (2003) were positive indications to **Software**.

We have noticed that the findings of Mursu (2002) concerning documentation does not have any clear connection to any of the earlier identified subcategories or factors, therefore we identified it to be a factor of its own, **Documentation** [P.2.3]. We classified it to belong to the subcategory TECHNOLOGY as it has links to **Software** and **Hardware**. Concerning **Documentation** Mursu (2002:217; 295) shows that the lack of manuals was a problem discussed by managers [P.2.3-a]. This example is identified as a negative indication of **Documentation**.

Mursu (2002) also gives the results from the inquiries with IT experts; she presents three examples of documentation and manuals. First that availability of good documentation of the technical aspect as well as user's manual is of importance [P.2.3-b]. Second that insufficient technical documentation can seriously affect support capabilities [P.2.3-c]. Third that, on the contrary, proper documentation of program allows for continuity and ease of maintenance even when the original developers are not available [P.2.3-d]. All three examples are used as indications for **Documentation**. Here we will add that the importance of local language is also a matter of Documentation.

A major problem concerning both **Infrastructure** and **Technology** is funding in the form of financial support. **Financial Support** [F.1.1] was one of the identified factors within FINANCE [F.1], section 5.1.3. There was a reluctance of donors to fund ICT activities; also reluctance of governments was found. Consequences of the limited funding were for example problems concerning ICT implementation or problems related to upgrading, maintenance, and repair of the ICT equipment.

Technology compatibility, complexity, and triability are three characteristics which can explain different rates of adoption. The characteristics should all be considered when designing hardware (Rogers, 2003). Market available equipment can for instance promote triability and the re-invention phase but also the adaptation of the technology. Market available equipment was previously mentioned as an indication [P.2.1-a] of **Hardware** and the key issue was that it is possible to be trained in the use of such equipment which affects ICT use positively.

Technology transfer to developing countries can be successful if different goals are fulfilled such as the technology can be developed, repaired, managed and operated domestically, important aspects to have in mind when developing and designing hardware and software (Maskus, 2003), section 4.2. The importance of local technical capacity is further discussed under the factors **Knowledge** [H.2] and **Skill** [H.3] classified under HUMAN CAPITAL, section 5.1.1.

Sustainable development requires creativity and innovation at every level including technical (Cearbhaill, 1998) at the same time as technological advance opens up new possibilities for sustainable development. As in previous times, today's technological advances raise concerns about their possible impacts, both positive and negative (Mursu, 2002). But it is important to consider that technical solutions that work in developed countries might not work in developing countries. In other words there must be an adaptation to local circumstances and local demands which call for local mobilisation and participation if the goal is to identify needs of the local area. A further discussion in this area was performed under SOCIAL CAPITAL, section 5.1.2, since we identified **Local Mobilisation** [S.1.1], **Identifying Needs** [S.1.3], and **Participation** [S.3.1] to be important factors influencing ICT use.

Relating to the question what is a hinder for development from section 4.1.3 Baumol and Blinder (1997) mention as one of the main reasons, lack of physical capital and a need for technological knowledge. But Chambers (1997) argues that there must be a shift in focus from tangible things like infrastructure to more human issues, as discussed in section 4.1. At the same time he gives voice to a less reductionistic view on poverty claiming that physical isolation must be seen as one of its parts (1995). Huge investments in infrastructure projects belong to the modernisation paradigm and its view on development (Wilson & Heeks, 2000). But the fact is that the issue of asymmetric information, as

discussed in section 4.1.4, has high relevance for the discussion on empowerment in developing countries. Asymmetric information, due to inefficient information systems, affects access to data and information (de Vylder, 2002). Hence, there is still a need for infrastructure investments. In section 4.3 we discuss some of the missions in the field of IS and one concerns the construction of IT infrastructure (Markus, 2000).

There is a close relation between development and new technologies, as discussed in section 4.1. ICT is a prerequisite for globalisation, according to McGrew (2001). The view of technology has changed in the development discourse during the decades from being a neutral instrument for development, to a demand for appropriate technology, to a favour for small scale and traditional technology, as highlighted in section 4.1. Another way to put it is to say that the trend has changed from 'technology-as-solution' over 'technology-as-problem' to 'technology-as-enabler' in the development discourse.

The current approach of technology in development propose a more systemic view where action in one arena, like technological, has impact on the others as the social, economic and cultural arenas (Wilson & Heeks, 2000). Different strategies for technology development and their different impact on local and poor people are discussed in section 4.1.4 (Wilson & Heeks, 2000; Platt & Wilson, 1999). The authors favour a participatory technology development process including ownership of the planning and implementation sub-processes.

In table 5.4 a complete presentation of the subcategories, factors, and indications belonging to PHYSICAL CAPITAL is given.

Table 5.4. Category PHYSICAL CAPITAL and its subcategories, factors and indications

PHYSICAL CAPITAL		
SUBCATEGORY	FACTOR	INDICATION (BY EXAMPLE)
P.1 INFRASTRUCTURE	**P.1.1** **Electricity**	a. (-)"Unreliability of *power supplies* (often grid electricity)…"[1:18] b. (+) "Telecentres are also sometimes established in schools and universities, where the *physical infrastructure* can be extended at

		modest cost to accommodate the telecentre"[2:17] c. (-) "Energy supply: When regular *supply of power* to computer systems cannot be guaranteed."[3:170] d. (-) "…*electricity* net was interrupted constantly and the ICT users could only expect a supply of electricity for three to four hours per day"[4:143] e. (-)"The *electricity* supply within our research area was both insufficient and unstable."[4:143]
	P.1.2 **Telecom Network**	a. (-) "...ongoing problems with *telephone* connections"[1:26] b. (+) "*Telecommunications* access is necessary if not sufficient to permit the rural poor in developing countries to extend the market for their goods and to ensure that they are as well-supplied as other market participants with price and other vital information."[2:35] c. (-) "Erratic and unreliable *communication network:* poor communication (network, telecommunication etc.) can hinder some projects."[3:170] d. (-) "The *telecommunication network* within the district consisted of only a few fixed lines with poor quality. This results in occupied lines as well as repeated interruptions when accessing to the Internet "[4:143]
	P.1.3 **Transport Network**	a. (+) "Provision of ICT access in rural areas is likely to prove most beneficial where complementary infrastructure and services are also made available. Rural electricity and *roads* are the most obvious infrastructural complements."[2:35]
P.2 TECHNOLOGY	**P.2.1** **Hardware**	a. (+) "Market available *equipment* meant that there was a support network in terms of training in the use of equipment and repairs" [1:27] b. (+) "There was no special design of *technology* but rather a use of a system made up of "off-the-shelf" components (subsystems). This use of market available *equipment* meant that there was a support network in terms of training in the use of equipment and repairs."[1:27] c. (-) "…the use of second hand *technology* was a noted hindrance on many of the projects."[1:29] d. (-) "…a standard *technical package* would probably negatively affect the project[1:28] e. (+) "The preferred *technology*, or *technology* mix, for providing low-cost ICT access will vary with local conditions."[2:21] f. (-) "...there is a need for robust *ICT equipment* considering the high temperatures, high humidity and dust in the area."[4:145] g. (+) "...the *ICT technique [i.e. technology]* needs to

	be adapted to the physical environment."[4:145]
P.2.2 Software	a. (+) "...a common feature of success from a technology point of view was the development of locally tailored *software* or the creation of local content."[1:27] b. (-)"… often the technology was out of date leading to…inability to run current *software*."[1:29] c. (+) "Simplicity: *systems* that are simple in design and implementation have proven to used for a long-term basis" [3:294] d. (-) "The costs for *software* licenses cannot be of Western dimensions"[4:145]
P.2.3 Documentation	a. (-) "Finally, there were some very practical problems. The lack of resources, in terms of…*manuals*…"[3:217] b. (+) "*Documentation:* A good documentation of the technical aspect as well as users *manual* must be done."[3:295] c. (-) "*Documentation:* insufficient technical documentation can seriously affect support capabilities."[3:295] d. (+) "Proper *documentation* of programs: proper documentation of program allows for continuity, ease of maintenance even when the original developers are no being available"[3:295]

5.1.5. Category CONTENT CAPITAL

The category CONTENT CAPITAL is defined by Batchelor et al. (2003:32) as "…the information communicated by the ICT…" They argue that this capital seems to be one of the key capitals and they express this as "If the information becomes out of date or irrelevant then as this capital fails so too the whole ICT project".

Within CONTENT CAPITAL we have identified two factors belonging to the two subcategories CONTENT and FORM, see figure 5.5. The factors are: **Localisation** and **Language**. We will discuss each factor and we start the discussion by describing the subcategory and move further with an explanation of the factors from the identified indications. A full classification of the subcategory, factors, and indications are presented at the end of this section, table 5.5.

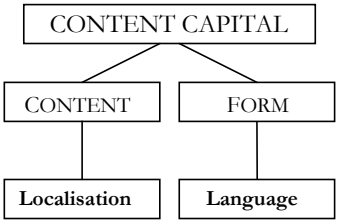

Figure 5.5. The category CONTENT CAPITAL and its subcategories and factors

We have classified the subcategory CONTENT [C.1] within CONTENT CAPITAL and we rely on Batchelor et al. (2003:25) as they identified it to be one important issue. In their study they found that there was a shortage of information with local content. This leads to the factor within CONTENT, **Localisation** which also emanates from Batchelor et al. (2003) findings.

The factor **Localisation** [C.1.1] was exemplified by four positive indications, three from Batchelor et al. (2003) and one from Caspary and O'Connor (2003:27) as they put forward that a starting point for successful ICT activity is that the venture provides services that users need and demand, including developing useful local content [C.1.1-d]. This is in line with Batchelor et al. (2003) as they establish that a key theme running through all the ICT activities is that there is a conscious effort to involve the client community in the detailed planning and execution of the project in order to develop the information to the target groups needs and that users would benefit from more content in local languages [C.1.1-b]. They continue with saying that the creation of locally tailored software and appropriate content contributed to the success of the ICT activity [C.1.1-c]. Moreover, they mean that one way to realize this is to introduce an interactive web site that can be accessed by users themselves, which can imply that they can publish their own content [C.1.1-a].

As mentioned above Caspary and O'Connor (2003) believe that the users demand is crucial to successful ICT use. Their demand-driven approach is about training production of locally relevant materials from generic information, as discussed in section 4.5. Caspary and O'Connor (2003:29) refer to Paisley et al. (1999) when they explain the needs of information and suggest relevant questions to ask as What information is needed, by whom, when, where, for what purpose etc., see also the factor **Identifying Needs** [S.1.3] within the subcategory SOCIAL ENVIRONMENT in SOCIAL CAPITAL, section

5.1.2. Caspary and O'Connor (2003) establish that small entrepreneurs benefit from ICT-enabled business support services, vital information like prices of consumables as well as training in small business software applications. Further they argue that quicker and more effective communication during disasters and better access to health-care services are examples of relevant information.

By making the content accessible, Caspary and O'Connor (2003) mean that there is a need to use innovative models to extend service provision in forms that are widely accessible. The Kothmale Community Radio in Sri Lanka is an example of a good starting point for the dissemination of ICT since it reaches all segments of local communities through the use of local languages, it can offer information, education and entertainment, it can be a platform for debate and cultural expression, and also local 'experts' can add value to the information by putting it into local context.

Developing useful local content entails, according to Caspary and O'Connor (2003), a need of providing a relevant local social network. They stress that many projects fail for lack of commitment to ongoing maintenance. Concerning telecenters the usage has been lower than expected and the telecentres have also failed to serve their specific target groups. Small family-run telecentres have though been successful in many countries, but those centres are concentrated in urban areas and they are not in the business of offering local content as in the case for some donor-supported centres.

Most users on the Internet expect free content and no one will develop local content without getting paid. Caspary and O'Connor (2003) suggests that NGOs and local government agencies may perform a useful public service in initial local content development and thereby increasing the utility of ICT access to the point where a critical mass of users attracts private entrepreneurs into web-based services.

Another way to overcome this problem could be that once a critical mass of local users has been achieved most local content provision should be run as a commercial enterprise with tailor-made information and for advertisers that are willing to pay for access to target online communities. Caspary and O'Connor (2003) give an example concerning local content creation from India, the 'Info shops'. The information requirements were identified and then volunteers from the village created a local database comprising: government programmes, cost

and availability of farming inputs, a directory of insurance plans, pest management plans, a directory of local hospitals and medical practitioners, a directory of local veterinarians, cattle and animal husbandry programmes (Shore, 1999).

The second subcategory within CONTENT CAPITAL is FORM [C.2] and we believe form can have decisive impact on ICT use. The factor identified within FORM is **Language** [C.2.1]. **Language** is highlighted in Batchelor et al. (2003); Caspary and O'Connor (2003); and in our pre-study (Wicander & Sundén, 2004). Batchelor et al. (2003) stress that language is one issue to do with and that users would benefit from more content in local languages [C.2.1-a]. This is one positive indication on **Language,** one negative indication is when they put forward that in projects using the Internet a problem is the lack of information in local language [C.2.1-b]. Caspary and O'Connor share a similar understanding when they state that one huge problem in India concerns the use of Internet and the lack of Internet content in the 15 national languages [C.2.1-c]. This is also treated as one negative indication. Finally we identified in our pre-study that there was a greater need for information in local language [C.2.1-d], one positive indication on **Language**.

Content and **Form** can be seen as a matter of both a quantitative as well as a qualitative aspect. Information in local language can be defined as a qualitative aspect. This has been observed by Caspary and O'Connor (2003) as one key for the use of ICT. Batchelor et al. (2003) put a quantitative aspect to this matter as they establish that not enough content in local language had a negative impact on the use of ICT. They also noticed that users would benefit from more content in local languages, see section 4.5.

Caspary and O'Connor (2003:19) claim that one big problem in India concerning use of Internet is the lack of Internet content in local languages. n-Logue responded to this by setting up strategic alliances for local language software and content: commodity market price information, school education augmentation, agricultural services, animal husbandry, money transfer, sales of financial products, and e-governance applications (Howard et al., 2001).

We have identified a number of linkages between the two factors **Localisation** and **Language**, and the approach of sustainable development. According to the Brundtland Report (WCED, 1987), discussed in section 4.4, sustainable

development contains the key concept of needs and in particular the essential needs of the worlds poor to which overriding priority should be given. Hence, sustainable development can be interpreted as a change that emanates out from a need or demand. Perdan (2004) expresses this as the principle of equity where equity focuses on imbalance in power; power in the meaning of who can access, use and manage resources. We consider this also to be a matter of language and by that it can be applied to the content of ICT-mediated information.

The Report also stresses the idea of limitations imposed on the technology and the social organisations. Hence it is a matter of needs versus limitations or advantages versus disadvantages. Concerning ICT we believe that we have to take some disadvantages like localisation of content to reach out to local people. The assessments of advantages and disadvantages must be done on a life cycle basis (Perdan, 2004), which makes the disadvantages of localisation overshadowed by the advantages of reaching out to the local people.

As stated before poverty can be defined as lack of access to social services and the inability to participate in society (Maxwell, 1999). We will add that not being able to understand the spoken or written language is also a matter of poverty. This could be achieved with ICT if the service is provided in local language with a relevant content. At the WSSD 2002 the linkages between poverty, environment and the use of resources was particularly emphasised expressed as the three pillars of economic growth, ecological balance and social progress. We believe that concerning ICT it is important to adapt the content to the local needs including using local language in order to reach economic growth and social progress. The adapted content can for instance be used for distance education and life-long learning (Cearbhaill, 1998). This is in line with Mursu (2002) as she declares that 'eco-development' of an organisation and community is dependent on basic needs and self-reliance. We see that one way to meet the basic needs is through local content as well as that using the local language is one way of increasing self-reliance.

Further, local sustainable development is challenging the vision of a homogenising culture, as mentioned in section 4.4. One way to reach local development concerning ICT can be through local content, such as community based information. This view is in line with Chambers (1983, 1997) and Woodhouse (2000). Furthermore, Redclift and Sage (1995) argue that if sustainable development is to mean anything it must be translated into local

action. Applying this on the centre-periphery terminology a geographical peripheral area must not be considered peripheral in a content sense. This can be applied to ICT as content must concern local issues and be written in local languages if people are to be able to interact and communicate with each other. Additionally, Woodhouse (2000) claims that development cannot be sustainable unless it works with rather than against cultural traditions. We believe this is a further argument for local content and local language.

About the diffusion of innovation process it is said to be enhanced if the innovation is perceived as being consistent with the existing values, past experience, and needs of potential adopters, then the innovation is compatible to a high degree (Rogers, 2003), section 4.2. It is not only the sustainable development which is promoted if cultural traditions are taken into consideration. The above lines highlight that the technology must also work with, rather than against, cultural traditions.

Sustainable development is also about intergenerational equity in the meaning of passing a cultural capital (Perdan, 2004) like a local language further to coming generations. It is matter of sustaining improvements over time and ensuring what we do today will not deprive the future. We must not close down options for coming generations by making irreversible changes, including elimination of a local language. The principle of maximising future choices is by making a considered judgment as to what are the most central, significant or important things to preserve (Perdan, 2004).

Concerning content and IS development Mursu (2002) argues that understanding the user community is the most important task. Walsham (2000) states that most IS research assume that the results are universal and disregards societal issues. Sustainable development imposes new responsibilities on the expert recognising that practical interpretation of sustainable development depends on the context. Therefore it is necessary to involve non-experts in a participative open-decision process (Mitchell et al, 2004).

Sustainable technology is defined by four paragraphs including that technology is usable and useful (Mursu, 2002). We find this including the content of information. Oyomno (1996) finds sustainable technology to be dependent on three main variables including the level of demand, which in itself is dependent upon the extent to which the applications are critical to the proper functioning

of the organisation. The second variable is appropriateness, meaning acceptability, adoption and institutionalisation. Appropriateness includes cost-effectiveness, affordability as well as simplicity, flexibility, maintainability and robustness. The third variable is local technology capacity, implying the technology not to be too expensive or too sophisticated to be supported and maintained on local resources. We see all these three variables connected to the factors **Localisation** and **Language**.

One of the key concepts in transfer of technology is adaptation, see section 4.2, and mutual adaptation implies adapting the technology to accept local skills and materials inputs (Gilbert, 1992:406). In diffusion of innovations the adopting process is enhanced if the adopters can participate actively in customising and shaping the innovation. The processes adaptation of the technology and adoption of an innovation have clear linkages to the factors **Localisation** and **Language** as both processes are enhanced if considerations are taken to local content as well as to local language.

To develop appropriate local content in the local language several factors within the SOCIAL ENVIRONMENT and TEAMWORK are crucial, section 5.1.2. For instance the factor **Local Mobilisation** [S.1.1] which emphasises the involvement of the local community where the poor as well as the authorities should be involved. **Identifying the Needs**, [S.1.3] another factor within SOCIAL ENVIRONMENT, stresses the analysis of the local area and the users demand and to attain this participation is needed, **Participation** [S.3.1] is a factor within TEAMWORK.

As discussed above and in section 4.1 as well, development must start from its own prerequisites (de Vylder, 2002). We believe development of content must have the same premise. It must not become a matter of blueprint imitating its Western origin in line with the modernisation paradigm resulting in some "…digitized, Westernized irrelevance" (Wilson & Heeks, 2000). It should be more in line with the multiplicity paradigm advocating alternative solutions and another way emanating from local needs and demands with a participatory approach, as discussed in section 4.1.3. The content must be defined within the community (Järvelä & Kuvaja, 2001) involving integration of local knowledge (Esteva & Prakash, 1998). This is also in line with Chambers (1997) and Freire (1970; 1974) thinking of putting the local people first letting them analyse their local , complex and diverse reality ending up in expressing their own needs.

As discussed above as well as in section 4.1.4, the main potential area for ICT is as a tool for information and communication, according to Wilson and Heeks (2000). This implies five different roles for local people and community as receiver, provider, producer, mediator and intermediator of data and information. Further, the problem concerning asymmetric information (de Vylder, 2002) is relevant in developing countries where there is a need for relevant data and information. Wilson and Heeks (2000) have noticed that there is a lack of proximity between source and poor people as recipients. Hence, producing their own content will diminish the risk of asymmetric information. This is in line with Ngwainmbi (1995) and she asks for a focus on local applications for ICT.

The discussion above can also be related to the infological equation of Langefors (1978:249), discussed in section 4.3, where he states that "The importance …is to make it clear that the data used to present a message to human beings must be designed with a view to suiting their semantic background…". Hence, there is dependence between information and the interpreter and her prior knowledge, frame of reference and perspective. This statement has fundamental consequences for the understanding of the information process (Lundeberg, 2001).

Referring back to our view on an information system in section 4.3 establishing that an information system has a socio-economic objective, socio-economic content should be considered as a relevant content in the information system. This is in line with the participatory approach in the Scandinavian school arguing that systems development within IS should be a 'people' development (Høyer, 2003), as discussed in section 4.3. This can also be related to the two missions for the field of IS, in accordance with Markus (2000), see section 4.3. The first mission is concerned with value and without use there will be no value. And usage is closely related to a relevant content and user involvement (e.g. Standish Group, 1994; Barki et al., 1993; Cule et al., 2000; Lyytinen & Hirschheim, 1987).

In table 5.5 the complete presentation of the subcategories, factors and the indications is presented.

Table 5.5. The category CONTENT CAPITAL and its subcategories, factors and indications.

CONTENT CAPITAL		
SUBCATEGORY	FACTOR	INDICATION (BY EXAMPLE)
C.1 CONTENT	**C.1.1** **Localisation**	a. (+) "...introduce an interactive web site that can be accessed by users themselves, so they can publish their *own* content."[1:25] b. (+) "…users would benefit from more content in *local* languages."[1:26] c. (+) "...a common feature of success from a technology point of view was the development of locally tailored software or the creation of *local content*"[1:27] d. (+) "Developing useful *local content*"[2:28]
C.2 FORM	**C.2.1** **Language**	a. (+) "…users would benefit from more content in local *languages*."[1:26] b. (-) "For the projects involving the Internet, an issue is the lack of information available in local *language*."[1:25] c. (-) "To date, use of the Internet in many regions of India is inhibited, inter alias, by the dearth of Internet content in way of the 15 national languages."[2:19] d. (+) "…a greater need for information in the local *language*."[4:145]

5.2. Re-Classification of Software, Documentation, Content, and Form

This discussion is a result and a refinement of parts of the previous presented analysis. It started from that we identified data which could not be satisfactory classified into any of the five presented tables, the five capitals. We will also in this section highlight and discuss the two previously introduced subcategories CONTENT (C.1) and FORM (C.2) including their factors, as well as the two factors **Software** (P.2.2) and **Documentation** (P.2.3).

We find that CONTENT CAPITAL, section 5.1.5, is not referred to at the same level as the other capitals, as the categories HUMAN, SOCIAL, FINANCIAL, and PHYSICAL all refer to an overall level in society. On the contrary, CONTENT refers to a particular part in society as it can be seen as an effect of the development of software and it can be viewed as *immaterial*. Immaterial capital has not been mentioned in any of the reviewed data sources but in the present section we argue of that it is highly appropriate to talk about

this as in its own category, namely IMMATERIAL CAPITAL. The new category IMMATERIAL CAPITAL can be described to represent things which can not be 'touched' upon and has to do with information mediated by ICT or with information mediated by documentation important in handling ICT.

We stress that the above description of CONTENT CAPITAL, with an information focus, can be used as a definition for IMMATERIAL CAPITAL. The description is highly relevant for the earlier identified subcategories CONTENT (unchanged definition) and FORM (unchanged definition) with its factors **Localisation** (which we here will break down into four factors) and **Language** (unchanged with the same indications as earlier). The two factors within the subcategory TECHNOLOGY, **Software** (here defined as a subcategory), and **Documentation** (also defined as a subcategory) are also significant within IMMATERIAL CAPITAL.

In the refinement of the framework we have recognised differences within the concept of Software. It can be divided representing one aspect of technology: software which are necessary to make the technology run at all (esp. Operating System Software). On the other hand, there are more application-specific software (Locally Tailored Software; see Batchelor et al. , 2003:27, 29). They are placed separately in two capitals, IMMATERIAL CAPITAL, and PHYSICAL CAPITAL. In IMMATERIAL CAPITAL, SOFTWARE is a subcategory with the factor **Locally Tailored Software**, while in PHYSICAL CAPITAL it is still a factor under the subcategory TECHNOLOGY, but now called **Operating System Software**. Relevant documentation is needed describing/clarifying the software, whether **Locally Tailored Software** or **Operating System Software**. DOCUMENTATION is a subcategory of IMMATERIAL CAPITAL consisting of two factors, **User Manuals** and **Technical Documentation**. While documentation describing hardware and hardware-related software fits under the factor **HW & OS Documentation** within the subcategory TECHNOLOGY in PHYSICAL CAPITAL.

CONTENT CAPITAL is previously defined, section 5.1.5, to be "the information communicated by the ICT" and it is important that "the information not become out of date or irrelevant" (Batchelor et al., 2003:32). They also claim that there is a crucial distinction between information and knowledge. About information Langefors (1995) means that it can be viewed as a function of available data, previous knowledge and training together with

time, see section 4.3.1. To be able to interpret data one needs prior knowledge, a frame of reference, or perspective. If you have different frames of references or perspectives you will interpret data differently. Moreover Batchelor et al. (2003) emphasise that for information to become useful for local people organisations needs to actively manage and process information, which is understandings of topics, levels of language, choice of language, ability to select illustrations, capability to produce illustrations, but also to provide back-up when needed. The key matter is where the information is to come from if it is to be relevant for local people (Batchelor et al., 2003:32). The issue of 'information' will be further discussed below.

We have identified that the interconnecting link between **Localisation**, **Language**, **Software**, and **Documentation** is *information*, which is thoroughly discussed in section 4.1. Information has been an important component for development in developing countries, which is concluded by several authors both from developing countries and developed countries (Ngwainmbi, 1995; Fuglesang, 1972; Lerner, 1958; Rostow, 1960). Development can be described as a continuous process which demands adequate information in constant circulation between politicians, decision-makers, project leaders, and receivers. Improvements in society which can be effects from better information and communication are for example political awareness and engagement, increasing equality, better public health, and diminished famine (Ngwainmbi, 1995).

Further, ICT can be seen as an information processing technology (Wilson & Heeks, 2000), and it is crucial that the information is relevant in both a quantitative as well as a qualitative aspect; this was also discussed in section 5.1 regarding the factors **Localisation** and **Language.** There must be enough information (from the users' perspective), the quantitative aspect, as well as relevant information (from the users' perspective), the qualitative aspect. As discussed in section 4.1.4 many poor people get their information from informal information systems and the information from such systems can be both incomplete and inaccurate, which in turn implies that poor people do not reach enough information and not enough relevant information. This problem is similar to the previously mentioned phenomenon of 'asymmetric information'.

According to Wilson and Heeks (2000) the absence of relevant information is due to the inability of poor people to voice their demand. Furthermore, the

provision of information is often driven by the objectives of the source rather than the needs of the recipient. This can be explained by issues as we discussed in section 4.2. From a technology transfer point of view ICT in developing countries can be seen as equivalent with aid assistance of international organisations and a mentioned problem is that it more often serves the donor interests with little attention to the receivers (Odedra-Straub, 1995).

The lack of dialogue between developers of ICT and users of ICT can in most cases be viewed as a one-way communication and to counteract with this there must be a focus on the 'micro-level' (Fuglesang, 1973). Poor communities produce their own information and knowledge and in this process ICT can play a positive role by allowing the information and knowledge to be more widely disseminated. ICT can be used to transfer information from poor communities to donor organisations, NGO and governmental organisations. ICT can above all be used to transfer information between people and communities (Wilson & Heeks, 2000).

Worth mentioning is that it is not self evident beneficial to use ICT for mediating relevant information to poor people. It is also of importance to listen to people and to take part of their collected knowledge concerning traditional ways of mediating information. In other words, it is essential to consult local people in order to be able to choose the most efficient means to mediate information, whether it is by electronic means or the 'traditional' way (Ngwainmbi, 1995). Innovative models can involve mix-and-match technologies for example the use of AM Radio to broadcast information downloaded from the Internet, as discussed in section 4.5.2 and 5.1.4.

5.2.1 Category IMMATERIAL CAPITAL

Within IMMATERIAL CAPITAL we have identified nine factors belonging to the four subcategories, see figure 5.6. The factors are: **Externally Produced Information**, **Externally Adapted Information**, **Locally Adapted Information**, **Locally Developed Information**, **Language**, **Universal Access**, **Locally Tailored Software**, **User Manual**, and **Technical Documentation**. Below we will describe each factor based on the examples we treat as indications. The indications also verify the refinement of the factors and subcategories. A complete classification of all subcategories, factors and indications are presented in the end of this section, table 5.6.

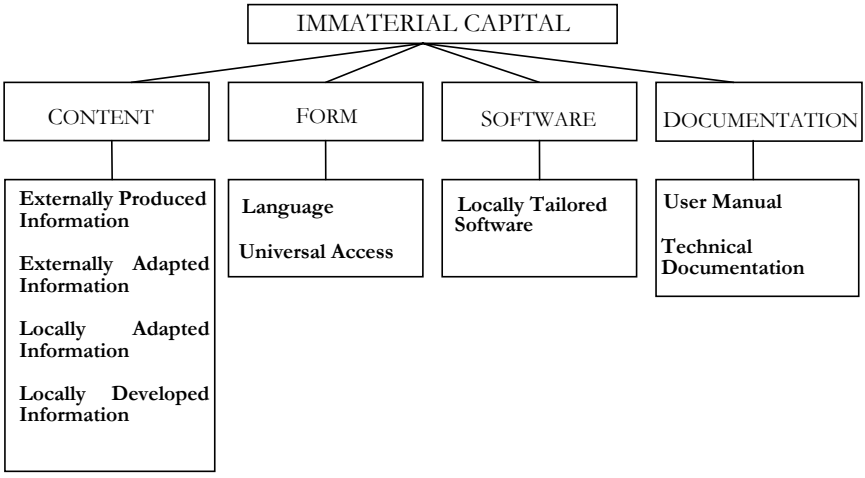

Figure 5.6. The category IMMATERIAL CAPITAL and its subcategories and factors

The selected parts from the previous analysis, which we treat here as subcategories, are:

- CONTENT (previously both a capital and a subcategory within CONTENT CAPITAL) is the product of the presented *information*
- FORM (previously a subcategory within CONTENT CAPITAL) represents in what way the *information* is presented.
- SOFTWARE (also a factor belonging to TECHNOLOGY within PHYSICAL CAPITAL) enables technology to present *information*.
- DOCUMENTATION (also a factor belonging to TECHNOLOGY within PHYSICAL CAPITAL) is *information* that helps the user to handle and manage the Technology correct.

The substance 'information' can be considered to be different regarding a number of aspects. 'Information' can be adapted externally or locally and it can as well be developed locally with local information. We have not found any other study pointing to that these aspects can be significant factors influencing the use of ICT. On the other hand Batchelor et al. (2003), Caspary and O'Connor (2003), as well as we in our pre-study gave examples of information needing to be locally adapted or locally developed. Adaptation is recognised by us to be one of the key concepts within technology transfer and we put forward that the adaptation to local conditions influences how successful the adoption of the technology will be, see section 4.2.1. It must be exceedingly important to

make a distinction between where the information is further developed and where it originates from and a classification can emphasise these aspects.

Therefore a clear distinction according to the above statement is performed emphasising where the information is developed and where it is originating from. The factors below are derived from the already identified factor **Localisation** (previously C.1.1, within the subcategory CONTENT previously C.1, section 5.1.5.) and are based on its indications. A brief introduction to each factor is held below, followed by a deeper description.

- **Externally Produced Information** [I.1.1] is information produced for one country/part of the world, can for instance be news broadcast produced by BBC News in Great Britain.
- **Externally Adapted Information** [I.1.2] is information externally developed and/or produced; the information is adapted externally to fit a target group in another country/part of the world.
- **Locally Adapted Information** [I.1.3] is information externally developed and/or produced; the information is locally adapted to fit a target group.
- **Locally Developed Information** [I.1.4] is information locally developed where the origin of the information is also local.

The factors belong to the subcategory CONTENT [I.1] within IMMATERIAL CAPITAL. Batchelor et al. (2003:25) stated that there was a shortage of local content in local language and those aspects together constituted the base in the content issue. Here we treat CONTENT and the belonging factors dealing with information separate from **Language** as **Language** is a factor together with **Universal Access** [I.2.2] within the subcategory FORM [I.2].
The first factor within the subcategory CONTENT is **Externally Produced Information** [I.1.1]. This factor is not particularly indicated in the data sources, but we argue in the same way as we do in the introduction to the category PHYSICAL CAPITAL, section 5.1.4. In section 5.1.4 we claim that buildings are an issue to consider when discussing ICT without finding any factors or indications. This discussion did not result in any factor pointing to the importance of the localisation of buildings as only substantiated factors were included. In this section we go the whole way and we identify all possible important factors.

Wilson and Heeks (2000:416) discuss about externally produced information when they claim that "The web…provides the information thirsty poor with a flood of 'noise': digitised, westernised irrelevance". This quotation highlights what we think is crucial to consider about the factor **Externally Produced Information**, that the information is produced for the home market in developed countries and has no information value for local people in developing countries.

The second factor is **Externally Adapted Information** [I.1.2]. Batchelor et al. (2003) and we stress this matter in our pre-study. Batchelor et al. (2003) mean that that users would benefit from more content in local languages [I.1.2-a] (previously C.1.1-b). This is one positive indication. One negative indication is when they put forward that in projects using the Internet a problem is the lack of information in local language [I.1.2-b] (previously C.1.1-a). We conclude that there is a greater need for information in local language [I.1.2-c] (previously C.2.1-d). By emphasising the expressed 'local' perspective in the examples they can be used as indications for the factor **Externally Adapted Information**. Information can be adapted externally to fit local circumstances. We discussed this in SOCIAL CAPITAL, section 5.1.2, both regarding the factor **Identifying Needs** [S.1.3] and the factor **Local Mobilisation** [S.1.1]. Identifying needs is a prerequisite for adapting the technology and for example the language chosen for the information affects how and if local people can assimilate the information. To attain a successful process of identifying needs local mobilisation can support this course of action. In section 4.2.1 a wider perspective is taken where we claim that the adaptation of a technology influences to what degree the technology will be adopted.

The third factor is **Locally Adapted Information** [I.1.3]. This factor is not particularly indicated in the data sources, but here we argue in the same way as we do about the factor **Externally Produced Information** above, that we consider issues without finding any factors or indications in the data sources. Further that we go the whole way as we identify all possible important factors. One possible indication for **Locally Adapted Information** can be when Batchelor et al. (2003) claim that a common feature of success is the development of locally tailored software [I.1.3-a] (previously C.1.1-c). A prerequisite for treating this as a positive indication is that software can be interpreted as information. Otherwise the factor is not substantiated.

'Information' is after all the most important capital in the ICT-discussion, as pointed out above.

The fourth factor is **Locally Developed Information** [I.1.4] and this was expressed in the examples from Batchelor et al. (2003), and Caspary and O'Connor (2003). One positive indication is the one from Caspary and O'Conner when they mean that it is important to develop local content [I.1.4-c] (previously C.1.1-d). Two other positive indications pointed to the creation of locally tailored software and appropriate content contributed to the success of the ICT activity [I.1.3-a] (previously C.1.1-c) as well as an introduction of an interactive web site that can be accessed by users themselves so they can publish their own content [I.1.3-b] (previously C.1.1-a).

The two factors **Locally Adapted Information** and **Locally Developed Information** emphasise the development of information locally whether the information originates locally or not. To have people participate in the development process is necessary aiming at identifying local needs. **Participation** [S.3.1] is a factor; section 5.1.2, which highlights the user involvement as well as development of ICT applications together with the user are essential aspects to consider in TEAM WORK [S.3], teamwork is one subcategory in the SOCIAL CAPITAL. But also for the involvement of the community is important, see above where we also discuss about the factor **Local Mobilisation** [S.1.1] and section 5.1.2.

Considering that people must be active in the development process of the information important regarding the factors **Locally Adapted Information** and **Locally Developed Information**, than a deeper reflection make it clear that education, both basic and ICT, and training is needed, as well as intermediaries for the users. Factors dealing with education, training, and intermediaries are found under the three subcategories KNOWLEDGE [H.2], SKILL [H.3], and USER ASSISTANCE [H.4] in section 5.1.1.

The second subcategory within IMMATERIAL CAPITAL is FORM [I.2]. FORM is identified by us in the previous section, CONTENT CAPITAL; here it represents the factors **Language** [I.2.1] and **Universal Access** [I.2.2]. Language and its indications are discussed in section 5.1.5, for this section see the indications [I.2.1-a] to [I.2.1-d], (previously C.2.1-a to C.2.1-d). **Universal Access** is presented here since it is a new factor. We recognised it as an

important factor from a statement from Caspary and O'Connor (2003) we treat this argument as a positive indication, they mean that local communities need to be involved in the design of universal access programmes by participating in decisions about particular information access outlets [I.2.2-c] (previously S.1.1-e). We observed two other indications highlighting **Universal Access**, new for the analysis. Batchelor et al. (2003) discuss that the use of symbols helped to make the information available in a more appropriate format [I.2.2-a] and that illiteracy partly was overcome by the use of icons [I.2.2-b]. We use those examples as positive indications on **Universal Access**. **Universal Access** can imply that a great part of the population in the developing countries can assimilate information. A fact is that in developing countries the majority is illiterate (this was for instance the case in Zambia where we performed our pre-study), see also the discussion under the factors **Basic education** [H.2.1] and **ICT education** [H.2.2], section 5.1.1.

The third subcategory is SOFTWARE [I.3]. **Software** P.2.2, was introduced as a factor within the subcategory TECHNOLOGY in the PHYSICAL CAPITAL, section 5.1.4, but here, in IMMATERIAL CAPITAL, we focus on the "local" aspect. SOFTWARE in the present capital has a new factor, **Locally Tailored Software** [I.3.1]. **Locally Tailored Software** was identified by Batchelor et al. (2003) to be one of the factors that helped the ICT activity to be successful. A positive indication from Batchelor et al. (2003) runs "…a common feature of success from a technology point of view was the development of locally tailored software…" [I.3.1-a] (also P.2.2-a). Two other indications stress **Locally Tailored Software**. First is the costs for software licenses in developing countries cannot be of industrialised countries dimensions [I.3.1-b] (also P.2.2-d). This was identified in the pre-study (Wicander & Sundén, 2004). Second is that simplicity is important and that simple design and implementation have proven to be useful on a long-term basis [I.3.1-c] according to Mursu (2002:294; this holds also for P.2.2-c).

The fourth subcategory within IMMATERIAL CAPITAL is DOCUMENTATION [I.4] (it was presented as factor [P.2.3] within the subcategory TECHNOLOGY in the PHYSICAL CAPITAL, section 5.1.4). Documentation is here classified by only focusing on the information and it cannot represent physical aspects such as paper. Here it is a subcategory with two new factors, **User Manual** [I.4.1] and **Technical Documentation** [I.4.2]. The distinction between the factors is that **User Manual** is information produced for the user

and **Technical Documentation** is information produced for the technical staff and this information is important for maintenance and support of the ICT. We have used the same examples as in section 5.1.4, except for P.2.3-a as it refers to 'manuals' which could substantiate both factors but is left out in the present table since it does not clarify the distinction between [I.4.1] and [I.4.2].

An example for the first factor, **User Manual**, is Mursu's (2002) argumentation when she claims that a good documentation of the technical aspect as well as users manual must be done [I.4.1-a] (also P.2.3-b). This is a positive indication. Another positive indication is the one for **Technical Documentation** where she means that proper documentation of program allows for continuity, ease of maintenance even when the original developers are no being available [I.4.2-b] (also P.2.3-d). A negative indication is when she claims that insufficient technical documentation can seriously affect support capabilities [I.4.2-a] (also P.2.3-c).

Below in table 5.6, a complete presentation of the subcategories, factors, and indications is conducted.

Table 5.6. The 'new' category IMMATERIAL CAPITAL and its subcategories, factors, and indications

'NEW' Category IMMATERIAL CAPITAL		
SUBCATEGORY	FACTOR	INDICATION (BY EXAMPLE)
I.1 (C.1) CONTENT	**I.1.1** **Externally Produced Information**	
	I.1.2 **Externally Adapted Information**	a. (+) …users would benefit from more content in *local* languages."[1:26] b. (-) "For the projects involving the Internet, an issue is the lack of information available in *local* language."[1:25] c. (+) "...a greater need for information in the *local* language"[4:145]
	I.1.3 **Locally Adapted information**	a. (+) "...a common feature of success from a technology point of view was the development of *locally tailored* software..."[1:27]
	I.1.4 **Locally Developed**	a. (+) "...a common feature of success from a technology point of view was ...

	Information	*creation of local content*"[1:27] b. (+) "...introduce an interactive web site that can be accessed by *users themselves*, so they can *publish their own content*."[1:25] c. (+) "Developing useful *local content*"[2:28]
I.2 (C.2) FORM	**I.2.1 (C.2.1)** **Language**	a. (+) …users would benefit from more content in local *languages*."[1:26] b. (-) "For the projects involving the Internet, an issue is the lack of information available in local *language*."[1:25] c. (-) "…one big problem in India concerning the use of Internet is the lack of Internet content in the 15 national *languages*."[2:19] d. (+) "…a greater need for information in the local *language*."[4:145]
	I.2.2 **Universal Access**	a. (+) "Another issue is *illiteracy*...the use of symbols to make the GIS information available in a more appropriate format"[1:25] b. (+) "*Illiteracy*...partly overcome by use of icons"[1:26] c.(+) ""Local communities need to be involved in the design of *universal access* programmes by participating in decisions about particular information access outlets" [2:29]
I.3 (P.2.2) SOFTWARE	**I.3.1** **Locally Tailored Software**	a. (+) "...a common feature of success from a technology point of view was the development of locally tailored *software* or the creation of local content."[1:27] b. (+) "Simplicity: *systems* that are simple in design and implementation have proven to used for a long-term basis" [3:294] c. (-) "The costs for *software* licenses cannot be of Western dimensions"[4:145]
I.4 (P.2.3) DOCUMENTATION	**I.4.1** **User Manual** **I.4.2** **Technical Documentation**	a. (+) "Documentation: A good documentation of the technical aspect as well as *user's manual* must be done."[3:295] b. (-) "Documentation: insufficient *technical documentation* can seriously affect *support* capabilities."[3:295] c. (+) "Proper *documentation* of programs: proper *documentation* of program allows for continuity, ease of *maintenance* even when the original developers are no being available"[3:295]

5.3. Summary of the Analysis

In this section we will summarise the findings of the analysis. One of the main findings is the 'new' IMMATERIAL CAPITAL, which developed from data which not satisfactorily could be classified into the existing five capitals. We start the summary with the HUMAN CAPITAL and continue with the SOCIAL CAPITAL, FINANCIAL CAPITAL, PHYSICAL CAPITAL, and finally the IMMATERIAL CAPITAL. We present the five capitals below together with the belonging factors. In total we identified 41 factors which all together represent a wide spectrum of life.

Within HUMAN CAPITAL we identified nine factors where six of the factors were about education and training. Education and training in various forms are essential for the use of ICT. One factor tells that an intermediary person could increase the ICT use, whilst another factor emphasised that self esteem influenced the use of ICT. Another factor stressed the importance of social power and how this could affect the use of ICT.

SOCIAL CAPITAL included twelve factors where a majority of the factors were about social environment. Social environment is crucial as it consist of social resources which can influence the use of ICT. One factor emphasises the mobilisation of the community in support, planning, and execution of an ICT project. An additional factor highlights the importance of identifying and analysing the needs of the local area as well as of the users.

The category FINANCIAL CAPITAL, consisted of five factors which all are crucial for the ICT use, the factors vary from funding of the ICT investment to the purchasing power of the users. One factor show that the possibility to get credit influences the possibility to finance an ICT activity, another factor stresses the logistic of bill collection and how this positively influence the viability of an ICT activity.

Further, in PHYSICAL CAPITAL we recognised six factors; they were all about infrastructure and technology. The factors belonging to infrastructure point to that well functioning electricity, telecom network, and transport network can increase the ICT use. The factors belonging to technology emphasise the importance of the choice of hardware, software, and relevant documentation.

Finally, within IMMATERIAL CAPITAL we identified nine factors. One factor stresses that information in local language is a key issue for enhanced ICT use. The 'local' perspective is also an argument for adapting information externally to fit local conditions. Two other factors indicate the importance of adapting information locally as well as developing the information locally to fit local conditions factor emphasises that software locally tailored can increase the ICT use. Also good documentation, such as user's manuals and technical documentation can promote ICT use. Another factor presents that the use of icons and symbols can be a help in understanding the information and actually it can affect the use of ICT as new user groups can be reached, for instance illiterate.

Below in figure 5.7 we have listed the factors below each subcategory and put the subcategories under their capitals.

At last some words about what could be called 'forgotten factors'. As mentioned previously, critical factors imply necessary but not with certainty sufficient factors. In other works other factors are mentioned that are not included in the data sources for this study e.g. factors concerning security matters corruption, network externalities, buildings in the meaning of the habit to visit a certain building, hardware in the meaning of keyboard e.g. an adapted keyboard to the local language. The framework seems, however, capable of admitting additions without any further substantial classification.

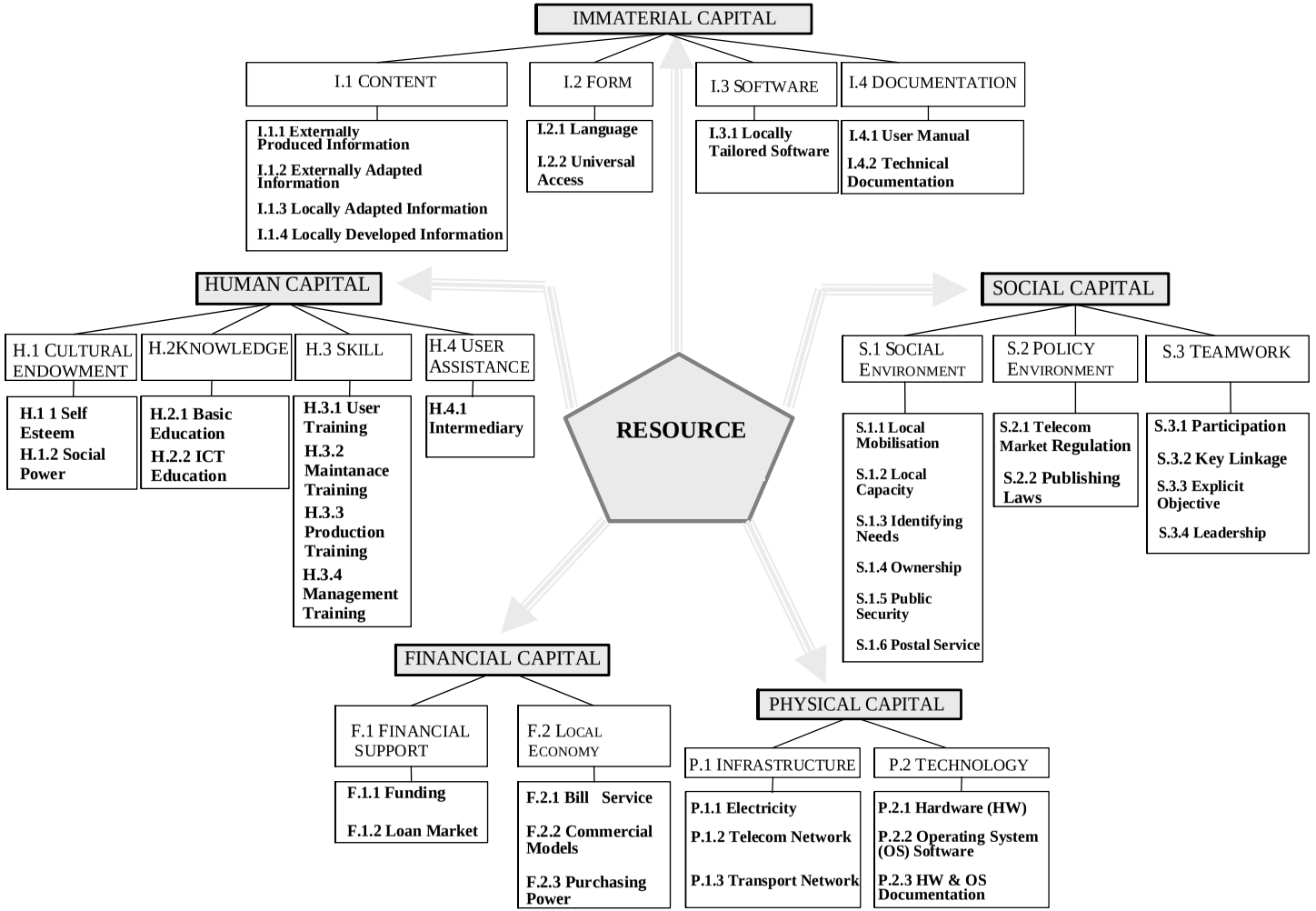

Figure 5.7. The Sustainable ICT Framework with its 5 capitals, 15 subcategories, and 41 factors.

6. Contributions and Further Research

In this chapter we will start with a short review of the given background to our research area as we want to recap on the research problem as well as on the aim and the research questions. Further, this chapter will describe our contributions as well as what implications the study will have both practically and theoretically. Hence, the purpose of chapter 6 is to reflect and discuss about if the research questions are answered, if the title of the thesis is correct, if the aim is reached, and how the two research questions have been answered.

6.1. Background in short

The point of departure for our research is that ICT is considered to be a tool with which to achieve development goals in developing countries. The expectations of ICT for socio-economic and human development have been high, but the real benefits and the positive impacts have been somewhat disappointing. The failure rate is high due to several barriers for implementing ICT in developing countries (Heeks, 2002). The rate of failure is connected to the local context and, according to e.g. Avgerou (2001), there is a need to discuss ICT contextually. Keniston (2002) claims that one reason for failures in developing countries projects are that ICT developers know almost nothing about factors that influence the success of ICT projects. So, unfortunately, many of the ICT projects have not been successful to date, and indeed there are many examples of failure or partial failure.

In accordance with this discussion and argumentation we identified the research problem for our thesis to be *failed ICT projects in developing countries*. Further, several authors state that there are few comprehensive studies concerning ICT in rural areas in developing countries (Waema, 1996; Keniston, 2002; Mayanja, 2003). To tackle the depicted problem a tool for studying use of ICT is desirable. There is also a significant need for analysing the underlying factors of failure. Hence, the aim of this work was to *develop such a tool that can support the understanding of the conditions for sustainable, i.e. successful, ICT projects in developing countries*. We believe that such an analysis is needed both in research and in practical implementation work. To reach the aim we had to answer the following questions:

- *Which are the critical factors influencing sustainable ICT use in developing countries?*
- *How would a framework be structured to properly include these factors in order to support analyses of sustainable ICT use?*

Our thesis can be described as multidisciplinary as it cuts across several academic research fields. Hence, four different theory fields were represented and together they constituted our theoretical foundation: *development theories, diffusion of innovations* and *technology transfer theories, information systems theories,* and *sustainability theories*. As argued in the introduction to chapter 4 a broad perspective is important in a holistic view and this is in line with our research approach inspired by the systems research approach.

For analysis of the identified factors we used an existing framework, the Sustainability Livelihood Framework from Ashley and Carney (1999) and further developed by Batchelor and Norrish (2002). The original framework has its origin in capital assets for livelihood and was adapted to ICT by Batchelor and Norrish (2002) through changing one of the capital assets, Natural capital, into Content capital. Our analysis could also be considered as a test and a verification of the framework. During our analysis we stated that the framework needed refinement to better suit its purpose.

6.2. Contributions

Our scientific contribution could be regarded as qualitative, mainly descriptive and partly explanatory. Further the contribution could be stated by the answers of the two research questions.

The answer to the first research question, *Which are the critical factors influencing sustainable ICT use in developing countries?* constitutes of *forty-one* factors as seen in figure 6.2 (in the figure the categories are displayed together with their factors) identified within fifteen sub-categories. For identification of the factors we have used four data sources: our own pre-study, presented in chapter 3, and three ICT studies presented in chapter 4, viz. Batchelor et al. (2003), Caspary and O'Connor (2003), and Mursu (2002). The identification phase was followed by a verification and analysing phase and during this phase the four theory fields contributed with a broaden perspective on the identified factors. That is, we recognised connections between the factors identified in the empirical studies and the theory fields mentioned above. Further we refined some of the identified factors by re-naming them making them more distinct and exact.

Some of the identified factors are of a general character applicable in all contexts while others are more specific to the context of our research interest, rural areas in developing countries. As well are some of the identified factors applicable on a national level or on a local level, while others are related to a group or an individual level.

The answer to the second research question *How would a framework be structured to properly include these factors in order to support analyses of sustainable ICT use?* constitutes of a tested and further developed framework from Batchelor and Norrish (2002). We refined the framework by adding one more level, a subcategory level, for making the categorisation of factors more precise. Introducing a subcategory level also facilitates a practical use of the framework.

We noticed some further weaknesses within the framework of Batchelor and Norrish and we suggested an alteration concerning one of the main categories. As we regarded the category 'Content capital' not to be appropriate it was changed to 'Immaterial capital'. Included in this change was a re-classification of two sub-categories as well as of two factors. The re-classification started out from an observation that we could not classify satisfactorily identified data into the five categories known as 'capitals'. We regard this refinement of the framework to be fruitful as it makes the framework more usable for analysing factors important to sustainable ICT use.

We illustrate the refined framework below. We consider Immaterial capital to be central for sustainable ICT use and we illustrate this by putting this capital on top of the pentagon, 'crowning' the framework, as it were. Further we consider Human and Social capitals as supporting resources. Financial and Physical capitals are considered as the foundation for the other resources.

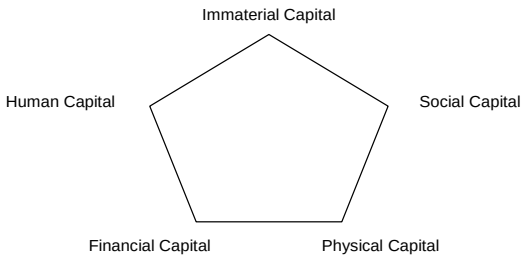

Figure 6.1. The capital assets including the IMMATERIAL CAPITAL (refined from Batchelor and Norrish, 2002:2; the origin is from Ashley and Carney, 1999:47).

Hence, the result of the analysis was so far a refined framework, but we believed that the framework was still not sufficient for a sustainability analysis of ICT use as it only focuses on one dimension, a *resource* dimension. We state it needed to be complemented with two more dimensions, a *space* and *time* dimension.

Concerning the suggested *space* dimension, the sections on theoretical foundations give an understanding for the need of a wider context of ICT projects, especially 4.1, as it goes into issues such as 'development' and 'developing countries'. We believe that if a tool is supposed to promote and support the understanding of the conditions for sustainable and successful ICT projects in developing countries, the process must start with elucidating the context for the tool. There is a need to give the framework a 'context', but when putting ICT projects into the wide perspective of 'developing countries' it is important to remember that 'developing countries' is not a uniform concept. Developing countries constitute a heterogeneous group which is important to have in mind when developing a generic framework. To make the framework usable it has to be complemented with parts that take account of a spatial dimension.

Accordingly, consideration must be taken to the local context, including the social, cultural and economic context so that research and development projects do not treat three fourths of the population as a uniform mass. The framework must not include a 'blue print' linear view; instead it must permit a start for each situation from its own prerequisites. There must be different kinds of processes in different regions including a 'bottom-up' perspective as suggested by Hettne (1990). In other words, there is a need for a contextual view of technology to be able to understand the role of ICT which applies to the framework.

Corresponding to the former discussion in section 4.4 of important issues concerning sustainability we argue that the issue of localisation must be regarded when discussing sustainable use of ICT. Some authors refer to localisation as a change on a local level where localisation takes development down to a level where it is easier to handle and where one can move from vision to practice or in other words, breaking development down into manageable pieces.

Hence we see localisation as an aspect of a space dimension. Along this dimension, we highlight localisation including local participation which is a central concept involving integration of local knowledge into the process (Esteva & Prakash, 1998). To involve the local community in the detailed planning and execution of an ICT project is important for successful ICT use as many failures of ICT projects originate from limited knowledge about the local context. Hence, communities can be seen as the central actors and the ones who should define the content (Järvelä & Kuvaja, 2001). In section 4.2 we discuss about the technology transfer and how this process can be affected positively if ICT is adapted to the local context. The mutual adaptation takes the 'adjustment' a bit further as it involves both the receiver and the sender context.

In order to reach real involvement in the local community and among the users or presumptive users a participatory approach is useful. The localisation process also demands considerations of local skills and knowledge. But at the same time it is important to remember that people might neither want to participate nor to get educated. Important in this discussion is also to note that 'local' people are not a homogeneous group.

To define what kind of information is needed is also essential in the localisation process. This approach means that decisions about ICT, from design to define relevant information, are based on local people. Careful observations of the local space will also discover marginalised people. It is important to involve different marginalised groups; e.g. women have to be involved into the process for defining their needs of information. Hence we suggest that the original framework by Batchelor and Norrish (2002) is developed with a space dimension to be able to include the matters discussed above.

Further, as mentioned previously we state the need for a *time* dimension. Concerning a time dimension the discussion in section 4.1 puts ICT projects into a wider perspective as a matter of development and it also illuminate that 'development' is a relative concept including differences in time scale. A time dimension should include that the needed time for implementation of a project varies considerably in different contexts.

There is also a relation between the time and space dimensions as the time concept is a relative concept and by that culturally conditioned. The approach

to time is contextually dependent and this gives that a time dimension should include a space perspective, that is, different cultural views on time frames and speed of change and also different ways to treat time. A further thought concerning the time dimension is that it should include that respect must be shown that there is still a dependency on colonial structures.

We consider that both the space and time dimension could be 'broken down' into factors. Maybe all resource factors in fact could be considered to have both a space and a time dimension and by that could each factor be analysed having this in mind?

As discussed in section 4.4 a time dimension can be regarded as included in the sustainability concept. Sustainability implies change and improvement over time and that this improvement will continue for a long time. Sustainability also implies balance in change and the importance of avoiding disequilibrium which we consider should be relevant concerning time perspective. Time is also crucial in diffusion of innovations as we discussed in section 4.2, that is that the time period between a technology become available and to it is widely adopted is often long. The diffusion process is dependent on many important factors such as the compatibility with values, beliefs, and past experiences of individuals in the social system. Then it becomes obvious that the introduction and support of ICT in developing countries should be performed over a longer time period. Too often the situation is that ICT projects are financed for a short time frame with a desire of quick implementation. One way to overcome this is that the introduction of ICT could be performed step by step with small changes over a long time horizon. We consider that a time dimension in adaptation to a 'new' technology is crucial, and ICT can be viewed as 'new' in many cases in developing countries.

Connected to a time dimension is the discussion held in section 4.3 concerning the paradox of success and failure. An ICT project can be considered as a failure in a short-time perspective but as a success in a long-time perspective. This argumentation could be applied to our empirical observations mentioned in chapter 3 that the donated computers were not in use as they were put in a corner of the offices and by that token the ICT project could be considered as a failure. With this comes that perhaps it is not only negative if equipment is not used fully the first few years: in the long run, after an adoption process, it could turn into a successful project.

Hence we suggest that the original framework by Batchelor and Norrish (2002) is developed with a time dimension to be able to include these matters discussed above.

Below we present a three dimensional framework, 'The Sustainable ICT Framework'. The three dimensions are time, including a locally adapted time perspective, space including the matter of localisation, and resource including the five capital assets. In figure 6.2 the resource dimension is described by its capitals, and factors.

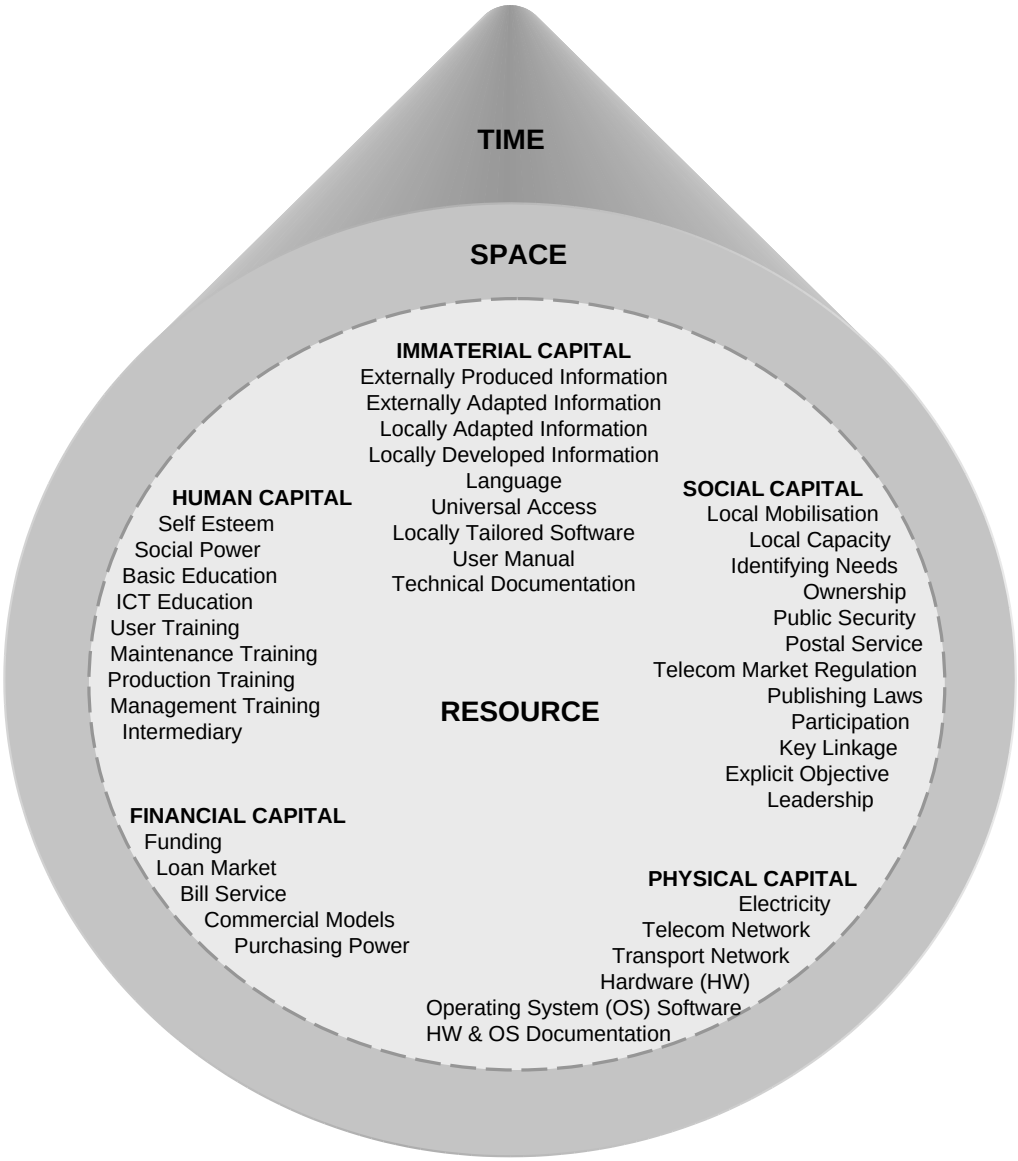

Figure 6.2. The Sustainable ICT Framework with the three dimensions

We regard also the conceptual discussions held in this thesis as a part of the contribution. The discussion has contributed with an expanded view on the dissemination process when a term becomes politically correct and/or scientifically accepted it spreads between scientific disciplines and political arenas. We have noticed this trend concerning certain terms e.g. participatory, sustainable, and gender. They have all become 'mantras' during a certain time period.

Further, the discussion held mostly in section 4.3 has contributed with a widen view on the terms 'success' and 'failure'. We regard that neither 'success' nor 'failure' are enough stringent terms to be used in scientific literature. Neither are they suitable as a measurable goal or objective for an evaluation process. The phenomena are far too complex to be measurable. Referring to the mentioned 'paradox of success and failure' we can conclude that 'there are no such things as success and failure' as a successful ICT projects can become a total failure in the long run and vice versa.

Then, what about 'sustainable' – is that a fruitful term to use? According to the discussion held in section 4.4 'sustainable' does not concern measuring a result against a fixed goal or objective, instead it concerns the process itself. However, sustainability has to be operationalised in measurable terms for planning an evaluation. Therefore, measuring along factors such as the ones we have presented is crucial.

Further, we will discuss if the title of the thesis is correct and representative to the content. Except the remarks on 'sustainable' which do not affect our title, we have thoughts concerning '…for Developing Countries in a Rural Context'. We mentioned in the final paragraph in section 4.1.2 our hesitant view to the concept 'developing countries' together with the insight about their heterogeneous composition. It would be more neutral to talk about 'low-income countries (LIC), 'middle-income countries' (MIC) and 'high-income countries' (HIC) in line with the World Bank denomination. However, we used the term 'developing countries' in this work as it is the most commonly used term.

To conclude, our contribution consists of a generic framework for analysing factors in a rural developing country context. As argued in this thesis technology is not the key resource; it is the combination and system of different

resources distributed along a time and space dimension that is the key . With our framework we have demonstrated that the ICT artefact is not the sustainability tool, it is the combination of different resources that makes it sustainable and competitive. Maybe it could be more suitable to talk about ICS –Information and Communication System – instead of ICT as ICS would highlight a systems view instead of a technology focus.

6.3. Implications

In this section we will discuss implications of our framework and answer the remaining questions raised in the first paragraph; if the aim is reached, that of developing *such a tool that can support the understanding of the conditions for sustainable, i.e. successful, ICT projects in developing countries.*

We hold that the framework, including the factors, is an important contribution which is useful for practical as well as theoretical purposes. Obviously, it addresses the research problem we mentioned in chapter 1, that of *failed ICT projects in developing countries*. We state that practically the framework can act as a tool preventing failures of ICT use in developing countries.

The list of factors can act as a guideline for planning, implementation, and evaluation of ICT projects in a rural developing country context. The identified categories and subcategories can assist in organising different factors which affect sustainable ICT use. Further the subcategories could be of help when identifying new factors.

Possible target groups for the framework are international aid and donor organisations, NGOs, policy-makers, as well as central and local administration in the recipient country. Additional target groups are consultants and managers in ICT projects. A concrete example of usage to mention is that our framework constitute an input to a Sida funded SPIDER-project aimed to develop a model for sustainable broadband market in rural areas in developing countries.

The framework will also provide a way of thinking about sustainable ICT use. The framework represents a complex reality, but it also represents a manageable possibility. The framework is also fruitful for the analysis of sustainable ICT use in developing countries as it provides three dimensions which are central in sustainable development. The framework has an analytical structure that can be used to enhance ICT use effectiveness and initiate change and improvement.

Hence the theoretical contribution is a generic framework for analysing factors in a rural developing country context that combines an existing framework with further dimensions according to sustainability theories. As discussed previously in section 4.4 sustainable development refers to development in general while sustainable technology and ICT as well as sustainable ICT use can be seen as a part of or a way to reach general sustainable development.

6.4. Further Research

In this section we will discuss our further research process. The further research will consist of two separate doctoral theses authored by Susanne Sundén and Gudrun Wicander, respectively. The contribution from the present study will be used in the intended studies as a point of departure. Our framework will function as the foundation for the research studies in the two doctoral theses. The research presented in this thesis still leaves some open questions concerning how it can be used and how the results can be applied. The findings and conclusion of this thesis have pointed out the importance of factors of immaterial capital.

Further, the doctoral theses will emanate from the common background that the present thesis constitute and will by that supplement each other giving a synergetic effect. The further research is intended to more in-depth deal with evaluation of ICT projects and activities in developing countries. We see that our framework including the identified factors could be a usable tool in an evaluation process.

Many of the ICT initiatives in developing countries have failed as stated in the introduction. Studies concerning financed and performed ICT projects and activities are therefore important in order to ensure that resources are used for intended purposes in an appropriate, secure and efficient way. To reach effective and efficient development assistance it is important to analyse the planning, implementation, follow-up, and evaluation processes. Important are as well tools and channels for the assistance and well organised processes. Hence, the question is not about *if* development assistance is relevant, instead it is a question of *how* to organise it to make it better. There is a need for a systematic process review to be able to answer this question.

We find that analyses and evaluation of ICT projects and activities could be of interest to financiers of such projects, be they governmental aid agencies or

private companies. One point of departure for such an evaluation could be a synthetic analysis of ongoing ICT activities as well as of completed ICT projects. Another point of departure could be a synthesis of the evaluations performed by an aid agency (e.g. by Sida's Secretariat for Evaluation and Internal Audit, UTV) concerning ICT projects and activities. The latter study could be regarded as a meta-evaluation and by that it could also be viewed as complementary to the evaluation performed by UTV.

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Information and Communication Technology Applied for Developing Countries in a Rural Context

Information and Communication Technology (ICT) has been considered a tool that can be used to achieve development goals in developing countries. In the same time, the majority of people living in developing countries, and especially those in rural areas lack access to ICT. Even if there have been many attempts to introduce ICT, they have in general not been long-lasting.

A framework for studying factors that influence use of ICT is desirable. We see it necessary to bring a sustainability aspect into the picture of ICT. In this work the requirement of sustainable ICT use stresses that ICT is long-lasting and that ICT meets the needs of the user. Thus, the aim of this work is *to develop a tool for conceptualisation that can support the understanding of the conditions for sustainable, and therefore successful, ICT projects in developing countries.*

A framework has evolved through the identification of factors from four empirical studies. Forty-one factors were identified and sorted into fifteen subcategories of five major capital assets. The main contribution of our study is that of a generic framework, which can be used as a guideline for planning, implementation, and evaluation of ICT projects in a rural developing country context achieving sustainable ICT. As argued in this thesis technology is not the key resource; it is the combination and system of different resources distributed along a time and space dimension that is the key. With our framework we have demonstrated that the ICT artefact is not the sustainability tool, it is the combination of different resources that makes it sustainable and competitive.

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