Preface

In 1992, I left development co-operation with the conviction that different approaches are needed to make it work. After a reasonably successful spell in strategic management, finance and technology management, I returned to development co-operation in 1999. The intriguing question for me was why do – or why don’t – developing countries take up ICT? At the International Institute for Communication and Development (IICD), I worked as lead facilitator and Country Programme Manager.¹ This prompted me to research literature and to search for comparable sector wide approaches and methods to learn from. My practical question was: how should one go about designing a process to make ICT effective for development?

IICD at that time initiated what was called the Round Table (RT) process, a participatory and multi-stakeholder approach which was generally appreciated in the targeted countries. So, my challenge became to understand the processes underlying the development and integration of technology in a society and in particular to conceptualise and evaluate the RT process as a methodology. I had an intrinsic motivation to do a Ph.D. study and this was carried out independently in my own time and at some distance from IICD. This limited the influence of organisational considerations on the research and gave a sort of ‘academic’ freedom.

An important psychological shift was that in the world of ‘consultancy and management’, the ‘what’ counts and in science the ‘why’. This inquiring attitude and skills were part of university training, but had to be actively invoked as I had worked so many years as an expert. I learned straight on from the (co)promotors that my opinion was not relevant at this stage, what counted is theory and facts on the subject. I therefore developed the following discipline in order to reduce personal biases:

- Avoid socializing with one group only, be close but remain critical and maintain a certain distance from the expatriate community;
- Build up trust, be emphatic, do not be judgemental, and be flexible; Search to understand in conversations, the influence of the position of the speaker and the relevant cultural and sub-cultural aspects;
- Coach partners and only intervene if absolutely necessary and discuss the decisions taken. It took coaching as responding to the needs and learning questions of the coached person and to stimulate reflection on their own behaviour in the context and to develop new perspectives (Caluwé & Vermaak, 2006). I tried to minimise the default in this coaching model of being at the same time programme manager. The

¹ Tanzania and Malawi and initially also as country programme manager for Burkina Faso and Mali, until the workload of developing these country programmes became too large. The author was about five times a year for 10 to 20 days in Tanzania.
The cap of programme manager implied to get the general label attached of donor and to have power due to access to expert knowledge and financial resources. I learnt quickly in 1999/2000 that playing the tune of manager means you end up by all decisions coming to you, no real interest by partners and not even a glimpse of sustainability. Coaching and partnership was far more natural as collaboration over a long period was required to come to results. Moreover, IICD is not a donor;

- Make notes, validate findings and search for alternative explanations;
- Assure inquiry into phenomena from different angles.

Dialogical reasoning requires the researcher to confront his or her own prejudices that guide the research. Prejudices are shaped by the education, social environment, ideology etc. (Gadamar, 1976). For example basic notions like the state, the ideal of development and social justice, and the phenomena of economic growth are not just 'normal'. Through previous experiences in sub-Saharan Africa, I already acknowledged the weak Weberian substance of the state and hence realized that that there should be another logic to the organisation of the state and particularly the bureaucracy. Secondly, the assumption seemed often rather erroneous that ‘development’ is a leading concept in the actions of higher level national and international civil servants. Thirdly, the ingrained Western attitude of expecting immediate or delayed remuneration based on purposeful acts, individually or as a group, based on a perspective of a growing economy, had to give way – quite often – to a perspective of stagnation like in the theory of the image of the limited good (Foster, 1965) or ‘grabbing’, or ‘caught up in the short term’ by an overload of challenges (Chabal & Daloz, 1999) or evasion as Wambu brought forward:

Wambu is a Nigerian, living in London, who traveled back to his village on request of his family, as his other brothers had other engagements. Describing a meeting in the village council on problems to be settled in his Nigerian village, he recounts “I enjoyed the meeting, the speeches and the sense of solidarity that was there. But later as I returned home, I began to worry about the things that had not been discussed…” And here he talks about the village being ‘eaten up’ by a neighbouring town. This frustrates the women as it changes the land situation. He airs the frustration of the young men without job or voice. Wambu closes with “I was overcome by a profound sadness” (p. 124). And he ends this account with “all of us in West Africa, are tasked with making real this emerging world, and building it brick by brick from the bottom up with a new story of rules, cultures and leadership” (Wambu, 2007, p. 133).

It is to this search I want to contribute to. As a development practitioner, I started more and more to enjoy this endeavour as it yielded insights for using technology far better and enabling social innovation, both in a development and a western setting. I hope you enjoy it too.
CHAPTER 1

Introduction

1.1 Aim and background of the thesis
   1.1.1 The aim of this study
   1.1.2 The terms

1.2 Societal relevance of the subject
   1.2.1 Ineffective development cooperation?

1.3 Outline of the thesis
1.1 Aim and background of the thesis

Globalisation increases mutual influencing and dependency of international and local developments. The dynamics of globalisation have intensified with Information and Communication Technology (ICT). This is illustrated by the rise of new concepts like electronic commerce in agriculture, or e-learning in education and the electronic health record in health care. For developing countries, the question is whether this technology could be designed and applied in such a way that it stimulates local development and contributes to poverty alleviation.

ICT is a main driver of change and as such has great relevance for developing countries in particular (Labelle, 2005; Mansell & When, 1998; Walsham & Sahay, 2006). However, the application of ICT in developing countries has known many failures, or partial failures (Heeks, 2002; Kimaro & Nhampossa, 2005; Krishna & Walsham, 2005; Walsham & Sahay, 2006). Although the body of literature on ICT in developing countries is growing (Walsham & Sahay, 2006), there are no or few systematic evaluations of these initiatives – their achievements, the constraints encountered, and how these were dealt with (Heeks, 2002). There are quite a number of ‘upbeat’ anecdotal stories, but they can be suspected of serving particular interests.

From the perspective of the Industrial World, it has been clear that ICT projects are prone to failure. Heeks (2002) estimated that up to 2001, only 15% to 45% of the ICT projects that were carried out can be considered successful. This dim picture is confirmed by more recent studies (Heeks, 2006). Wade (2004) took the example of multi-purpose community telecenters in rural Mexico and signalled a success rate of 20% only. Some of the problems encountered include: insufficient funding for maintenance, inadequate political interest and will and cultural constraints. Solutions indicated (by the donor) are participatory design and paying attention to sustainability issues, without further specifying ‘what’ and ‘how’. Wade (2004) blames this on the fact that the real issues are neither investigated nor addressed. Moreover, though a pilot might become successful, the challenge is to replicate or up-scale it (Braa et al. 2004; Wade, 2004). Apparently, the implementation and sustainability of ICT applications is a complex and often a messy problem.

In the OECD countries, ample means were spent on ICT. Over time, the failure rate decreased and ICT fuelled a spurt in economic development. This gives hope for developing countries (UN Millennium project, 2005). However, in developing countries, ICT draws on very scarce resources, managerial time being one of them. This problem is exacerbated by the fact that most ICT applications do not function in isolation, but are mutually linked; overall success requires some mutual adjustment and coordination.

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1 The connotation of developing countries or less developed countries (LDCs) is not a satisfactory label as it has a normative connotation. But as it is widely known, it is followed in this thesis.
Usually, this does not come about easily and needs a specific effort. Another problem is that ICT applications are often ‘captured’ by the existing organisational inadequacies and inefficiencies and do not contribute to improvement (Wade 2004, p. 201). Also the “internalization of the technology” is a point of attention, as the technology is rather novel to the local context, especially to specific domains of application like agriculture, education and health. If ICT is just a ‘donor bubble’ as Heeks (2002) fears, a window of opportunity has gone by and disillusionment has gained a foothold.

1.1.1 The aim of this study

Thus, it is relevant to study success and failure of ICT applications in developing countries and to explore appropriate approaches for designing and implementing ICT applications in such a context. In this study, we start with the development of a meaningful theoretical perspective and prospecting the methodologies applied for ICT design and implementation in developing countries. Next, the most promising method will be evaluated. The insights thus gained should contribute to theory and to the improvement of the methodology. In summary, the aim of this research is to study ways to identify, design and implement sector-wide ICT applications novel to the local context that are relevant to development and at the same time sustainable.

1.1.2 The terms

The label ‘sector-wide’ refers to ICT applications that are relevant for larger parts of a sector that need a certain level of standardisation or interoperability and in which various stakeholders are involved.

The term ‘development’ is, as a concept, hard to define. Clearly, it is not just a technical or economic process, but also a social and political process. It refers to change, to a higher level of human welfare. However, Leftwich (2000, p. 16) states: “Development is one of those essentially contested concepts whose precise definition is unlikely ever to be agreed upon”. One ‘grass roots’ definition is cited by Hounkonnou (2001, p. 200): “In the southern part of Benin, most of their villagers refer to what we call ‘development’ as ‘nunkonyiyi’, which is ‘moving forward’, from their current situation to a better one”. As defining development in a precise way is beyond the scope of this thesis, we will rely on the intuitive notion of development, or ‘moving forward’, as perceived by the users of an ICT application, both individuals and organisations. To the needs of these the ICT application has to respond.

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2 This suggests a temporary phenomena or hype; it involves a strong attention by donor leading to donor financed investments, which is not sustainable but ceases after some time.

3 *Maendeleo* is the word used for development in Swahili. It means ‘the process of making progress’ from the root of ‘kuendelea’.
'Sustainability’ refers to the capacity to endure, but the term lacks a clear consensus definition. For an ICT application it implies integration in new and existing practices and its maintenance and reproduction. Sustainable development is also about meeting the needs of today, without compromising the ability of future generations to meet their own needs. This brings in the normative element (Willis, 2005) of the ‘why’, ‘what’ and ‘how’ as inherent to development. Braa et al. (2004) perceive creating sustainability as shaping and adapting the ICT application to the local context, cultivating local learning processes, and institutionalizing routines of use that persist over time.

‘Scalability’ refers to the expansion of the socio-technological system in scope and size (Braa et al., 2007). It includes the spreading to other sites (replication or scaling out) or enlarging of the ICT application capacity (scaling up). Scalability can be further refined as extendable in functionality, the ability to do more work (load factor), to cover larger areas (geographical factor) or to serve more organizational units (administrative factor). Hence, scalability also entails an increased capacity to generate and reproduce ICT applications.

Scalability implies that potential users, other actors and the wider context in general, allow embedding of the ICT application into existing practices and at the same time, enable the development and enacting of new work practices (Miscione & Sahay, 2007).

1.2 Societal relevance of the subject

In view of the impact ICT had on economic and social life in Western countries, one might hope for ICT to offer great opportunities for developing countries. Indeed, the increased awareness of the importance of ICT as a supportive tool for development in various domains (i.e. education, health, administration) has resulted in a more proactive approach by national governments and donor agencies. The ‘Bridging the Digital Divide’ initiative and the publication of the UNDP Human Development Report 2001 ‘Making technologies work for Human Development’ have stimulated the debate. In 2002, the ‘Building Digital Opportunities’ programme, funded jointly by CIDA (Canada), DFID (UK), DGIS (the Netherlands), and SDC (Switzerland), has actively advocated specific attention for ICT for development (ICT4D). Increased attention has also been found among other development agencies in the North.

Taking the argument of a possible contribution of ICT to development one step further, it could be that ICT strongly influences social change. In technology studies, the possibly wider effect of new technologies on social practices is recognised. Sørensen (2002) states that technology may act as a catalyst for social change.
1.2.1 Ineffective development cooperation?

However, the effectiveness of ‘old ways’ of development cooperation, with a heavy reliance on external expertise, has been disappointingly limited. For example, the progress in realising the Millenium Development Goals is not encouraging. Reliance on the market and structural adjustment policies have had devastating effects on many communities and households (Willis, 2005). Also, development cooperation is very time consuming for local staff, without substantial benefits, either in influence or learning. Of indicative value is a WHO study (Dodd et al., 2007) that makes the point that hosting missions takes considerable time, illustrated by a case study in Tanzania, which shows that 20% of the district medical officer’s time is spent on hosting missions and an additional 25 staff days per quarter on report writing. Quoting The Economist (April 7th, 2007, p. 55): “The OECD reckons that, between them, 31 poor-country governments received 10,837 donor “missions” in 2005, almost one a day. Even those that explicitly asked for “quiet periods” to get on with their real work were not spared.”

While the effectiveness of development cooperation is beyond the scope of this thesis, a few observations are relevant. It should be noted that the sector-wide approach, initiated around 2000, contributed to a better coordination of development cooperation. It reduced the number of projects that were often fragmented from a sector perspective and that were often donor driven. Yet the sector-wide approach puts an emphasis on bureaucracies to initiate and implement development. This creates ways of working, like the sector policy dialogues between receivers and donors, which easily lead to bureaucracies isolating themselves from the field. All the more so as issues like accountability and fighting corruption tend to make the administrative procedures more strict. It also draws heavily on the capacity of the recipients to implement policies. An underlying assumption of the sector-wide approach is that the bureaucracy of the recipient truly promotes the interests of all citizens. Critics seriously doubt this.

Leftwich (2000) brings forward the notion of the primacy of politics, e.g. the political elite dominates the bureaucracy and will ultimately serve its’ own interests. He notes that the leading role for the bureaucracy in development could be useful only if the ruling elite has a truly development-oriented ideology, with clear leadership and persistent well-balanced economic and social policies. Another negative effect of bureaucracy-led development processes is less room to break way from current practices and create the disruptive change that might well be needed. Such changes, if and when they occur, are generally the result of a bottom-up process in a less structured environment.

Apparently, there is a tension between, on the one hand, the needs of novel technologies being implemented sector wide by bureaucracies, and on the other hand the built-in resistance to change characterizing bureaucracies world wide. In this context, many

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authors (Puri & Sahay, 2007; Sen, 1999) stress the importance of broad participation as a way to alleviate this tension and thus make development efforts more effective. To this end, a more comprehensive approach is required, with broad participation as an essential condition.

Therefore it is relevant for development and for society at large to explore better ways to use ICT in developing countries, creating attractive options for those directly and indirectly concerned with ‘moving forward from their current positions’. This thesis intends to be a scouting expedition on how to design and implement ICT applications that deliver on its potential for development.

1.3 Outline of the thesis

The nine chapters of this thesis are an account of an iterative search process. The structure is as follows. Chapter 2 presents a brief overview of the theoretical background, including definitions of ICT, the different approaches to designing an Information System and the strategic decision-making processes related to these systems. Next the concept of participation and the participatory approaches used in Information System design and implementation are discussed. Thereafter the social shaping of technology is discussed, which is the main theoretical perspective for this research. Chapter 3 describes the research design. This includes the research objective, the research questions, the research approach, the methodologies applied, the validity checks and an overview of the cases studied.

In chapters 4 to 8 the findings of this study are presented. These chapters have already been published, except for chapter 8, which is under review at the time of publishing this thesis. They are slightly adapted to ensure consistency of terminology and reference style. In addition, ‘headings’ of sections may have been altered, while overlap between the theoretical background, the research design and the original articles has been minimised.

Chapter 4 contains the study of an emerging methodology to ICT development, the Round Table (RT) process. In this process, the relevant stakeholders in a sector or around a theme are all involved in an effort to make best use of a new technology relevant to their domain. Both individuals and organisations are coached and trained to develop ICT applications that are novel to the local context and relevant for development. The RT process may take up to seven years. The process aims to intervene in an early stage of the process of technology transfer, local development and appropriation, when technological and institutional change is still possible and before lock-in has occurred.

Chapter 5 takes a different perspective. Based on a rare success story in ICT, it ana-
lyses the processes leading to the successful development and integration of an ICT application, in this case the introduction of ICT to improve the administration of the municipality of Kinondoni in Dar es Salaam, Tanzania. This chapter, along with the conceptualization of the RT process, provides the insights to understand and improve the RT process.

In chapters 6 and 7 the RT process is evaluated. Chapter 6 is an evaluation of the RT workshop that regroups the different stakeholders around a theme and initiates the RT process. It is based on three in-depth case studies: education in Tanzania, agricultural marketing in Mali and health in Tanzania. For validation, data were also used from seven other comparable workshops. Chapter 7 is an evaluation of the subsequent phases of the RT process. It is based on the case study of education in Tanzania. For a number of aspects these findings are verified against the results of eleven other RT processes.

In chapter 8 the case of education in Tanzania from chapter 7 is again studied, but from a different perspective. The focus is on factors influencing scalability. This leads to an analysis of the complex interactions between the project, the sector and the macro level. Also attention is given to the degrees of change triggered by the technology.

Chapter 9 revisits the research questions. It summarises the main features and sequences of actions of the methodology of the RT process. It draws the lessons learnt and discusses the theoretical implications. We also re-examine the validity of the findings. This chapter wraps up with questions for follow-up research, including a reflection on the potential of the RT process to induce system innovation and possible implications for development cooperation.

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5 As the orientation of this study was to conceptualise and to evaluate, the reader should not expect an operational guideline as this would be beyond the scope of this study.
Theoretical background

2.1 Information and communication technology: converging definitions

2.2 Approaches to the development of information systems
   2.2.1 Information system design
   2.2.2 Information Systems Strategizing

2.3 Participatory approaches
   2.3.1 The concept of participation
   2.3.2 Participatory approaches
   2.3.3 Participatory approaches for ICT in developing countries

2.4 The social shaping of technology
   2.4.1 Innovation
   2.4.2 Path dependency
   2.4.3 Technology Assessment
   2.4.4 Constructive Technology Assessment (CTA)
   2.4.5 Socio-Technical Transitions
   2.4.6 Scalability

2.5 Implications for research design
This chapter begins with a closer look at ICT and the development of different definitions. Subsequently a short overview of the approaches to the development of information systems is given. As participation is important in information systems development, the concept of participation and the different approaches to participation are discussed as well as their usability in a low income or development context. In the last section we introduce the social shaping of technology and innovation studies as the main perspectives and concepts of this thesis.

2.1 Information and communication technology: converging definitions

Information is derived from the Latin word ‘informare’ which means to ‘give shape to’. Information is defined as ‘all that adds definiteness or knowledge’. Information thus implies human interpretation. A coded signal is necessary to transfer information. This code is called data. If data is related to context it acquires meaning and becomes information. Information contributes to someone’s knowledge. Communication is a specific use of information. Human communication, in its basic form, can be conceived as the production, exchange and processing of (symbolic) information amongst people (Oomkes, 1986). Communication is about creating meaning from the sender’s side and attributing meaning from the receiver’s side. Networks of individuals are communicating between each other, so communication is perceived as a social process (Engel, 1995).

The technology supporting information and communication processes has evolved rapidly over the last thirty years. This is reflected in the evolution of the common parlance that shifted from electronic data exchange (early 1980s), and information technology (IT) (as of the late 1980s) to ICT (from the 1990s to present day). The concept of ICT combines areas of telecommunication, hardware as well as software. General applications emerge such as the Geographical Information Systems (GIS), but specialisations develop too, such as medical informatics. Within the area of development cooperation, ICT has been defined in various ways (Greenberg, 2005; Michiels & Van Crowder, 2001; Skuse, 2001; UN ICT Task Force 2003; Weigel & Waldburger, 2004; World Bank, 2002). This reflects both the container nature of the concept and its rapid development. Many definitions focus particularly on the ‘newer’ computer-assisted and digital technologies, such as the Internet or mobile telephony. Some do include ‘older’ electronic technologies, such as radio or television. Some even include the whole range of technologies that can be used for communication,

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including print, theatre, folk media and dialogue processes. Some focus only on the idea of handling and transmitting information. Others encompass the broader concept of being tools to enhance communication processes and the exchange of knowledge. One common element is that ICT is considered to be a tool; nothing more, nothing less. The World Bank in its strategy paper on ICT (2002, p. 3) provides the following definition: “Information and communication technologies consist of hardware, software, networks, and media for collection, storage, processing, transmission, and presentation of information (voice, data, text, images)”.

The unifying factor in this ‘widening’ and ‘deepening’ field of ICT is the information system (IS) (Kusters, 1999). A long established perception of an information system is the description of information requirements of an organisation that has to be fulfilled by information technology. Bemelmans et al. (1999) conceive information systems as a collaboration of various components, to which systems theory is applicable. This puts up the question at what level of the hierarchy of systems, as defined by Boulding (1956), are information systems positioned? Are information systems merely technical e.g. hardware (that is up to level 4 in Bouldings’ hierarchy) or do they encompass higher system levels like the human being (level 7) and socio-cultural systems (level 8)? Lee (2004, p. 11) states: “an information system can be defined as the system that emerges from the mutually transformational interactions between the information technology and the organisation”. This socio-technical conception of an information system is also reflected in the definition of Heeks (1999, p. 15), who defines information systems (IS) as “systems of human and technical components that accept, store, process, output and transmit information”. I will use the latter definition in this thesis as it reflects the socio-technical character of ICT.

It should be noted that in the literature, the terminology of IT, ICT or IS is used somewhat interchangeably. This reflects different theoretical backgrounds, but also “semantic ambiguity inherent in the study of very fast changing technologies” (Avgerou & Lèbre La Rove, 2003, p. 7). Labelle (2005) states that the term ICT was coined to reflect the seamless convergence of digital processing and telecommunications. In this thesis, we use the term ‘ICT’ and ‘IS’ interchangeably. The term ICT is more commonly used in the field of development cooperation.

If an information system is fully integrated into the day-to-day activities of the users and might no longer even be perceived as an information system by the users at all (Vreven, 1999), it is called ‘embedded’. A similar concept is ‘domestication’ that refers to something becoming an inherent part of a routine, in other words ‘seeping into the

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2 ICT can be split into IT and Information and Communication Infrastructure (ICI). ICI refers to physical telecommunications systems and networks (cellar, broadcast, cable, satellite, postal) and the services that utilize them (Internet, voice, mail, radio, and television)” (The World Bank, 2003).
fabric of everyday practice’ (Monteiro, 2004). Globalization pushes for embedding on a global scale (like Skype or SMS). In order to participate in the global society, the different national and sub-national societies have to integrate ICT in daily life in one way or another.

The emphasis in the goal of information systems is shifting over time. A prime area of attention in the past was internal efficiency; later customer value and strategic relevance became important. Now ubiquitous meaning at any time and at any place is the main focus (Applegate et al., 1996; Vreven, 1999). Further developments add more ‘intelligence’ to the technology and its scope (Vasilakos & Pedrycz, 2006). An example of such a shift is the development of World Wide Web applications that allow the user to enter into a dynamic interaction with the web, as opposed to the retrieval of static data; a development with such obvious and widespread consequences for the functionality of the web that it has become known as ‘Web 2.0’. Web 2.0 uses the same basic technology as Web 1.0 with the addition of some software tools and increased bandwidth. It seems to be driven by cumulative changes in the ways software developers and end-users use the Web.³ For example in health care, Web 2.0 is used as a tool to invite more participation and to move to a more patient centred approach. The implications of what is called Web 3.0, or the ‘semantic web’, are still unclear. It is expected to centre on personalised and computer generated data.

2.2 Approaches to the development of information systems

Important fields of study in information systems are (a) the design and development of an information system and (b) the strategic decision-making process on information systems at organisational level. Both are discussed briefly in this section.

2.2.1 Information system design

To design an information system is a creative process (Kusters, 1999). It starts from an idea, then progressively more detailed models are developed. What the information system should do, is generally laid down in the functional requirements and the performance requirements. The information system should be part of the business architecture (Rijsenbrij et al., 2002) and this is based on the organisational strategy.

³ See for example http://en.wikipedia.org/wiki/Web_2.0. The economist (Data, data everywhere, February 27th 2010) also highlights the important economic interests involved. Shirky (2008) sets out how social tools related to communication change the way we communicate and organise. Or practices science: from hypothesis driven to data driven (F. van Harmelen, World Wide Web and Social Development Seminar, Dies Natalis VU, 2009).
The approaches for developing information systems evolved over time. Main approaches (Vreven, 1999) are:

1. The sequential approach, this is the classical step-by-step approach. It is also called the waterfall method, to indicate that one step has to be finished before the next can start. A major disadvantage of this approach is that it takes a long time to develop an information system and new insights can hardly be accommodated.

2. Incremental development by splitting up the system into subsystems that can be developed rather independently (similar to the concept of concurrent engineering).

3. Iterative or evolutionary development involves developing a rather simple information system first and then adding functionality in the course of time. In this way a prototype becomes a starting point for iterative or evolutionary development.

Some combinations of these development approaches occur, especially between method (2) and (3).

The involvement of users in information system development, initially non existent or very limited, gained importance in the past two decades. This we will discuss in the next section. However, future users often do not exactly know what they can expect of the information system. To solve this problem, a simple prototype is developed during the stage of functional design. This gives users the opportunity to influence the system's design.

2.2.2 Information Systems Strategizing

Strategizing is associated with defining goals and plans to reach them, but as a definition this is too narrow as it presupposes rigid control over the future. A more encompassing definition is that strategy is concerned with the match between the internal capabilities of an organisation and the environment (Kay, 2000) or as Janszen (2000, p. 191) states “understanding and influencing the position and stakeholders of an organisation”. Information systems are perceived as a part of the strategy of the organisation. The decision-making process in an organisation as related to information systems is called ICT governance, a term coined by Earl (1996). It is derived from ‘corporate governance’

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4 For example the System Development Methodology (SDM) was published in 1974.
5 Evolutionary prototyping should be distinguished from explorative prototyping, in which the prototype is only used to prospect the desired functionalities.
6 In terms of external position (relation to customers, suppliers etc.) and internal position (resources, capabilities etc.).
which is defined as the relationship among various participants in determining the
direction and performance of corporations (Monks & Minow, 1995). The basic concern
is about coordination and alignment in order to create optimal conditions for growth and
renewal. ICT governance can be seen as a system of interlocking roles and relationships
(Magalhães, 2003). This not only includes the top management, the ICT manager, senior
and middle managers, but also the end-users and suppliers of ICT services and products.
These roles and relationships are dynamic and form what Earl (1996) calls a ‘constitution’
process, which is an ensemble of learning processes by the stakeholders involved.

The (organisational) learning processes lead to the progressive uptake of more complex
and encompassing ICT applications. This is reflected in the stages model proposed by
Nolan (1979). This model departs from organisations being unaware of the capabilities
and uses of ICT. But when a few people start to use it, the demand increases strongly
and management starts to better control the use of ICT and in a next stage to better
exploit the use of ICT. Finally, full integration of ICT in the organisation, in strategic and
operational terms, is achieved. This model was revised and enriched by Galliers (2004),
by incorporating internal features in order to come to a more inclusive framework for
information systems strategizing. The six stages progress from Adhocracy to Integrated
Harmonious Relationships.

The framework for Information Systems Strategizing has four core elements:
(a) Information infrastructure strategy, which is simultaneously linked to (b) a deliberate
exploitation strategy and (c) an emergent exploration strategy. This continuous tension
in strategic management between exploration and exploitation is recognised in strategic
management (Leidtka, 2001). It requires (d) a change management strategy to cope
with changes in exploitation. Ongoing learning and review is a key process (see Figure
2.1), as Galliers (2004, p. 257) points out; “Information systems strategy should also
be seen as being ongoing and processual, crucially dependent on learning from ‘below’,
from tinkering and improvisation, and from the emergent and unintended consequences
of strategic decisions, as well as, from the more deliberate, designed and codified ICT
‘solutions’ that have been implemented”.

According to Magalhães (2003), the aforementioned growth models as proposed by
Nolan brought out the notion that the use of ICT is due to external influences (e.g.
market pressures) and internal forces (e.g. organisational learning). Also, he notes that
the ICT evolution goes through alternating cycles of ‘expansion’ and ‘control’. Another
area of attention is the demands and expectations of the technology platform versus
those of the business platform and the way they mutually influence and stimulate each
other. Consequently, ICT development has to be framed in a wider organisational
and behavioural context (Magalhães, 2003). This argument seems to be reinforced by
the increasing importance of collaborative networks. This contributes to increasingly
‘porous and debatable’ boundaries of organisations. This notion is also brought
forward by Gallier (2004) and in strategic management in general (Volberda & Elfrink,
A point of caution is that aforementioned notions of information strategizing are developed in the context of more affluent societies. Their value for developing countries is not yet fully clear.

### 2.3 Participatory approaches

The importance of participation for the design and implementation of information systems became evident over the past 20 years. It provided the answer to the problem of extreme failure rates. Before the 1990s, the IT professionals were in a leading position in the design process; thereafter the users became more explicitly involved (Applegate et al., 1996). Participatory approaches are widely acclaimed as required and useful (Applegate et al., 1996; Puri & Sahay, 2007). The advantages of participation in information systems development include legitimization, better chances for user acceptance, and knowledge sharing. For an appropriate use of knowledge, especially tacit knowledge, the direct involvement of stakeholders, like users, is required (Collins & Evans, 2002). In this section, we first explore the concept of participation and thereafter discuss the participatory approaches to information systems development.

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7 Similarly in development cooperation, the role of participation for sustainable development is widely acknowledged (Puri & Sahay, 2007).
2.3.1 The concept of participation

Caron-Flinterman (2005), who carried out a literature search on participation, states that effective participation is often associated with values like fairness, competence, equality, mutual respect and mutual learning. Reference is regularly made to the ‘theory of communicative action’ that involves action based on consensus among all the interested and affected actors in the collaborative decision-making processes, achieved by free and rational discourse (Habermas, 1975). Somewhat hidden in participation is the concept of dialogue. Dialogue captures the notion of a free exchange of meaning between actors, which implies the suspension of assumptions (Senge, 1990). It is important to learning processes and the elicitation of tacit knowledge (Nonaka & Takeuchi, 1995).

In line with Arnstein (1969), this thesis takes participation as the involvement of the different stakeholders and a sharing of power in order to enable stakeholders to influence the decision-making process and its outcome. Arnstein (1969) developed the ‘ladder of citizen participation’, in which the power exercised by citizens in decision-making ranges from ‘level one: being manipulated’ to ‘level eight: in full control’ (see Figure 2.2).

Low levels of participation are, for example, communication merely to educate users and to align their visions with those of experts in order to gain more support from a higher level for decisions or policies. Intermediate levels are consultation (level four) and placation (level five), which are low levels of power sharing basically aimed at legitimization and satisfaction i.e. the feeling of being heard. In partnership (level six), genuine participation occurs with actual power sharing in a fair decision-making process, which includes deliberation and negotiation. A stronger influence is exercised when power is delegated (level seven) and a part of the decision-making can be controlled. It is this sharing of power and the possible political struggle involved that is most characteristic for the concept of participation. A participatory process can be complex and involves, besides power sharing in decision-making, also dialogue and learning. Puri and Sahay (2007), in an excellent overview of participation in both development theory and information systems, articulated a theoretical framework, which emphasizes that “participation is not an either/or binary condition but a multilevel, complex and dynamic process with an inherently political character” (Puri & Sahay 2007, p. 141).

2.3.2 Participatory approaches

Participatory approaches to information systems development have been pioneered in Europe since the 1970s. A well-known participatory model to information systems development is the Swedish model. The fear for job losses in the graphic industry in Sweden due to the introduction of ICT, was an important impulse. Members of Trade
Unions acquired knowledge of the technology and negotiated their participation in the design processes of the ICT applications relevant to the branch. From the start, the explicit political goal was boosting the capabilities of the workers and the Unions in their negotiations with management. This is, consequently, a Trade Union based collaborative resource approach (Floyd et al., 1989) and the normative element does not make it easily replicable (Kraft et al., 1994). Over time more participatory methods were developed and practiced e.g. Information System Strategic Planning (Cassidy, 1998), and the integrated architecture framework of Cap Gemini.8

Three main categories of criticism have been aired against the way participatory approaches are structured and deployed. First a number of so-called participatory methods are not, in the sense of Arnstein, ‘partnerships’, but rather ‘informing’ or at best ‘placation’. While the agenda and approach is already decided by management, the users are involved only in the ‘how to implement’ stage. Focussing on developing

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countries, we often see processes being labelled ‘participatory’, while in fact national ministries and/or donors have already taken all the important decisions (Francis, 2002; Mosse, 2001).

Secondly, an important point of criticism of participatory methods as developed in mainstream IS research, is their grounding in a positivistic and universalistic perspective. A positivistic approach implies, or at least aims for, a measure of control of the object of study – IS and organisational change – as is usual in the (physical) sciences (Avgerou et al., 2004). This emphasizes the supremacy of this view over others. Consequently, it takes away the essence of participation and confines the role of participation to knowledge transfer and creating acceptance. A universalistic perspective assumes that the value of ICT and the processes through which such value is achieved, are considered independently from the circumstances of the social actors involved in the design and implementation of information systems9 (Avgerou & Madon, 2004).

Thirdly, differences in context have their own exigencies. For this reason, participatory methods developed in Western countries might not be adequate elsewhere. For sub-Saharan Africa, the following limitations were cited in literature in relation to the application of participatory approaches developed in a Western setting. While awareness and the development of an organizing vision for ICT (Swanson & Ramiller, 2004) have gone through various processes of growth over the last three decades in the OECD countries, in developing countries the awareness of the potential value of ICT remains rather limited (Heeks, 2002). Often, the ‘top’ lacks real commitment beyond lip service (Furuholt & Ørvik, 2006; Qureshi, 1999), especially in sub-Saharan Africa. Puri & Sahay (2007) argue that contextual differences arising from (a) the frequent involvement of public sector bureaucracies, (b) inadequate capacities with respect to human resources, infrastructure, finance and technologies, and (c) the focus on marginalized communities (rather than businesses), are also often not adequately considered when ICT projects are designed and implemented in developing countries.

For these reasons, it is less fruitful to base the research presented here on an established participatory methodology for IS design developed in a Western setting.

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9 This implies universalistic assumptions on knowledge and conceptions of value as well as environments that include similar types of organizations. It assumes that institutional structures and social aspirations are considered universalistic in terms of the unfolding history of society at large (Avgerou & Madon, 2004). This has parallels to the modernization theories (see Willis, 2005) in development studies like the ‘stages of economic growth’ that assumes one path to development. Development is defined in relation to modernity, starting with moving away from agricultural societies with traditional practices to a stage of pre-conditions for take-off, using the analogy of a plane moving along the run way until it reaches take-off. This leads to linear planning models and more mechanistic approaches. Later on the economic focus was widened in development studies as to include social and cultural dimensions. Also the importance of participation of actors concerned in development became broadly recognised.
2.3.3 Participatory approaches for ICT in developing countries

ICT applications are more and more interlinked. Individually or as a group of applications, they should be interoperable and they should be relevant to a sector or a part thereof. In order to gain such a wide perspective, the participatory approach aims to include all relevant stakeholders. It transcends the user-producer interaction common to most participatory approaches to include all relevant ‘voices’, which together constitute a system. This increases the complexity of the participatory exercise, as (a) more interests and positions are affected and (b) participants will bring personal, organisational and inter-organisational issues to the table. This suggests a search for methodologies to co-construct the ICT applications, involving users, producers, regulators, service providers etc. Moreover, a stakeholder may function at multiple levels (personal, organisational, inter organisational) and in multiple roles; a producer of one kind of application is a user of another ICT application.

There have been limited attempts to link ICT to meaningful development aims from a local perspective and with an action-reflection connotation (Walsham & Sahay, 2006). In view of the aim of this thesis, I searched for participatory approaches to IS design in a development context, with a sector-wide perspective and covering the whole time span from design to implementation to integration. This search yielded limited results. Of interest is the health information system programme (HISP) that focuses on monitoring data for public health management. This is a large-scale action research programme in the health sector, initiated and guided by the Department of Informatics of the University of Oslo (Braa et al., 2004). HISP is an excellent example of action research that is of use to developing countries. However, for our purpose the focus of the programme is too narrow and the approach is in a number of cases rather ‘top-down’. Also, HISP has its own agenda through the software they develop and propagate, which, from the perspective of our investigation, is a weakness.

Another interesting approach is the Global e-Schools and Communities Initiative (GeSCI) that focuses on education. This initiative, however, seems to struggle with the implementation of ICT applications and has shifted the focus to an expertise center for ICT in education and towards strategic advice for policy development.

An emerging approach is the ICT Round Table process developed by IICD. It is a participatory approach to the development of ICT applications that are novel to the local situation. The aim is to empower local individuals, organisations and communities to employ ICT for development purposes. Unwin (2009, p. 139) remarks:

10 Translated from French.
“... a key feature of the institute’s work, namely Round Table workshops, that were designed to bring together multi-stakeholder partners ... has provided a consistent focus for IICD’s work in subsequent years, as it has developed into one of the world’s leading ICT4D centres.”

Comparable processes in terms of a multi-stakeholder involvement, a participatory approach, a sector focus and a long-term involvement – from identification to full scaling – were sought for, but have not been found in the field of ICT. Thus, it seems relevant to study one or more of the aforementioned experiences. To do so, a perspective on IS research is required that allows the contextualisation and the co-construction of the technology by stakeholders. This is presented in the next section.

2.4 The social shaping of technology

This research started off with screening mainstream ICT literature (Hevner et al., 2004; Venkatesh et al., 2003), but it provided insufficient theory for the task at hand. One of the main caveats mentioned of the research on information systems is that the corpus of this research is “centred on assumptions of technical/rational behaviour in the setting of professionally managed business organisations” (Avgerou, 2004, p. 1). A wider framing of the information systems design and implementation approach is required in order to find the rationale behind apparently irrational behaviour (Avgerou & Madon, 2004; Walsham, 2001). Particularly in a development setting, the traditional information systems approach lacks explanatory value (Furuholt & Ørvik, 2006). This argument is reinforced as the development of the technology itself largely took place in a Western setting with a dominantly techno-rational decision-making environment based on capitalistic values. Hence a number of choices in the past are now embedded in the technology and restrict the possibilities and ways the technology can be used. Nevertheless the fluidity of the ICT technology suggests there is still plenty of room for further developments and adaptations. Therefore, our investigation takes on a perspective which allows for differences in social and organisational context, including the decision-making environment. The upshot is that such an approach has more explanatory value in the context of developing, non-western, societies.

This quest for alternative perspectives is ongoing in the IS research community. The ‘Social Shaping of Technology’ approach (SST) is perceived as a promising direction for IS research (Howcroft et al., 2004). Lee (2004) remarks that SST has become almost an orthodoxy in the field of technology in general, yet it has been largely neglected in IS research. Large segments of IS research consist of behavioural studies, from a positivist and technological perspective, on how people or organisations use, adopt, or diffuse information technology. Lamb and Kling (2003) add that the cognitive, social psychology and cybernetic models shaping the understanding of ICT design and use are insufficient
and leave out nearly all of the organisational and environmental context. In contrast, SST starts from the premise that technology is inherently a social construct.

In SST, technology is perceived as heterogeneous, consisting of material and immaterial elements (Geels, 2005). The word ‘technology’ is used in a broad sense as a ‘configuration that works’ (Rip & Kemp, 1998). Different elements are aligned in such a way as to fulfil a particular function. In other words there is an alignment between the (technical) form and the (social) function. Therefore the context actually helps the artefact to fulfil its function (Geels, 2005). Likewise the artefact influences the context.

In the reflection on alternative perspectives in IS research, also the negative effects of ICT should be considered. Technology has an impact on society and it appears that ICT can contribute to improved well-being also for the poor (Cechinni & Scott, 2003; Unwin, 2009; Swaminathan, 2004). Critical notations bring forward the marginalizing effect of ICT whether on a global scale, or locally. For example Castells (2004) points out that the scale and ways of information use and exchange are unprecedented and influence the restructuring of capitalism. This will accentuate uneven development not only between North and South, but also between dynamic segments and territories of society everywhere. The implications of ICT are not only economic, but also political, social and cultural. Definitely, ICT is a strong local social intrusion (Klein & Huynh, 2004; Zeleza, 2005). In addition, concerns have been aired about the effects of ICT as instruments of control and compliance. Klein & Huynh (2004) provide some examples of controlling staff, which as such might not be bad and undertaken from an efficiency point of view, yet these control decisions are made administratively, bypassing consensus formation.

While these critical notations are controversial and subject to debate, it underlines the need to reflect well on the way a technology is developed and used. The IS literature clearly shows how identical software applications in similar organizational contexts can result in very different organizational impacts in which ICT is used with an orientation towards empowerment, or oppositely towards control (Doherty et al. 2006). Bunders (1994) argues that if a technology is considered important than everyone has a right to be involved. She shows how participatory strategies may lead to design options more appropriately tailored to the needs and conditions of marginalized groups. Therefore it is important to search for an approach that incorporates a societal perspective, including the divergent interests of the multitude of stakeholders involved.

SST spans a wide range of perspectives and concepts, including actor network theories (e.g. Latour, 1999), the social construction of technology (SCOT) (e.g. Bijker, 1997), systems of innovation (e.g. Lundvall, 1992), socio-technical transitions (e.g. Geels, 2005) and approaches in innovation management (Williams & Edge, 1996). Differences between the various approaches stem from different disciplinary backgrounds, research traditions, national characteristics (Howcroft et al., 2004), methodological differences
and the relative emphasis on the negotiability and fluidity of technology (Broerse, 1998). Below, we provide the theoretical background to the main perspectives and concepts that informed the study.

2.4.1 Innovation

In searching for new perspectives in information system research, Avgerou (2003) underwrites the concept of technology as a social construct. She conceptualizes the use of information systems as an innovation in the local context. The following argument helps in this positioning:

“... the construction or configuration of new technology artefacts and the working out of organizational arrangements unfold by a mix of technical/rational tasks, institutionalized enactments and improvisational action, as people make sense of the potentials of ICTs in their work context and seek to appropriate it. IS innovation is inevitably situated in the organization concerned, although most technology components are acquired as standard ‘solutions’ from the IT industry and many IS implementation efforts are aimed at introducing what are seen as established ‘best practices’ elsewhere” (Avgerou, 2003, p 142).

Innovation itself has been defined in many different ways, but generally two features stand out: novelty and generating value. Important is the classical definition of innovation by Joseph Schumpeter as:

“the commercialization of all new combinations based upon (i) the application of new materials and components; (ii) the introduction of new processes; (iii) the opening of new markets; (iv) the introduction of new organisational forms” (Janszen, 2000, on cit. p. 3).

This definition brings forward the notion of four different, but interlinked, aspects of innovation: the new technological artefact, the new application, the market or user groups and new organisational practices and forms. Innovation triggers changes to the existing situation, which lead to innovation trajectories within an organisation (Janszen, 2000). This has implications for their strategic possibilities.

This study focuses on situations where it is less the artefact (e.g. hard- or software) which is innovative as the social processes enabled by the artefact; the ICT-based innovation, giving rise to the development of new processes, organisational forms or markets. As mentioned in the introduction, there is little literature on this topic, particularly concerning sub-Saharan Africa.

The innovation process is a highly complex social set of activities, which can be conceived as an iterative, spiral process resulting from the interactions of a number
of actors (Williams & Edge, 1996). Not only technical, but also social, organisational, political, economic and cultural factors influence the development of technological innovations and the outcomes of ‘technical’ change. Thus, what is the same innovation as far as hardware and software is concerned, may take on a different trajectory depending on these other factors.

Especially relevant from our point of view is the question: how beneficial is the direction taken from a perspective of development? Clearly, political and ethical judgements are relevant here. Are gender issues taken into consideration? And issues of environment and sustainability? To what extent is it designed to serve the needs of the higher income groups only? Or is it designed to serve the low income groups, the so-called bottom of the pyramid and be effective in poverty alleviation? In a development context, the benefits of innovations solely guided by market forces do not seem evident. The question is, therefore, are other forces capable of influencing ICT innovation in such a way that the benefits are evident? Let us have a closer look at the concept of trajectory or path dependency.

2.4.2 Path dependency

The notion of path dependency was developed in economics. It implies that innovations are built on existing patterns and, to a certain extent, the innovation and its further development are ‘locked-in’ by these patterns. Consequently the development of a technology follows a certain path, thereby excluding and limiting other options. Various explanations have been proposed for the phenomenon of path dependency, for example: increasing economic returns through economies of scale for a particular technology, technological relatedness, user routines leading to lock-ins (Geels, 2005) and so on. These explanations might be complementary, but most relevant to our investigation is the ‘quasi-evolutionary’ theory, as it addresses the identification and design of the technology and its applications. This theory is an extension of evolutionary economics which takes variation, selection and retention as central concepts to explain technological development. Paradigms are of great importance as they dominate the processes steering variation and selection. Over time, this results in paths or trajectories (Dossi et al., 1988). Quasi-evolutionary theory assumes that the variation and selection environments are coupled (Van de Belt & Rip, 1987). This coupling might lead to the development of niches, protected spaces where novel variations can be developed without too early exposure to rigid selection. The variation and selection processes are guided by search heuristics.

12 These low income groups were always considered charity cases; designing for these groups still was generally considered a subvention rather than a valid business proposal. That it is worthwhile to also consider low income groups from a business angle, is argued by Prahalad (2004) and equally suggested, for Africa, by Mahajan (2009).

13 Raven (2005) provides a more elaborate and elegant definition of a niche – i.e. a protected space where visionary actors can experiment, exchange and codify knowledge and expectations – with the aim to contribute to a broader transition to a more sustainable socio-technical system.
Early stabilisation of a technology affects the actors in a field, because it sets constraints for future technological developments. If a dominant design of a technology gains ground and starts to stabilise, irreversibility might occur. Especially lock-ins might impede the development of options which are more favourable from a societal point of view.

In the process of technology development, expectations of possible outcomes play an important role. In the early stages, opportunities for developing and applying new technologies seem limitless, yet no one knows which technological options will eventually become successful; the uncertainty is high. At a later stage, while the outcomes can be better estimated, changes are difficult to make due to earlier decisions and investments (Merkerk, 2007). This so-called Collingridge dilemma (Collingridge, 1980) makes interventions in the development process difficult. The appreciation of the effects of technologies is object of study of the field called Technology Assessment.

### 2.4.3 Technology Assessment

The famous Charles Lindbergh was at the cradle of the concept of Technology Assessment (TA). It rapidly gained ground in the USA and Europe in the 70s. TA is the umbrella term for approaches to appreciate the effects of a technology and/or societal problems that arise from the application of a technology. It aims to minimise the negative impact and to promote positive effects (Smits & Leyten, 1991). Initially TA had an early warning function and contributed to long-term policy making. Later the emphasis shifted to short- and medium-term policy and to broadening the decision making process (Smits & Leyten, 1991). An overview of the methods and impacts of TA as applied in Europe is provided by the international project called Technology Assessment, Methods and Impact (TAMI) (Butschi & Ladikas, 2004), which is a collaboration of 13 TA institutes from West and Central Europe. Their joint definition of TA is “a scientific, interactive and communicative process with the aim to contribute to the public and political opinion forming on societal aspects of science and technology” (Klüver et al., 2004).

In TA, the expert view and scientific methods were dominant for both promoting and controlling the technology. In the mid-nineties an approach to TA emerged based on a constructivist perspective and in line with the notion of the Social Shaping of Technology. This new approach criticised the old way as:

“after-the-fact gatekeepers’, meaning to put an emphasis on controlling, instead of influencing the shaping of the main features of the technology. What is missing are mechanisms and processes to facilitate societal learning about how to coproduce technology and its impacts, and how to achieve desirable outcomes… strategies that take up that challenge, and uses are labelled as constructive technology assessment” (Rip et al., 1995, p. 2-3).

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14 In Asia, TA was taken up in Japan, but it has not been formalised in a TA institute (Kobayashi, 2004).
Schot and Rip (1997, p. 251) state:

“constructive technology assessment shifts the focus away from assessing impacts of new technologies to broadening design, development, and implementation processes.”

2.4.4 Constructive Technology Assessment (CTA)

The overall objective of the new, so called “constructivist” approach is formulated as to “broaden the decision-making process on the design of new technologies and the redesign of old technologies in order to meet societal goals” (Schot & Rip, 1997, p. 252). This implies widening up the aspects and criteria considered in the decision-making process, and including more actors in the technology development process at an early stage. In short, to reduce the costs of learning by error as Rip (1986) puts it. Because with the ongoing development of the technology, irreversibility might set in and time and resources might be wasted (Ernst & Kim, 2002). When decisions about a ‘new’ technology can be made more socially robust in an early stage, the eventual outcomes can be more socially robust as well (Rip et al., 1995). To allow for a participatory approach and for network-based processes, an infrastructure has to be established. A present insight to deal with the Collingridge dilemma is vision building, experimenting and proceeding step by step.

Learning and societal agenda development are two key processes in constructive technology assessment (CTA) in order to attain anticipation, reflexivity and social learning (Roelofsen et al., 2008; Schot, 2001). Anticipation concerns the societal effects of the technology and the search for possible synergies between designers, users, citizens, policy makers etc. Reflexivity concerns a reflection on one’s own and other’s knowledge, perspectives, roles, etc, and is the basis for double loop learning, in which existing paradigms are redefined (Argyris & Schön, 1978; Kolb et al., 1991). Schot (2001, p. 41) takes reflexivity in the context of CTA as “to shape technological development processes in such a way that social aspects – in the long run – are symmetrically considered”. Social learning is concerned with “new” technologies that evolve in a mutual learning process on technological options, user preferences and necessary institutional changes that are not given ex-ante, but are created and modified along the way (Schot, 2001).

Societal agenda development requires alignment i.e. the mutual and well-functioning adjustments between different actors involved in the technology shaping process. Collaborative decision making on the technology development process by the relevant stakeholders, implies intertwined processes of learning, power sharing and negotiation. Reflexive learning and negotiation should lead to the development and legitimization of common or congruent goals (Grin & van de Graaf, 1996). Together with the sharing of ‘language’, norms and values, this will coordinate the behaviour of the actors involved as related to the technology.
CTA has been applied to a wide variety of technologies, including ICT, genomics and nanotechnology at the micro and at the meso level (Broerse, 1998; Decker & Ladikas, 2004; Heiskanen, 2005; Rip et al., 1995; Roelofsen et al., 2008). Constructive technology assessment broadened TA with interactive and participatory methods. Bütschi et al. (2004) conclude that scientific and participatory methods complement each other well and are now considered current TA practice. While the insights of CTA are applied, the approach itself has not been spelled out in a methodology. Rip and Schot (1997) advance two generic strategies for technology development, but do not provide the detail necessary to make the approach operational. The generic strategies are:

- **Strategic niche management** i.e. the development of technology in protected environments, avoiding (market) selection before the technology is sufficiently mature;

- **Loci for alignment**, i.e. the creation of spaces for stakeholders to interact.

CTA differs from Participatory Technology Assessment in that the latter focuses on approaches for direct, interactive inclusion in the TA process of affected stakeholders, such as interest groups, consumers etc. alongside professional experts and policy makers. The emphasis in Participatory Technology Assessment tends to be more directed towards the regulatory process than to the design of the technology itself (Heiskanen, 2005).

The importance of vision building and learning is also a central focus of Strategic Niche Management. This field is closely linked to CTA, but with a focus on the development of niches (Raven, 2005). Sustainability is defined largely in environmental terms. While best practices have been generated related to niche management, the integration with the wider socio-technical environment is less clear (Raven, 2005). This approach has so far mainly been applied in the fields of waste management, energy, mobility and food production.

### 2.4.5 Socio-Technical Transitions

Innovation Management, CTA, Strategic Niche Management etc. are basically prescriptive and therefore relevant to managing change processes. Socio-Technical Transitions is predominantly descriptive in nature. It is a strand in the social shaping of technology that studies the transitions from one socio-technical system to another. It helps to understand how new technologies emerge and become dominant. The focus is less on the level of an organisation, but on a societal function like for example mobility, communication or health care (Geels, 2005). This perspective might be helpful to understand the diffusion and integration of ICT in domains like education, health, agriculture and rural livelihoods.
A novel technology, especially a potentially radical innovation like ICT, induces and requires change in the socio-technical system in order to be integrated (Geels, 2005). The integration of ICT at the meso level depends on the degree of change required and the ‘changeability’ of the socio-technical system. The degree of change required depends not only on the nature of the technology, but also on the design and the implementation process. For example management of information systems at organisational level can inform and empower local management and workers. But information systems solely designed to inform the central level and without feedback to lower levels, tend to reinforce existing structures; consequently the ‘change effect’ of the technology has been neutralised, offsetting the intended gains for development.

2.4.6 Scalability

Scalability refers to the spreading of the ICT-based innovation to other sites (also called replication or scaling out). But scalability also means enlarging the ICT application or scaling-up. Scalability is about the integration in the social patterns of a specific domain. A proven and sustainable ICT-based innovation at organisational level does not necessarily mean recognition and acceptance in a wider socio-technological system. Therefore, scalability has to be distinguished from sustainability. Scaling is not a matter of copying, but is a learning process to reproduce the ICT-based innovation locally; a ‘translation’ as it is called in the SST literature (Latour, 1986).

Scaling requires alignment (Braa et al., 2004). In Network Theory, alignment is used as a relative measure of the extent to which the agendas and interests inscribed into the practices, institutions, and strategies of the network, pull in the same direction and serve the same purpose (Callon, 1991). A high level of alignment implies a stable and durable network. A new technology can inadvertently create a counter network with competing agendas. For example, related to the Health Information System Programme (HISP), Braa et al. remark that:

“HISP represents a marginal, alternative and at times, opposing network relative to the significantly larger and dominating network through the World Health Organization (WHO), various donor agencies, the World Bank, national health authorities, and large corporations selling hardware and software” (Braa et al., 2004, p. 342).

Also, opposing coalitions might emerge around a new technology, which block each other. Apart from political aspects, non-alignment may be due to various reasons.

15 For example Grin and van de Graaf (1996) provide an interesting example of contradictory forces for wind mill technology in Denmark.
2.5 Implications for research design

Summarizing, the application of ICT in developing countries has known many failures. At the same time, ICT is recognised as relevant for development. The aim of this thesis is to how to identify, design and implement sector-wide ICT applications novel to the local context that are relevant to development and at the same time sustainable. The theoretical background suggests that participatory approaches, in an early stage of the development process, are essential to the development of successful ICT applications. Through participation and dialogue the relevant contextual factors will become apparent and local priorities will be articulated.

The design of the research is based on the study of existing experiences with a participatory approach that incorporates elements of the social shaping of technology and that is practiced in the real world. A complementary view is developed by taking as point of departure the conceptualisation of the development of ICT applications as an innovation in the local context. This means to study the underlying innovation processes in real settings. These findings should contribute to a better understanding of the complexities of developing and scaling ICT applications that are perceived as relevant to development and therefore trigger positive changes in the socio-technical system.
3.1 Overall objective and research questions
3.2 Research approach
3.3 Research method and data collection tools
3.4 Overview of case studies
In this chapter we elaborate on the research design. First the research questions are formulated, followed by the research methods used and an overview of the data collection tools. The chapter wraps up with an overview of the different cases studied and summarises on the last page the case studies per research question and per chapter.

3.1 Overall objective and research questions

The aim of this thesis is to better understand the processes underlying the development and integration of technology in society, in particular to understand how to design and implement ICT applications that deliver on its potential for development. To narrow down the question, I focus on development at the level of a sector and I give it an action connotation. Therefore the objective of this thesis is to analyse a consistent set of interventions to identify, design and implement sector-wide ICT applications novel to the local context that are relevant to development and at the same time sustainable. Moreover, it should contribute to poverty alleviation.

As technology is not only about material artefacts (like hard and software), but also about novel social practices, ICT-based innovations have the potential of generating novel work practices, thereby contributing to a better economic performance as well as to more effective ways to reach social and societal goals. Thus, they offer the opportunity to improve the performance of development cooperation, the need for which is generally felt (see Ch 1.2). In chapter 2, it was argued that introducing ICT in a new setting can be conceptualised as innovation in the local context, especially the development of novel practices enabled by the technology. The social shaping of technology added to the conceptual framework the notions of the co-construction of technology and of path dependence. The introduction of ICT in developing countries, perceived from the perspective of the social shaping of technology, could open new avenues for understanding and shaping development policies and programmes. As hypothesized in the introduction “technical substitutions can thus affect wider socio-technical configurations, this means that technology may act as catalyst for social change” (Sørensen, 2002, cited by Geels, 2005, p. 53).

Against this backdrop, we search for an answer to the question: How to identify, design and implement ICT applications novel to the local context that are relevant to development are sustainable and contribute to poverty alleviation? Such an approach has to be participatory as of a very early stage of development of the ICT applications and to allow for the consideration of societal goals. The RT process, mentioned in the previous chapter, is taken as case material to study the initiation, development, impact and sustainability of ICT applications. This choice is justified: (a) by the relevant features of the RT process in the light of the literature, (b) by the limited number of alternative
methods to study (see 2.4) that are tailored to the needs of the development setting and applicable at organisational and at meso level, and (c) for practical reasons as the author became, next to country programme manager, also the lead facilitator to apply and further develop this method. The RT process is briefly explained in Box 3.1.

The RT process emerged over time based on the application of a number of principles set by its founders and as a collection of best practices. But is it just a collection of different methods, or is it theoretically consistent? And, if so, what are the underlying

Box 3.1 IICD and the RT process

The International Institute for Communication and Development (IICD) was set up as a foundation in The Hague by the Directorate General of Development Cooperation and International Development (DGIS) of the Dutch Ministry of Foreign A faires in 1996. Its mission, then and now, is to harness the power of ICT for development. IICD spelled out some principles for the ICT development initiatives, which it supported. These principles included: ICT should be (1) novel in the local context, (2) locally owned, (3) demand-driven, (4) participatory, and (5) multi-stakeholder.

Initially, IICD focused more on the development of ICT policies in the countries. IICD started to use scenario development (van der Heijden, 1996) as developed in the field of strategic management. The intention was to trigger the development of national ICT policies. Soon the emphasis shifted to the development of ICT projects. The reason for this was to have more ‘visible’ activities and results. The RT processes at the national level resulted in a wide variety of projects being developed and implemented by local actors. As the focus in development cooperation shifted to sector-wide approaches (SWAs), RT processes also began to concentrate more at the sector level, for example by focussing specifically on developing ICT projects for the education sector, the health sector or the livelihood sector. Criteria for the ICT projects that were supported during formulation were: to be novel in the local context and to be moulded to local needs. IICD did not commit itself to financing during formulation, only to broker in the search of funds. In practice, after formulation and peer review at IICD, most ICT projects were (co-) financed by IICD with seed capital (up to US $ 120 000). This seed capital was acquired by IICD from the Dutch Development Cooperation or other donors. The expected results of the ICT projects were impact on end-users and sustainability of the ICT applications. A stronger emphasis of impact on poverty alleviation has been added over time to the RT process. This is searched for by including representatives of the ‘poor’ in the RT process. Gradually the emphasis shifted to leveraging, i.e. ICT applications being scaled up (including replication).

Over time, the RT process developed into a comprehensive collection of methods that ranged from generating an idea for a novel ICT application in the local context up to formulation, (co-)financing or brokering for seed funds, implementation, embedding in the local organisation, and integrating ICT into the overall sector as far as possible. The main constituent elements of this approach were: facilitation, organisation, providing possibilities for structured learning complemented by expert advice, coaching for the ‘innovators’, and networking.

The development of the RT process has been a learning process within IICD as well. The mechanisms for learning and standardisation of the RT process included: (a) the adherence to the underlying principles, (b) enforcement of some procedures related to these principles, (c) a rather well-defined process for identifying and formulating novel ICT applications in the local context, and (d) intervision and knowledge exchange sessions between IICD staff.
concepts, common elements or principles\(^1\) and guidelines? Therefore the first research question is:

1. **How can the RT process be conceptualised?**

Before going to the logical next question on the effectiveness of the RT process, the complementary view is addressed that conceptualises the development of ICT applications as an innovation in the local context. The second research question is:

2. **What are relevant innovation processes leading to the successful development of an ICT application at organisational level in the setting of a developing country in sub-Saharan Africa?**

These findings help to understand why certain methodologies for the development of ICT applications might work or not. So a critical question is: to what extent do the findings of both research questions converge? If the convergence is limited, a more in-depth research is required on what influences each of the possible success and fail factors (notwithstanding the need to evaluate the effectiveness of the RT process). If there is convergence between the findings of the first and second research questions, it helps to build-up theoretical insight and provides guidance in improving parts of the methodology to develop ICT applications novel to the local context.

The third question is to evaluate the effectiveness of the methodology for the development of ICT applications:

3. **How effective is the RT process in generating sustainable ICT applications that are moulded to local needs?**

In line with the earlier advanced concept of development (Ch 1.1) as a self directed and self-owned process, the development relevance is analysed by the demands and the priorities indicated by the participants of the RT process. The RT process is participatory. According to Rowe and Frewer (2004), the outcomes of participatory processes can only be understood in the light of the processes leading to it. The RT process spans a period of four to seven years during which many external influences are unleashed upon it. It might also be assumed that intermediate output and outcomes will not be produced in a linear fashion. This poses the question on a meaningful phasing of the RT process, to assess its effectiveness.

A first clearly demarcated cycle or phase in the RT process is the RT workshop. This is the initiation of the RT process during which stakeholders meet and define what type of ICT-based innovation they would like to embark upon. The second cycle involves developing a prototype of an ICT-based innovation and implementing it. The third cycle consists of improving or revising the ICT-driven innovation and assuring its

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sustainability. This implies that organisations commit themselves to the ICT-driven innovation as part of their strategy and allocate resources or find a market for it. This assumes that, by this stage, the local context has become receptive and conducive to the technology and particularly to those ICT applications generated that are relevant to development, including poverty alleviation. Preferably these ICT applications are enlarged or replicated elsewhere as to become step by step an integral part of the sector concerned. If required this involves policy making to open up markets and/or to create conducive rules. As the cycles two and three are closely linked, they will be considered for evaluation as one single phase. The sub-research questions then become:

3a. To what extent is the RT workshop an effective methodology to initiate a social shaping of technology approach?

3b. Given a well-conducted RT workshop, what are the process conditions and the outcomes of the subsequent cycles of the RT process?

Apart from evaluating the effectiveness of the RT process, it is relevant to acquire more insight into the factors that influence the scalability of an ICT application. The fourth research question is:

4. What factors influence the scalability of ICT applications that are novel to the local context, yet with proven functionality in that environment?

The research questions are summarised in Table 3.1.

### 3.2 Research approach

To answer the research questions different types of research are required. This is elaborated first. Thereafter, the constructivist approach of inquiry is discussed succinctly.

<table>
<thead>
<tr>
<th>Table 3.1 Overview of research questions</th>
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<tbody>
<tr>
<td>1. How can the RT process be conceptualised?</td>
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<td>2. What are the relevant processes that lead to ICT-based innovation at organisational level in a development context?</td>
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<tr>
<td>3. How effective is the RT process in generating sustainable ICT applications moulded to local needs?</td>
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<tr>
<td>3a. To what extent is the RT workshop an effective methodology to initiate a social shaping of technology approach?</td>
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<tr>
<td>3b. Given a well-conducted RT workshop, what are the process conditions and the outcomes of the subsequent cycles of the RT process?</td>
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<tr>
<td>4. What factors influence the scalability of ICT applications that are novel to the local context, yet with proven functionality in that environment?</td>
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The research is partly conceptual as it seeks to identify and to conceptualise the underlying principles of the RT process (research question 1). The research is also partly explorative in nature as it tries to understand the processes that play a role in the initiation, development and integration of a technology that is novel to the local context (research question 2). This generates plausible relationships between elements during a situated episode and suggests heuristics for intervention. The study on both research questions (1) and (2) is pursued in parallel. This enables the development and validation of a conceptual framework that allows a more consistent inquiry into the subject and to outline possible courses of action.

After conceptualisation of a method of intervention, the type of research switches to evaluative in a search for answers to questions about the effectiveness of the RT process. The research becomes again explorative when trying to understand the interaction between the emerging technology and the wider context, in order to identify the factors that determine the ‘changeability’ of the socio-technical system to integrate the technology. The types of research and their sequence are summarised in Figure 3.1.

The Social Shaping of Technology is grounded in Constructivism. Social actors tend to have different perceptions of the same matter. These multiple realities are not governed by a limited set of causal relationships, but are actively given shape and meaning by ‘social actors’ (Guba & Lincoln, 1989). Interpretative inquiry (Klein & Myers, 1999; Walsham 1995) is applied. This research approach is “aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context” (Walsham, 1993, pp. 4-5). The understanding is developed by constantly moving from the whole to the part, and back to the whole. Through these iterations of the hermeneutic circle, a complex whole of shared meanings emerges (Gadamar, 1976).

Klein & Myers (1999) have developed principles to guide interpretative field research. Long-term interaction between research studies, subjects and context is required to investigate the situation that is emerging. People are not only the products of history, but active creators and re-creators of the present and the future. As the research material is socially constructed through the interaction between the researcher and the subjects, great care has to be taken to reduce biases. Self-awareness and self-reflection are essential. This includes an effort to be ‘part of the context’, a conscious effort to understand one’s own interests, one’s own judgements and the emotions they provoke. Important but difficult to understand and to detect, is the kind of conversation and behaviour the researcher induces in the participants. Similarly, there might be systematic ‘distortions’ in the narratives of the participants on certain

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2 A principle reflects a basic assumption and a standard to which a method has to comply. This is in line with the definition of a principle made by Rijsenbrij et al. (2002) in the context of ICT architecture. They define a principle as a fundamental idea to fulfil a general requirement.
topics as well. Therefore, the informants’ view cannot be taken at face value, but has to be questioned critically. Different data sources, data collection methods and views of different researchers should all contribute to minimise bias.

### 3.3 Research method and data collection tools

The research is based on literature reviews and case studies. The case study approach has been chosen because it provides a rich description of the “whole” (Yin, 1994). It is suitable for ‘how’ and ‘why’ questions where there is no control of behavioural events and the focus is on contemporary events (Yin, 1994). It combines quantitative and qualitative research.

Most case studies used in this thesis, are situated in sub-Saharan Africa and some in Latin America. Generally, for each research question, one or several cases are studied in depth and the findings are compared to other cases. All these cases deal with the introduction of ICT in a specific sector, like education, health, agriculture, etc. An exception is the...
second research question that is based on an in-depth study of one case of introducing ICT at organisational level, but also in a sector with little experience with ICT.

In this study, most data is collected in Tanzania as the PhD researcher is country programme manager since 1999 and for about five times per year for 10 to 20 days in the country. The advantage for the researchers is to be familiar with the local context and developments. The disadvantage is that the particularities of the country might have too much influence on the study. Therefore comparison with other cases is introduced. The researcher travelled as lead facilitator to other countries and was country programme manager for Burkina Faso and Mali as well till 2002. Most case material is based on two social service sectors – education and health – and on the agricultural sector (production, marketing and some agro-processing). Figure 3.2 provides an overview of the cases studied per chapter of this thesis and the relevant research question(s) involved.

The tools for data collection used in this thesis are briefly presented below. More detailed information is presented in the chapters concerned. Main data sources were closed-ended questionnaires, open-ended questionnaires, semi-structured interviews, in-depth interviews, direct observation, focus groups, desk studies, intervision and participatory observation.

The closed-ended questionnaires related to the following subjects: personal characteristics of participants in the RT process; project beneficiaries (e.g. rural-urban, knowledge level, income level, etc.); the quality of IICD’s support in project formulation or training, the process conditions and output of the RT workshop, and the impact of the ICT prototypes. Data collection and analysis was done independently by the monitoring and evaluation (M&E) unit of IICD. Open-ended questionnaires were used to collect complementary feedback to the closed-ended questionnaires; opinions of participants on the RT process, including on the interactive policy sessions; and to collect complementary feedback and opinions of users of the ICT prototypes.

Interviews were in-depth or semi-structured, but with ample room for the interviewees’ narrations. Interviews were noted or taped and transcribed. Interview data were analysed by both contextualization and categorization (Maxwell, 1996). During contextualization main messages and perspectives of interviewees were estimated by trying to understand their story as small case studies. To investigate the emerging themes, categories were formed and compared. Observant data relates to the RT workshops and interactive policy processes.

Focus groups were held once a year and lasted about one day. The focus group sessions were moderated by the M&E unit of IICD and local consultants. During the focus group sessions, each ICT prototype was represented by two or three staff members.

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3 The researcher handed over the programme management of the education sector as of end 2005 to the network officer.
of the project, and sometimes (end-)users of the ICT application. Ample space was
given to the participants to react to the findings of the M&E unit of IICD and to give
their views in small groups and plenary. The main objective was to learn together, to
understand why and how certain developments occurred and not to make judgements.
To avoid mutual influencing, ample use was made of structured rounds with ‘Post its’.
Group sessions for ‘member checks’ (Maxwell, 1998; Guba & Lincoln, 1989) were held
for restitution and to validate the findings of research questions 3a and 3b.

Desk studies included quarterly progress reports of projects, studies by consultants,
evaluation reports on activities, evaluation reports of IICD, reference reports as
preparation to RT workshops, reports of RT workshops etc. Intervision sessions as a
reflection by peers, were held with knowledgeable IICD staff on each of the development
cycles of the RT process. The sessions took about three hours each. During the sessions
judgement was suspended, hierarchy was not very important and learning through
dialogue was the aim. Facilitated by the researcher, ideas were ventilated without too
much mutual influencing.

Finally participatory observation provided more details, background and contributed to
the verification. Rich sources of information were meetings with the teams developing
ICT applications and network meetings of these teams. It allowed to get a better insight
in the behaviour and reflections ‘behind the regular pattern of interaction with donors’,
to get a better understanding of motives, of interpretations and contexts. It helped to
distinguish between espoused theory and theory in use (Weick, 1976). Biased selectivity
(Yin, 1994) was reduced through the length of the observation period.

The variety in data sets contributes to minimise biases. Different forms of validation
were applied:

1. Data triangulation. Comparing the different data derived from situated
   episodes of an actor and expressed in a certain format in a particular
   setting;

2. Methodological triangulation. Different research methods are applied to
   collect data on the same phenomenon, like interviews, questionnaires,
   participant observation etc;

3. Researcher triangulation. The involvement of various researchers studying
   the same phenomenon. This entails interviews by different interviewers,
   conversations/interviews with academically trained Africans, revisions of
   draft papers by peers especially the M&E unit of IICD, discussions with
   peers in the country team4 and intervision sessions at IICD.

4 The Tanzania team comprised besides the country programme manager, from IICD site an ICT expert/trainer,
who visited Tanzania with a frequency of about three or four times a year for about 10-14 days, a networking
officer who promotes knowledge exchange, who visits the country about three times a year for 10-14 days, and a
monitoring and evaluations officer visiting twice a year for about 10 days per visit.
3.4 Overview of case studies

The point of departure of the thesis is desk research on the principles of intervention as articulated during the establishment of IICD in 1996. Over time, these principles were filled in and enriched with those elements that seemed to contribute most to the RT process. By about 2001, the methodology of the RT workshop was more or less fixed and by 2004/2005, the methodology for ICT prototype formulation, implementation and integration at organisational level had fully crystallized. This archetypal RT process, as practiced around 2005, is used as point of reference throughout this thesis. However, scaling and integration at meso level took longer and is not yet fully clear by 2009.

To answer the first research question, substantial literature and desk research was undertaken, including an intensive exchange with IICD staff to find out opinions on what works well, what not and why. The desk research was complemented with the analysis of six cases in Burkina Faso, Ghana, Mali, Uganda, Tanzania and Zambia. The findings were verified against a number of other cases (see Figure 3.2). This yielded the principles on which the RT process is based. It represents the converging reflection and work practices within the organisation. This was completed and validated during two intervision sessions with IICD staff in 2005/2006.

In parallel a case study was conducted on an ICT project in Tanzania. This project was about the introduction of ICT to improve the functioning of the municipality of Kinondoni in Dar es Salaam, Tanzania. ICT was introduced by an external actor. After an initial failure, the approach was changed and it turned into a rare success story. The aim was to analyse the processes leading to ICT-based innovation in a development context at organisational level. The research was based on 10 semi-structured interviews, desk research, a Master’s Thesis on the cultural and political aspects of the project, two focus group sessions and participatory observation. Pre-empting on the findings of the thesis, the conceptualisation of the RT process (chapter 4) and the relevant innovation processes revealed in a development context (chapter 5), indicated a strong match with the approach of constructive technology assessment. This was incorporated in chapter 4.

The evaluation of the RT workshop drew on a rich set of quantitative and qualitative data, based on three in-depth case studies: Education in Tanzania in 2002, agricultural marketing in Mali in 2004 and health in Tanzania in 2005. All data collection methods were used. Most important data sources were: daily reports and feedback in a group setting at the end of the day’s session by about 2 to 4 observers, 86 closed-ended questionnaires, 75 open-ended questionnaires, 23 semi-structured interview with participants more than one year later, participatory observation, interviews with

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5 This refers to the core group most active with the RT process including Dr Stijn van de Krogt, Lisette Gast, Arjan de Jager, Francois Laureys, the author and more generally the members of the country programme team of IICD.
Figure 3.2 Overview of the cases studied per chapter and per research question
IICD country team members and local consultants and desk research. For validation, data were also used from closed-ended questionnaires of seven other comparable RT workshops held in Bolivia 2002 on Agriculture, Burkina Faso 2003 on Agriculture, Ghana 2003 on Agricultural marketing, Ecuador 2005 on (District) Governance, Uganda 2003 on Health, Zambia 2002 on Livelihood Opportunities and Zambia 2003 on Education. In addition qualitative data were used based on open-ended questionnaires for the above-mentioned RT workshops of Ghana 2003, Zambia 2003, and Burkina Faso 2003. It should be noted that the Bolivian, Ecuador and Uganda workshops were carried out by a different lead facilitator.

To evaluate the development and the outcomes of the RT process over a number of years posed some methodological challenges. One approach would have been to use surveys to assess a large number of RT processes and then compare the outcomes. A problem with this approach is that the RT process develops over a longer period of about four to seven years and is embedded in a particular social reality. Over this long time-span, other interventions, structural changes and contingencies might have a strong influence. This hampers comparison based on quantitative data alone. It is also not in line with the need for contextualization that was argued earlier. Therefore, an in-depth case study would be more appropriate. The ideal case should be based on a successful RT workshop, extending over a period of several years, with a minimum number of external distortions and readily accessible for the researcher. The introduction of ICT in the education sector – mainly in secondary schools and teacher training colleges – in Tanzania fulfilled these requirements. The RT process is evaluated over the period 2002-mid-2007. Most data collection tools were used, particularly semi-structured interviews, participatory observation and focus group sessions to understand the process. For the analysis of impact, the closed-ended and open-ended questionnaires of the M&E unit were important. Parts of the findings have also been compared with 12 other RT processes, again in sub-Saharan Africa and Latin America. Desk research, externally established evaluation reports, data of the M&E unit, participatory observation and intervisio were important for validation.

The study on scalability implied an analysis of the wider context and the effects of interventions undertaken. It was therefore also based on the case of introducing ICT in education in Tanzania. The main data collection tools used were participatory observation by two researchers conducted independently from one another, desk research, 15 in-depth interviews, and exchange with experts and knowledgeable informants. Figure 3.2 summarizes for each research question the type of research applied and the cases used.
Chapter 4

Conceptualising the Round Table process

4.1 Introduction

4.2 Research method

4.3 The Round Table process

4.4 Emerging principles
   4.4.1 System thinking
   4.4.2 Multi-stakeholder involvement
   4.4.3 Participation
   4.4.4 Ownership
   4.4.5 Dialogue
   4.4.6 Learning
   4.4.7 Facilitation and organisation
   4.4.8 Step-wise approach
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4.5 Comparison to other approaches
   4.5.1 Interactive and participatory approaches
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   4.5.3 Comparison with Constructive Technology Assessment (CTA)
   4.5.4 Rejected principles

4.6 Conclusion
4.1 Introduction

A starting point for this research was that successful implementation of ICT projects in developing countries is far from easy and straight-forward. Linear, top-down approaches to innovation have rarely resulted in sustainable development and adoption of ICT. Various evaluation studies revealed that explicit attention needs to be paid to the socio-cultural, political and institutional context in which the ICT application has to operate and that users need to become active participants throughout the project (Walsham & Sahay, 2006).

In this chapter we focus on a specific participatory approach, the Round Table process (RT process) developed by the International Institute for Communication and Development (IICD). The RT process is used to initiate and mainstream ICT at sector level, and is applied in nine countries in Africa and Latin America. The aim of this chapter is to systemise the experiences of the trial-and-error process of developing the method of the RT process. This means basically to identify its structure and guiding principles. A proper conceptualisation will enable to sharpen this tool and to evaluate its achievements more thoroughly.

4.2 Research method

The research approach can be characterized as a multiple case study analysis. Six cases were the RT process was applied, were selected for analysis. The six cases are situated in comparable African development settings and include the service sector education and health as well as the market sector. The cases include: (1) education in Tanzania, (2) economic development (especially agriculture and tourism) in Uganda, (3) agricultural marketing in Ghana, (4) education in Zambia, (5) agricultural development (especially marketing) in Burkina Faso, and (6) agricultural development in Mali. The findings of these cases are verified with twenty other cases – as far as possible – at different stages of development and for the different process interventions used.

Main information sources were:

- Internal documents and discussions related to the cases studied;
- Field experiences and in-depth intervision sessions;
- Feedback from participants;
- Participatory observation as the author became gradually responsible as facilitator of key parts of the RT process and from that perspective searched for the main design variables;
• External feedback through evaluation reports on the fulfillment of IICD’s mandate and the relevance of the approach.

An inductive approach in line with the Grounded Theory was followed to develop propositions on the possible underlying principles. The Grounded Theory approach requires the formation of categories to which incidents can be related. The formation of categories was based on internal documentation, participatory observation and existing theoretical insights. The constant comparison of incidents in the same category builds the theoretical properties of that category. These categories were evaluated by comparing them with case study data and by intervision.

The outcomes of the RT process were only assessed roughly at this stage of the research. The purpose of this research is to develop a framework for evaluation of the RT process. Data is checked on internal consistency. This inductive approach is concluded by comparing the results to findings from literature.

4.3 The Round Table process

In 1996, the IICD was established by the Dutch Ministry for Development Co-operation as an independent non-profit foundation. Its mission is to assist developing countries to realize locally owned sustainable development by harnessing the potential of ICT. In the search for a method to bring about relevant policy and projects in a participatory and locally owned way, IICD contacted Global Business Network (GBN). This group of ex-Shell managers and strategists, used scenario development as a tool for strategy development. IICD, GBN and a third sub-contracted group, Whole Systems, developed jointly a workshop called the ICT Round Table workshop. It consisted roughly of three blocs: scenario development, prioritization of leverage areas for change and project development. This was the beginning of the development of a full RT process.

The aims of the RT process are to stimulate innovation processes, to generate prototypes of ICT applications relevant to the system considered and to assure embedding of the innovation in the system. To this is added an objective of poverty reduction in view of the mission of IICD. The expected outcomes for the sector concerned include:

• ICT applications molded to local needs;
• increased speed of uptake of the technology, perceived as innovation processes in the local context;
• a conducive environment for the use of ICT;
• impact on poverty alleviation.

The outcome of impact on poverty alleviation is searched for by including representatives of the ‘poor’ in the RT process.
The RT process can be conceived as a string of interventions alternated by individual activities of prototype owners. A prototype is an early and typical example of a new ICT application in the local context. It is the most visible part of the innovation and a way of testing ideas and learning. Each intervention can be conceptualised in terms of the method(s) used and the guidelines for their application. Each method is based on one or more principles. A principle reflects a basic assumption and a standard to which a method has to comply. The principles will be described in the next section. The RT process consists of 35 interventions grouped into three development cycles (DC):

1. the RT workshop including its preparation;
2. prototype formulation and implementation;
3. embedding or integration within the local context (including scaling if appropriate).

The RT process is adapted to the local situation. Therefore the three phases and the 35 steps are an ideal-type only. Table 4.1 presents the main steps of the RT process.

The process intervention can be conceptualised as a sequence of cycles as depicted in Figure 4.1. The first development cycle is characterised by various preparatory activities guided by a steering committee, and a RT workshop with as major parts scenario development (Heeks, 2002), definition of leverage areas for change and identification of prototypes. Scenario development is experienced as a ‘strong’ method as it very well combines a number of principles of the RT approach. The second development cycle focuses on prototype development and is marked by individual coaching, expert advice to prototype owners, and joint sessions for peer exchange and training. Lobbying and awareness raising might also be an important part. In the third development cycle the emphasis is shifted to policy making and organisational and institutional development to enhance scalability. The methods of intervention, especially during the first development cycle, are well spelled out. The methods of the second development cycle need further refinement. For the third development cycle we are still experimenting, but on-going interventions seem promising. In Box 4.1 an example is provided of the RT process on education in Tanzania.

The RT process has been developed through trial and error. For example the first Round Table focused at national level with the intention to generate policy and projects across sectors. It was split into two parts, with a pause of several months in-between. This turned out to be costly and less effective. Working with a champion turned out to become easily too political or too ‘bossy or patronage”, thereby reducing ownership. Later on also the need for a proper preparation was recognised and preparatory workshops/sessions were introduced.

The emphasis on national level was less effective and the focus shifted to sector or sub-sector level. Discussions became more focussed and in-depth. Also the ICT prototypes
### Table 4.1 Main steps in the Round Table process (Ideal type as defined on current practices in September 2005)

<table>
<thead>
<tr>
<th>Development Cycle (DC) and step</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>DC 1 RT workshop (in detail):</strong></td>
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<tr>
<td>(a) Preparation:</td>
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<tr>
<td>1 Reconnaissance theme</td>
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<td>2 Initiation of a steering group</td>
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<td>3 Demarcation theme</td>
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<td>4 Selection of participating organisations and participants</td>
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<td>5 Development reference report</td>
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<td>6 Preparatory workshop/seminar for participants.</td>
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<td>(b) RT workshop</td>
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<td>7 Analysis current situation</td>
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<td>8 Scenario development</td>
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<td>9 Visioning</td>
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<td>10 Analysis of sectoral leverage areas for change with ICT</td>
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<td>11 Idea generation</td>
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<td>12 Setting priorities</td>
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<td>13 Prototype identification</td>
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<tr>
<td>14 Diffusion of results of RT workshop</td>
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<tr>
<td><strong>DC 2 Prototype development and implementation (summary):</strong></td>
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<tr>
<td>15 Engage organisation to commit to (prototype development) process</td>
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<td>16 Coaching of prototype owners</td>
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<td>17 Workshop on project formulation (only in two cases) (Note: The prototype is elaborated as a project. Terms are used interchangeable)</td>
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<td>18 Selective support by experts</td>
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<td>19 Workshop on basic ICT skills</td>
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<td>20 Workshop on ICT aspects of prototype development</td>
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<td>21 Regular meetings on progress, technical issues</td>
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<td>23 Peer review of project document</td>
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<td>24 Lobbying for co-financing</td>
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<td>25 Contract negotiations</td>
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<td>26 Team progress meetings and coaching</td>
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<tr>
<td>27 Awareness raising, training and some experimenting within project and direct environment.</td>
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<tr>
<td>28 Networking activities aimed at info exchange and peer learning</td>
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<td>29 Lessons learnt sessions (focus group meeting)</td>
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<tr>
<td><strong>DC 3 Integration (also called embedding) (summary):</strong></td>
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<td>30 Networking to support policy participation</td>
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<td>31 Sector policy development</td>
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<td>32 Project review and expansion/replication</td>
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<td>33 Reformulation of project or formulation for up-scaling/replication</td>
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<td>34 Formal integration into the strategy of an organisation and its structure</td>
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<tr>
<td>35 Network events for knowledge sharing</td>
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55
became more a kind of portfolio relevant to the development of the sector. Also the passage from scenario thinking to leverage areas and the identification of actions was smoothened. ICT was abolished as an important subject in scenario building and more attention was given to the main constraints and potentials of the (sub) sector. ICT was introduced as a means to help to realise the main leverage areas. The RT workshop itself was brought closer to the people by working with a national co-facilitator instead of a team of expatriates only.

Also the process of prototype formulation during and after the RT workshop was streamlined and better integrated with training and network events. Gradually the attention shifted to ICT policy development and the scaling of the prototypes and their integration in the sector. More speed and momentum was built into the process.

4.4 Emerging principles

Based on the experience with the different cases, a pattern of underlying principles can be observed. Defining these principles is key to evaluating and improving the RT approach. The case analyses and intervisio sessions point to nine principles on which the RT process is based: system thinking; multi-stakeholder involvement; participation; ownership; dialogue; learning; facilitation and organisation; step-wise approach; and networking. These principles are intertwined. Below they are listed and elaborated one-by-one.

4.4.1 System thinking

The principle of system thinking is central to the design and implementation of the RT approach. System theory is a general and broad approach (Krishna & Walsham,
2005). It underlies social-constructive approaches to change management. In these approaches social change is conceived as a complex process and an outcome of the interaction of social, cultural, political, economic and technological influences, with a priori the impossibility of defining a sole driving factor. System theory thus provides a holistic methodology. It enables the various stakeholders involved to make sense of their environments, the events and their actions, and to stimulate learning. It allows the development of individual or shared strategies related to innovation. This is even more important in an environment with stakeholders from strongly different cultural, political and economic backgrounds as is often the case in a low-income setting.

Box 4.1 The RT process on education in Tanzania

In 2002 the RT process started with a multi-stakeholder event in which students, teachers, headmasters and representatives of educational institutions and the Ministry of Education and Culture came together in the RT workshop for four days. Participants informed one another about developments in the educational sector, and subsequently developed scenarios on the future of the sector. Thereafter leverage areas for change were defined. The participants subsequently generated ideas on useful ICT applications in education. Ideas were discussed and the best were selected. Teams made up of one or two organisations elaborated their ideas and presented them plenary. The process aroused energy and enthusiasm among participants. Remarkably this was still mentioned by participants one year afterwards.

After the RT workshop some training sessions of two to four days were provided for the same participants; firstly on general ICT skills, and secondly on building small parts of an ICT prototype (e.g. web sites, databases and multi-media teaching materials). A short course was given on project formulation as well. Project teams further developed the ideas generated during the RT workshop. These ideas took the shape of ICT projects geared at service delivery (e.g. publication of education materials on the web, or websites for information dissemination or data collection). These projects were small scale; this made learning easier and less risky. After some time, up-scaling and revision took place. Some actions identified were related to ICT policy development for the sector.

IICD provided assistance to the project-owners and their teams through coaching, training and expert advice to develop the project and policy ideas into action plans. Assistance was also provided in finding funds for these usually small projects, ranging generally from US$ 40 000 to US$ 120 000. To enhance ownership co-financing was preferred, although often only time and existing facilities could be offered by the owner. Funding for these projects came from external donors or IICD partners and IICD seed funds. IICD monitored and coached during implementation. In conducting this programme, IICD collaborated with BDO partners (bilateral donors) and NGOs.

Networking events were organised regularly to exchange experiences on prototype development, to exchange relevant ICT developments, to discuss or develop joint initiatives (promotion, lobbying, etc.), and to provide feedback and lessons learnt extracted from project owners and end-users. This networking was completed by more general sessions organised by a local platform aiming at the exchange of ICT for development in general. During these sessions, ICT projects of all sectors were highlighted.

Seven ICT prototypes were implemented between the end of 2002 and early 2004 and an interactive policy-making process was initiated.
ICT is explicitly perceived in the RT process as a tool and not an end in itself. System thinking helps in finding meaningful applications. It is used in several ways and at different stages. Firstly, it is used in the design of the RT process by considering the system boundaries and the main actors to be invited; the combination of multi-stakeholder and conversation means ‘you bring the whole system into the room’. Secondly, it is used during the workshop through the tool of scenario building and the definition of the leverage areas, which generates the portfolio of prototypes. A nice example of the strength of scenario development as system simulation was in Ghana as a scenario including elements of poor governance was developed. Someone suddenly realised its meaning clearly and said a bit panicky:

“We have seen this before!”

System thinking is also the leading tool in guiding inquiries in the network and especially in the interactive policy-making process to arrive at scalability of desired ICT applications.

The main system tools are based on soft modelling. During the RT workshop this is embedded in scenario development and the concept of leverage areas for change. System thinking for discussions around specific topics is guided by the initial stages of group model building as used in system dynamics (Sterman, 2000). Value attribute analysis is a new methodology, comparable to soft modelling yet with specific features. It was used in interactive policy-making.

### 4.4.2 Multi-stakeholder involvement

The multi-stakeholder character is maintained throughout the process. It starts by consulting and inviting the key stakeholder of the system into the RT workshop. Multi-stakeholder involvement is highly appreciated as it provides a better understanding of one another’s role, particularly as some are end-users of applications. It also complements knowledge, and decisions are better informed, since all relevant points of view are brought up.

The importance to have all relevant actors involved in the process is illustrated well by the following case. During the RT workshop on agricultural marketing in Ghana, the marketing ‘madams’ were absent. These women largely dominate the market as middlemen. Due to some practical problems they could not participate. The facilitator did not insist as he wrongly feared too much conflict during the RT workshop and possible negative effects on trust between the participants. When during the RT workshop the controversial issues related to the marketing ‘madams’ were raised, the ‘sparkle of confrontation’ missed out. During another RT workshop the facilitator found himself separating parties (representatives of cooperatives and private traders) ready to start a fight. Multi-stakeholder events surface different interests that might
trigger a more in-depth conversation. It brings in confrontation between different interests. This has to be managed. The facilitator plays a mediating role and maintains transparency in the process.

If the participants of the RT workshop are brought together regularly, a network emerges as demonstrated by education in Tanzania, where prototype owners even tried to join in a consortium.

4.4.3 Participation

The RT workshop and other non-training events are largely participatory. Participants refer to the process as ‘extra-ordinary and extremely participative’ especially the RT workshop. Of course the facilitator influences through agenda setting: the choice of the theme and the organisations or persons to invite. However this is done in collaboration with a steering committee that comprises the most important actors related to the theme. Experience learns that the slightest manipulation or imposition and political agendas back fire. Openness on the own agenda as of the beginning is required and this agenda should be limited to the general results expected. During the preparation sessions of the workshop attention is paid to show examples in such a way that no biases are introduced.

Participation is required to elicit tacit knowledge, and to create ownership and networks. A main role of the facilitator is to assure that each participant speaks out and is heard. The right mixture of participants is therefore of utmost importance. It is a prerequisite for a ‘rich’ discussion. A number of participants are invited in view of their role as leaders of different organisations – including professional, NGOs and grass root groups – particularly their decision-making power, strategic insights and visionary capacity. Moreover they are capable to guide change. Senior staff brings in knowledge of operations and often are the project managers for the prototypes. Some participate in the role of users only. IT specialists and subject matter specialists are usually a tiny minority.

However, the real concept of participation is about sharing power. The usual hierarchy is temporarily broken down and all participants are equal. The facilitator thus influences the status quo of the power distribution, albeit only temporary. Real power change is caused by structural changes in the system as the relative position of the actors shifts and their inter-linkages increase. The ultimate meaning of the principle of participation is to accelerate institutional change so as to make the environment more conducive to producing generally desired results.

1 IICD internal evaluation report 2003.
4.4.4 Ownership

Ownership relates to own responsibility and accountability of actors. It implies nobody decides for you. Generally this is considered normal. However the weak position many actors are in, or a ‘culture’ of real or perceived dependency create strong dependencies. An example is a public school that might not feel free to use ICT on its own initiative without permission from the ministry, or leaves a gift of a box of books unopened for the same reason. This is why donors are not part of the RT workshop, even though some participants ask for it.

Ownership often implies empowerment of less dominant actors. Empowerment is provided in the RT process through information, knowledge, coaching and inclusion in events. This continues throughout the RT process up to the level of sector policy development. The support in working towards the development and implementation of a prototype is based on the fact that the owner and his team have the lead. Respecting ownership might mean that from a technical point of view a ‘less optimal’ solution is developed. This tolerance for the imperfect and the problems that might occur according to the ‘mental map’ of the facilitation team is a permanent tension. Emphasis on the principle of learning eases this tension.

As ownership is with each organisation, it is the facilitator who has to balance between organisations. Giving the ownership to one party only (e.g. in the case of ministry of education in Zambia) transforms ownership in dominance. Governance should be done progressively by the network. This means that the facilitator is relatively powerful in the beginning, but yields its power gradually to the network.

4.4.5 Dialogue

Another principle is conversation in the form of a dialogue. Dialogue contrasts with monologue (expert advice, lecture, etc.) and with discussion, which is more perceived as a game of ‘ping pong’, as well as with imposition through structural measures. In dialogue people become observers of their own thinking, which is a basis for learning (Kimaro & Nhampossa, 2005). Becoming conscious and being capable are keys in the theory of change to being fully competent (Bunders et al., 1999). The principle of dialogue is applied throughout the RT workshop and in group meetings thereafter. Expert sessions might occur during formal training sessions, but the tendency is to move to training through ‘hands on’ problem solving. Dialogue is also the main tool in coaching of the individual owners and their teams by the IICD country team.

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2 In this thesis, when the term ‘ownership’ is used, it refers to the broader definition, including the psychological, economic and legal aspects. The often used expression ‘sense of ownership’ refers primarily to the psychological dimension of ownership, leaving out the economic and legal dimensions.
The principle of dialogue risks being disturbed in case of smaller and weaker organisations. Their dependency on the facilitator might be strong, which results in a skewed relationship from a power perspective. However, if not carefully managed by the facilitator, this weakens the sustainability of the prototype. A situation not desired by both parties. A clear point of tension arises around the contract negotiations in case IICD finances the prototype. This is partly solved by clarifying the financing ceilings as of the beginning and urging for a sober style in budgeting. If possible, the self-confidence is reinforced by seeing other and more advanced prototypes working along the same guidelines.

4.4.6 Learning

Participants often mention learning as important in the RT process. Different types of learning occur. Most important seems to be experiential learning. The development and implementation of the prototypes is key in this respect. Networking, dialogue and feedback foster social learning. Learning based on lecturing seems less effective. An important distinction in learning for innovation is between single loop learning to improve current practise, and double loop learning in which new insights are developed (Heeks, 1999) and mental models\(^3\) are changed. It is these mental models that influence – consciously or unconsciously – decision-making and hence the processes undertaken by an actor. In double loop learning the assumptions, insights behind current practises are put in question. Double loop learning is about change and innovation and it is this type of learning that is stimulated in the RT process – firstly affecting the individual mental model, and through the individual the team, the organisation and ultimately the network. Scenario building is an important tool to this end.

4.4.7 Facilitation and organisation

Facilitation of the process is essential. It helps to focus attention, and allows participation and dialogue to be effective. The usefulness and quality of facilitation is clearly acknowledged in questionnaires after the RT workshop. Facilitation is needed to provide a ‘neutral setting’ in which the different actors can meet. The facilitator – being a ‘neutral’ outsider, yet knowledgeable in the field of ICT innovation – receives somehow naturally a mandate to bring parties together, to facilitate, and even to mediate between them. A personal impression is that actors appreciate to have a trusted party who bridges between them, because trust is often low in a development setting.

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\(^{3}\) Mental models “include our beliefs about the networks of causes and effects that describe how a system operates, along with the boundary of the model (which variables are included and which are excluded) and the time horizon we consider relevant - our framing or articulation of a problem” (Sterman, 2000). Mental models is a term often used in system-thinking, Slightly broader terms are mental frames or frames of meaning (e.g. Grin & van de Graaf, 1996).
The RT process is organised by one and the same group as a core. People understand it is an organised string of interventions. This gives a sense of purpose and helps to get attention. People are often ‘overloaded’ with all kinds of operational concerns and activities, both in work and private. An organised string of events means attention to the innovation and the realisation of prototypes. Owners are used to a one time ‘great workshop’. Their reflex is to go back to the usual after the workshop. An effective way to break this natural scepticism or passivity, is to show prototypes that resulted from other RT processes; after all “seeing is believing”.

4.4.8 Step-wise approach

The RT process is a step-wise approach or gradual approach, reflecting a view on how to manage change. The RT is a gradual process. An idea might be large, but what it means and how it works develops gradually. Designing a large programme as of the beginning has not occurred yet. This is only partly a consequence of the budget ceiling; it is mainly due to the way people are learning and develop a vision. Only when ideas/innovations are more mature – tried out successfully and can count on sufficient support – a large-scale programme might be envisaged. At organisational level this is reflected by the need to incorporate it into the strategy and operations of the organisation. Similarly at sector level the innovation has to become part of the policies and current practises. For example after seeing a number of prototypes functioning, hearing the positive experiences of other countries, and having a few people working on this consistently, the Government of Tanzania is designing a large-scale programme, with support of the Swedish Development Cooperation, the so-called e-school programme.

4.4.9 Networking

Networking as a principle means permanent interaction. It is required as innovations take place in networks (Krishna & Walsham, 2005; UN Millennium Project, 2005). Networking allows social learning and hence accelerates innovation. This clearly happens during the various workshops and meetings. In the annual evaluative session, participants indicate their appreciation of exchanging with other stakeholders, working together and ‘staying in touch’.

Another aspect of networking is political agenda building. It is a balancing act not to end up in advocacy. This occurs easily as change will always hurt some people. A position of ‘activism’ and transparency based on national objectives, seems the clearest stance for the facilitator, especially if a cross-sectoral reputation is built up. The best way to manage agenda building seems to be to create special multi-stakeholder sessions on ICT policy development in which more organisations can participate than the network members only.
A third aspect is governance, by which the network becomes the main facilitator of further innovations. Within the network leaders emerge. Driving forces for innovation are embodied in the actors who take the role of leaders and co-opt others in collaboration.

4.5 Comparison to other approaches

In this section we will compare the learning from our experiences to other interactive and participatory approaches as comparable approaches in ICT are limited (see chapter 2).

4.5.1 Interactive and participatory approaches

Looking outside the field of ICT for development, more literature can be found on the conceptualisation of interactive and participatory approaches. Swaans et al. (2006) conducted, amongst others, a literature survey on participatory approaches to agricultural innovation and found that they show remarkable similarity in what they consider as crucial principles for success. These include the central role of farmers; commitment to a shared vision; enhancing trust relationships; facilitating social and experiential learning; knowledge integration; enhancing coalition building; capacity development; and scaling out, scaling up and institutionalisation. Several of these principles largely coincide with the principles identified for the RT process, particularly those related to system thinking, ownership and participation, dialogue as a way of ‘knowledge generation’, a step-wise approach and learning.

Differences occur with respect to the following principles: coalition building, enhancing trust relationships and commitment to a shared vision. This seems to be due to the nature of the RT process and the pronounced multi-stakeholder character of the RT process. The RT process is geared to mobilise the initial energy of the stakeholders by developing prototypes that are relevant within the system. Consensus is searched for, but not at the expense of individual initiative. The underlying assumption is that for an effective innovation to take place, prototypes are required and knowledge internalised before a meaningful planning can take place that assures sufficiently national ownership. This is partly contradictory to the paradigm that only through planning and co-ordination beforehand, effective development can result. Paradoxically it seems the other way around; initiatives taken by participants should reflect their own interests. An innovation means value creation; in general the lesser the number of people who share in it, the more value can be appropriated and the easier the development of the prototype is. Linkages with other actors, such as end-users, regulators and suppliers,

4 Approaches may however differ in their emphasis and interpretation of the different principles.
are required. Coalition building generally occurs in sub groups, but it depends on the specific sectoral and cultural setting. Also trust might be more difficult to enhance over time. Trust is helpful, but above a minimum level not essential. It turns out that the extent, to which the interests of the actors are served, is more important. On this basis (temporary) coalitions emerge. Similarly shared vision is perceived as less important. In one RT workshop the shared vision was replaced by selecting common themes arising from the scenarios and to examine the possible role of ICT in it. People do not refer much to a shared vision. Mostly mentioned is the positioning of their own ideas and having the possibility to pursue it. The multi-stakeholder character is required for elicitation of knowledge, effective coalition building and optimising win-win possibilities, setting the stage for embedding and legitimating.

4.5.2 Comparison to a system-based approach like Future Search

The RT process also has similarities with other ‘system-based’ approaches, such as Future Search (Weisbrod, 2004). Future Search also emphasises having the ‘whole system’ in the room, dialogue, learning, etc. However it puts more emphasis on searching common ground and personal networking, and seems to be weaker in experiential learning and developing ownership. The RT approach is also more explicit in the follow through. Other approaches developed from an ICT perspective have not been encountered in the countries of the case studies over the period 2002–2004, except some methods for detailed design.

4.5.3 Comparison with Constructive Technology Assessment (CTA)

CTA has been developed on the premise that technology is socially constructed. Therefore it should be possible to ‘steer’ technology in society in socially desirable and ‘successful’ directions; maximizing the positive and minimizing the negative impacts (see chapter 2.4). Changes can be made in the decision-making process so as to influence the outcome – the technological product, in this case the ICT-based innovation. To organise the processes that make up CTA, five categories are distinguished (Broerse, 1998). These broad categories overlap as the processes involved are interlinked and iterative. The five broad categories are:

1. Social conditions or Infrastructure: creating a participatory infrastructure, where all relevant stakeholders can meet, exchange and progress with the CTA process.

2. Step-wise approach: moving gradually and iteratively from problem analysis and visioning to ideas, decision-making and action.

3. (Social) Learning in participatory processes includes three types (Irvin & Stansbury, 2004): (a) substantive learning, (b) procedural learning and
(c) reflexive learning. Substantive and procedural knowledge are also called single loop learning (Kolb et al., 1991). Reflexive learning might lead to so-called double loop learning and contributes to sense making. This is about the ongoing retrospective development of plausible images that rationalise what people are doing (Weick, 1999).

4. Societal agenda development and decision-making includes mutual and well-functioning adjustments between actors, collaborative decision-making and agenda setting for policy-making.

5. Communicative actions is a new category (Decker & Ladikas, 2004), with the function to inform better, a wider, but concerned audience on the CTA process and to stay in ‘touch’ with actual developments in society, science and technology.

The core of the RT process is to come to collaborative decision making on the technology development process by the relevant stakeholders, subsequently followed by a broadly supported implementation process. This implies intertwined processes of learning, power sharing and negotiation, much the same as in CTA.

The principles of the RT process put some more emphasize on the creation of the social conditions (‘the infrastructure’) for CTA than on the contents of the processes. The general characteristics of CTA and the RT process are compared below in Table 4.2. Looking beyond the obvious semantic differences, there are some differences. The system approach is clearly a part of the RT process in terms of the choice of the theme to deal with and the tools used in the process. Also ownership is marked distinctively in the RT process perception but is not an explicit concept in CTA. This might be due to the RT process’ focus on a development context. The way ownership comes about will be elaborated in the next chapter on the Kinondoni study (chapter 5), but it should be noted that ownership is an outcome of learning, sense making and idea generation. Sense making is different from decision making. It is about setting the frame within which decisions are made. It is a continuous process of an individual in a certain role of creating a mental frame to incorporate cues. It is about the plausibility as constrained agreements with others and enactments that help to get a better grasp of the sense it makes (Weick, 1995, 1999), in this case ICT. The two concepts of system approach and ownership are further elaborated in the following chapters and will be the subject of discussion in the last chapter of this thesis (Chapter 9, Synthesis and Reflection).

The concept of networking as a principle covers both creating and maintaining the social conditions for CTA and political processes as alignment, collaborative decision-making and agenda setting. Change management and institutionalisation are recognised as important in the RT process. They were perceived as a part of the learning and capacity building and especially of networking at organisational and
## Table 4.2 Comparison of CTA and the RT process

<table>
<thead>
<tr>
<th>Main categories of processes constituting CTA</th>
<th>Processes that constitute the Round Table Process</th>
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<tbody>
<tr>
<td>I. Infrastructure (processes to create the conditions for substantial CTA processes to happen)</td>
<td>Multi stakeholder (the whole system involved)</td>
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<tr>
<td>Relevant stakeholders involved (the whole system involved)</td>
<td>System thinking</td>
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<tr>
<td>Participatory</td>
<td>Participatory</td>
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<tr>
<td>Exerting drive</td>
<td>Not mentioned</td>
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<tr>
<td>Ownership</td>
<td>Ownership</td>
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<tr>
<td>CTA agent(s) providing organisation and facilitation</td>
<td>Organisation and facilitation</td>
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<tr>
<td>II. Gradual development (step-wise approach)</td>
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<tr>
<td>Joint problem analysis and visioning prior to agenda setting and implementation</td>
<td>Step-wise approach. Scenario analysis and visioning precedes idea generation and the experimentation through the development of evolutionary prototypes.</td>
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<td>Idea generation</td>
<td>See above</td>
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<td>Experimentation</td>
<td>See above</td>
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<tr>
<td>III. (Social) Learning (processes that relate the ‘Mental Frames’ to the innovation)</td>
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<tr>
<td>Substantive and procedural learning</td>
<td>Learning (single loop learning)</td>
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<tr>
<td>Reflexive learning and sense making</td>
<td>Learning (double-loop learning)</td>
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<tr>
<td>IV. Societal agenda development/Decision making (processes that realise and integrate the innovation into the organisation and sector)</td>
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<tr>
<td>Alignment (networking, negotiation and coalition building)</td>
<td>Networking (as permanent interaction and hence a part of the social conditions for the RT process, but also for alignment to come to joint actions and for agenda setting. Collaborative decision making is implied in the methodology and the concept of networking.)</td>
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<td>Collaborative decision making</td>
<td>See above</td>
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<tr>
<td>Agenda setting and interactive policy making</td>
<td>See above</td>
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<tr>
<td>Managing change</td>
<td>Recognised, but not elaborated separately</td>
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<tr>
<td>Institutionalisation</td>
<td>Recognised, but not elaborated separately</td>
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<tr>
<td>V. Communicative actions (communication with most members of the system concerned (organisation, sector) to create acceptance and to remain related to ‘reality’)</td>
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sector level (including interactive policy-making). The importance to recognise change management and institutionalisation more explicitly was a finding of the case study presented in next chapter. Finally, communicative actions are covered in the RT process, but not in a very structured manner. Changing that will be part of the recommendations resulting from this study.

In conclusion, the RT process can be regarded as an operationalisation of CTA.

4.5.4 Rejected principles

In analysing the experiences also some principles were rejected. A point in question is ‘resource provision’, as IICD often provides its partners with some seed funds. Although it stimulates the RT process, it is not considered a principle, because in some cases owners search their own resources. Even without receiving IICD financing the RT process is appreciated by owners. As one participant said:

“It does not matter whether the project is realised, this learning experience is very important; doing something on our own”.

Providing only some seed funds has the advantage that participating just for the sake of having resources is not interesting, as the own contribution – mostly in time and hence income opportunities foregone – is too large. Nevertheless a scarcity of resources is a constraint that reduces slightly the number of prototypes realised. The main constraint is institutional blockage as national and donor funds are only available for larger programmes and embedded in the standing policies. Small and innovative prototypes do not easily fit that category. But ideally the RT process should lead to the reallocation of resources.

4.6 Conclusion

We identified the main rules or principles underpinning the RT process that are essential for its success. The RT process takes place over a number of years. The whole process of building prototypes, capacitating staff, inducing organisational and management changes eventually result in institutionalisation. Policy development, as a means to assure integration at sector level and a more conducive environment, is a particular point of the RT process. As experience with the RT process grows there is a tendency to initiate and boost the embedding process earlier and in parallel to prototype development.

Also change management approaches, like Future Search, are based on principles that largely correspond. It confirms the validity of the RT process. The nine principles largely correspond to other interactive approaches practised for agricultural innovation, especially the interactive learning approach as described by Swaans et al. (2005) and by
Broerse (1998). These approaches are based on Constructive Technology Assessment (CTA) as well. A closer comparison between CTA and the RT process indicates that the RT process can be regarded an operationalisation of CTA. This argument is further developed in this thesis.
Developing ICT in Kinondoni municipality; a study on innovation processes

5.1 Introduction

5.2 Research method

5.3 Description of the Kinondoni project
   5.3.1 Administrative situation
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5.4 Findings
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5.5 Discussion

5.6 Conclusion
5.1 Introduction

In this chapter, we describe and analyse a rare success story on ICT for governance. The project is located in Kinondoni Municipal Council (KMC). KMC – with about 1.1 million inhabitants – is one of the three municipalities of the city of Dar es Salaam, Tanzania (census 2002). The project started in 1999, and in 2006, the project was fully embedded. The ICT applications are currently financed through the municipalities own resources and pursued actively by the council and the executives. The applications include e-mail, internet, management information systems on health, education, internal loans, licences etc. and GIS applications for land tax purposes. The objective of our case study is to identify the main processes that have contributed to the success of the Kinondoni ICT project. This study should provide an answer to the second research question as what are the relevant processes that lead to ICT-based innovation in a development context.

The development and implementation of an information system is perceived as an innovation in the local context. The nature of the innovation does not concern so much the artefact (e.g. innovations in ICT hardware), but rather the social processes enabled by the artefact, the so called ICT-based innovation. As mentioned in chapter

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2, the innovation process is a highly complex social set of activities, which can be conceived as an iterative, spiral process resulting from the interactions of a number of actors. This implies that not only technical, but also social, organisational, political, economic and cultural factors influence the development of technological innovations and the outcomes of technical change.

CTA intends to provide both a descriptive and a prescriptive model of successful technology development. The main categories of processes that constitute CTA have been spelled out in the previous chapter (Ch 4.5) and are summarised in Table 5.1. The question is to what extent can the processes implied in CTA be considered relevant to explain the outcomes in the Kinondoni project? But we are also interested to investigate whether additional processes can be identified. In short: what are the relevant processes that lead to ICT-based innovation in a development context? The CTA approach is, as a prescriptive model, often criticized as being too broad. The analysis of case studies, such as the Kinondoni project, could lead to a more mature CTA approach that can more adequately guide innovation processes as implied in technology development processes. The case study should reveal the CTA processes as it is a heuristic to bring about innovation. The measurable result should be the strategic decision to realize the ICT-based innovation and its broad acceptance and use.

This chapter starts with a description of the research methodology. The Kinondoni case is introduced through a chronological overview of activities and achieved results. The next section presents the findings on the main processes that have been identified as success factors of the Kinondoni ICT project. In the final section, the conclusions, limitations of the study, and further research questions are elaborated.

### 5.2 Research method

The case study approach was used to analyze the Kinondoni ICT project. Concepts or categories of possible success factors or processes were developed based on the aforementioned conceptual framework (Table 5.1). The categories were compared to data obtained through interviews, direct observation and documentary analysis. Data collection covered the project from its inception in 1999 until 2006.

Ten semi-structured interviews with main players and users of the ICT innovation were conducted end of 2004. Interviewees included the executive director, the deputy mayor, the IT manager, three heads of services and four staff members. The interviews covered the following questions: What made the ICT-based innovation happen in Kinondoni? What were underlying processes? What was important to the success or failure of these processes? During the interviews, the categories (from our conceptual framework) were explored in an organic way and new ones were generated if interviewees mentioned other features or incidents they considered important. The interviews were processed
in a programme for qualitative data analysis and broken down in segments that were
categorised. The constant comparison of incidents mentioned by the interviewees in
the same category build the theoretical properties of that category (Glaser & Strauss,
1967).

A rich source of data was direct observation by the researcher. He acted as coach and
practised ‘hands-off’ management to the Kinondoni project. Although observation
is likely to have led to more subjective and biased results, it also provided additional
research opportunities as there was a good rapport with the actors involved (e.g. per-
sonal experience and access to tacit knowledge) that might be missed when restricting
to more objective and retrospective research methods. However, it is important for
enhanced validity to combine this method with other research methods, such as
documentary analysis and interviews (triangulation).

An important source of documentary analysis was, besides project documents and
minutes of meetings, monitoring and evaluation surveys that were conducted by the
project sponsor IICD on an annual basis. IICD employs an independent monitoring
system based on interviews with users and project participants conducted by an external
researcher. Findings are presented to the project team during a feedback meeting. In
addition, the results of a study on cultural and political processes in the Kinondoni ICT
project during the pilot phase, conducted by a master student of the VU University
Amsterdam, were used (Rozendal, 2002). The study was based on participatory
observation and interviews. Further validation was obtained by discussing initial
findings of the case study with senior staff and experts involved in KMC. In addition,
the Kinondoni experience was subject of a three-day workshop in May 2005 to share
the experiences of Kinondoni with 14 other municipalities and districts.

5.3 Description of the Kinondoni project

The project idea for ICT in Kinondoni was born in 1998 during the National ICT Round
Table in Dar es Salaam organised by the International Institute for Communication
and Development (IICD). At that time ICT was in a very early stage of becoming of
interest to Tanzanians. In political and government circles the interest was very limited
or not existent. Most donors were negative on ICT; some called it “toys for the boys”.
However, the director IT of the Tanzanian Commission on Science and Technology
(COSTECH), perceived ICT as a possibility for development during the fore-mentioned
ICT Round Table workshop. Based on his knowledge and access to Kinondoni, where
his wife was district commissioner, he developed (with a consultant) a proposal for
the use of ICT in district governance. The project was small with only US $ 38 000
financed by IICD. It lasted from early 2000 till late 2002. In this section we present a
short description of the administrative situation in Kinondoni, followed by the pilot
project and the limited results it yielded. Then by 2003 a turning point was witnessed. The main events are presented chronologically and a narrative account of the results is provided. It is against this background that the main processes leading to the results are analysed in the next section.

5.3.1 Administrative situation

The administrative situation of Kinondoni in 2000 was poor. To sketch the situation: paying land tax was very time consuming, and it was almost impossible to retrieve data on land titles. This problem applied to many fields, including education and health, for which limited and often unreliable data was available. Files were stockpiled against the walls in crammed offices or somewhere in a lost corner. Management was generally ad hoc, reacting to an endless stream of problems, urgent demands and high level urgent interventions, which disrupted the workflow and turned planning into a real challenge.

By late 2000, the district Kinondoni was transformed in Kinondoni Municipal Council (KMC) – an autonomous body, governed by councillors, both elected and nominated, and chaired by the mayor. KMC is divided in 27 wards and 127 urban locations. The Municipal Director oversees the executive staff consisting of about 4500 persons distributed over the usual departments of a municipality. This transition from district to council is supported by the Government Reform Programme that started in 2001. It aims, through decentralisation and other measures, to improve the efficiency and quality of services provided to citizens. For a more transparent handling of government finances the use of a software package is imposed by central government. Some organisational restructuring and rationalisation of staffing made it possible for councils to get some quick wins in efficiency and revenue collection. The councillors exert a strong influence in the municipalities. Although decentralisation is the policy, the central ministries are reluctant to give up power and to shift to a role of policy making and monitoring.

5.3.2 The pilot project 2000–2001

The project sought to innovate in information management through bottom-up driven data streams as opposed to the general applied top-down approaches. Bottom-up means that for example a school generates simple management data (e.g. number of students, study results etc.) for its own purpose and as a spin off sends data to municipal level. The project covered the headquarters and three wards. Two prototypes would be developed one on health and one on education. Information on health and education would primarily originate from these three wards and be transmitted by email to the Kinondoni host computer. Part of the processing and creation of sectoral data was
expected to be done at two of the computers at headquarters and the health node at Mwananyamala hospital. Consolidation of information from the sectoral nodes would be done at the LAN host computer, which was also performing the function of an Internet server for the network. A third prototype on the registration of birth, marriage and death would use information that originated from the registration office at the headquarters. It was not realised, but a loans and a business license data base were created later on in stead. Technical solutions for the prototypes were simple, but worked out completely different for health than for education. For health, a bottom up approach was undertaken starting at a dispensary. A consultant was involved, who also developed the national health management information system (HMIS). In stead of actively involving the users, the expatriate consultant took the lead and ignored their needs. The prototype turned out to be of no use. In a later stage it was redone by a Tanzanian consultant in a more participatory way. The end product was a good balance between the interests of the health facility and the information needs of the municipal health authorities. Presently this programme is scaled up at a number of health facilities throughout Tanzania.

For education the needs of the user were better accommodated and the data base was better used. Again it served both the needs of the municipal authorities as well as the schools. It even helped the municipal education officer to win a major dispute with a number of councillors on who should oversee the construction of new schools. The transparency of her ICT-based simple administration was the decisive factor for the Minister of Education who had to settle this dispute. However, efforts to come to a redesign of information flows were hardly successful and the emphasis shifted to the computerisation of existing data flows. Only later redesign became possible.

Two types of training were provided. For the IT staff, training was provided outside KMC and along with other ICT practitioners. The training was rather tailor made. For the users the training was done at the computer lab of COSTECH. Classes were given at a suitable hour for the staff. Some liked to be trained in this field; others needed ‘a gentle push’. The COSTECH officer came to their offices and invited them to come to the classes. Transport was provided as well as an afternoon tea. In total, over 100 employees and 44 councillors were trained and were reasonably conversant with computers. The project was aimed at sensitising government officials at all levels in the municipality, from the ward to the top municipal officers, on the use of ICT. In addition, some key personnel would be trained on data collection and processing using computers. It was anticipated that through the impact and experience gained from this project, another bigger project would evolve that would cover the entire municipality. Although the project was appreciated and warmly invited by the commissioner, the executive director and the mayor, support was limited to lip services only. After a reasonable start the project slowed down. Computers were used, but primarily for word processing and spreadsheet applications. Two small prototypes and a website were
functional, but only used by a small group and of limited quality. Key implementation problems were attributed to:

- Suspicion; ‘Are COSTECH and IICD not computer vendors? What is their agenda?’

- Lack of ownership by KMC and confusion on who is managing. Most technical and management activities were done by a COSTECH team, which contributed to alienation. Operational pressures and staff shortages made management “hands off” and irregular.

- Some theft occurred and it took time to replace.

- Setting up of connectivity got strongly delayed.

In 2001 a workshop was held at COSTECH for a representative group of Kinondoni staff to review the project. Some allowances were paid in that case. However this joint review did not generate the ownership and enthusiasm wished for.

5.3.3 The follow-up programme as from 2002

By the end of the pilot project the IICD programme manager took steps in order to develop a follow-up to the project and in consultation with KMC a new line was set out. The emphasis was put on a participatory process approach to be guided by KMC. As of that time all meetings and workshops were organized at KMC at their regular terms. The starting point of this process was a multi-stakeholder workshop in February 2003 that included about 70 participants. Local consulting ICT firms, KMC Councillors, Heads of KMC Departments and Ward Executive Officers attended the workshop. The agenda included a review of the experiences and the lessons learnt as well as joint steps to set up a strategy for ICT in Kinondoni. Thereafter a team of consultants elaborated a strategic ICT plan that was adopted by November 2003.

The strategic plan formulated ten themes including health, education, human resource management, customer relations, GIS for increased revenue collection, etc. Finance was included, but this largely consisted of taking up a compulsory top-down driven, nation-wide public finance system. Each theme was elaborated in an operational plan by a user group headed by a co-ordinator and technically assisted by a consultant. By early 2005 the operational plans were discussed, adapted and endorsed.

Results include the development and use of data bases on land titles (a GIS application), business licenses, municipal assets, loans, education and health (see Table 5.2). Implementation is mentioned by KMC staff to be easy as all groundwork has been done through the other processes. However the regular problems of the municipality, which are largely imposed by the environment, slowed down the implementation process. Problems include staff turnover due to transfers, external interferences, such as last
minute urgent data requests, and the local custom of taking a considerable amount of time for meetings. After the 2006 elections, an urgent need was felt to finalise the digitization of the land titles, which meant a temporisation of the further development of other applications.

Apart from the website, implementation is oriented to the improvement of internal processes. Reaching out to the public is still a second priority. The strategy foresees the implementation of a customer relation system, allowing tracking inquiries and complaints of citizens. Delivery of services through the web (e.g. application forms for licenses) is another service prepared for.

As a part of the regular IICD monitoring and evaluation a survey was undertaken in 2004 among 22 staff members of which eight administrative staff, twelve technical staff, one support staff member and one teacher. Most of the staff members (86%) followed tertiary education. 55% of the interviewees were female. Of the interviewees 64% was between 31 and 40 years. The findings of the survey indicated a strong overall satisfaction by higher educated staff who use ICT in their daily activities. In general staff insists on more facilities, while the actual number of computers have increased. The project is reported to have a positive impact on decision-making, the contents and timeliness of reporting, transparency and productivity. At a personal level, it is experienced as motivating, enlarging skill levels and broadening horizons. It increases social esteem and earning opportunities. A negative aspect mentioned is the danger of retrenchments as some fear the computer will take over their job. It is expected that increased transparency with less opportunity for corruption is perceived by some as negative.

The results achieved by KMC are firm. They are far ahead of the two neighbouring municipalities that operate in comparable circumstances. Both municipalities have sent staff to KMC to ask for assistance. Similar requests came from the cities of Mwanza, Mbeya and Moshi. KMC also attracts many visitors. It won an award for being the best ICT project of Tanzania in 2003. It should be noted that in KMC the centrally

<table>
<thead>
<tr>
<th>Applications in use:</th>
<th>Standard software and databases solutions in use:</th>
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<tbody>
<tr>
<td>Education information system and database</td>
<td>ArcView GIS 3.2 for spatial data handling processes</td>
</tr>
<tr>
<td>Health management information system</td>
<td>LISCAD for survey computerisation and processing</td>
</tr>
<tr>
<td>Stores and asset registrar system</td>
<td>MS Office applications</td>
</tr>
<tr>
<td>Loans database</td>
<td>MYSQL as database platform</td>
</tr>
<tr>
<td>Local Government monitoring database</td>
<td>Linux for mail server</td>
</tr>
<tr>
<td>EPICOR based financial management programme</td>
<td></td>
</tr>
<tr>
<td>(implemented through Local Government Reform Programme)</td>
<td></td>
</tr>
<tr>
<td>Land title information database</td>
<td></td>
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<tr>
<td>Business license database</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Hardware includes:</strong></td>
</tr>
<tr>
<td></td>
<td>Database server, Mail server, Application server</td>
</tr>
<tr>
<td></td>
<td>More than 80 computer sets incl. UPS</td>
</tr>
<tr>
<td></td>
<td>4 printers, 1 firewall, hubs, switches and network facilities</td>
</tr>
</tbody>
</table>
imposed financial software package is installed and staff is trained already for some years, but it was not operational yet in 2005.1

In June 2005 a workshop was held to replicate the Kinondoni experience. Teams of directors and senior officials of 14 municipalities and districts participated, including the Presidents’ Office. It was done fully by Tanzanians with some input of the first researcher as one of the facilitators, and further taken up by the Presidents Office. A previous version of this chapter was part of this workshop.

The timeline of the project is presented in Table 5.3.

### 5.4 Findings

The analysis of the experience over the whole period 1999–2006, points to processes that account for the success. The various elements of the conceptual framework were all but one, identified as factors/processes contributing to the success of the Kinondoni ICT project. However, we also identified some additional factors/processes: the importance

<table>
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<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>1998 June</td>
<td>National ICT Round Table held, project Kinondoni identified</td>
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<tr>
<td>1999 May</td>
<td>Feasibility report prepared</td>
</tr>
<tr>
<td>1999 November</td>
<td>Size of project strongly reduced in view of finance available</td>
</tr>
<tr>
<td>1999 December</td>
<td>Contract signed between COSTECH and IICD and official launching of project</td>
</tr>
<tr>
<td>2000 February</td>
<td>Kick off meeting with heads of department of Kinondoni (KMC)</td>
</tr>
<tr>
<td>2001 March</td>
<td>IT Manager recruited at KMC and was also appointed as co-ordinator of Local Government Reform Programme</td>
</tr>
<tr>
<td>2001 January</td>
<td>KMC was transformed from district into a municipality</td>
</tr>
<tr>
<td>2001 June</td>
<td>Lessons learnt session on the first phase of the project at COSTECH</td>
</tr>
<tr>
<td>2003 February</td>
<td>Multi-stakeholder workshop at KMC to discuss the role of ICT at KMC</td>
</tr>
<tr>
<td>2003 November</td>
<td>Development of a strategic plan agreed</td>
</tr>
<tr>
<td>2003 November</td>
<td>Workshop to review the strategic plan. Strategic plan approved and budget allocations for ICT increased at KMC.</td>
</tr>
<tr>
<td>2004 February</td>
<td>Formation of a team to make the strategic plan operational. Development of the idea of user groups.</td>
</tr>
<tr>
<td>2004 March</td>
<td>Training IT staff on databases</td>
</tr>
<tr>
<td>2004 September</td>
<td>Start of user committee meetings</td>
</tr>
<tr>
<td>2004 December</td>
<td>First draft operational plan</td>
</tr>
<tr>
<td>2005 April</td>
<td>Review and adoption of the operational plan</td>
</tr>
<tr>
<td>2005 April</td>
<td>Full implementation strategic plan in KMC</td>
</tr>
<tr>
<td>2005 May</td>
<td>Replication workshop for other districts and municipalities in Tanzania</td>
</tr>
</tbody>
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1 It became operational in 2007.
of building up and ‘exerting’ drive, prototyping, the active management of change, and
the process of institutionalisation. Below all identified processes are elaborated one by
one. We describe how these processes manifested themselves, how they worked out
practically and which aspects were considered most significant.

5.4.1 Relevant stakeholders involved in the innovation process

The involvement of Kinondoni staff in the conception and implementation of the pilot
project was limited. In fact the idea was gently imposed to them by the IT director of
COSTECH, whose wife happened to be the district commissioner of Kinondoni at
that time. Together with the fact that IICD was willing to finance the project made it
accepted by KMC. Yet stakeholders needed a ‘gentle push’ to participate. Developments
took a turn when the follow-up programme was initiated and COSTECH and IICD
started to act as CTA agents. This started off with a multi-stakeholder workshop
held in February 2003 with the purpose to define the follow-up of the pilot project.
The workshop regrouped all relevant stakeholders, including councillors and each
group the majority of the members of that group were present, except for less senior
and junior staff members who only had representatives involved chosen by the CTA
agents (COSTECH and IICD) in concertation with KMC. This was made possible by
the nature and status of COSTECH as an official agent to the development of new
technologies and the role of IICD as an advisor and donor. Having representatives of
all parts of the system involved in the innovation process proved essential, not only
for social learning, but especially for alignment as set forth in section 5.4.10 below. An
omission was that no citizens were directly involved; the argument was that councillors
were representing them.

5.4.2 Participatory

During the pilot project participation was more symbolic with little effective influence
on the course of the project. This took a turn with the follow-up programme. This
started with a workshop in February 2003. This workshop was set up and conducted
in a participatory way, i.e. the workshop settings created temporary and artificially
some power sharing (Arnstein, 1969). The facilitators (COSTECH-IICD) limited
power differences by enabling all participants to speak out and by pressing for joint
decision-making. It implied an indifference of the facilitators towards the output of
the RT workshop (Rowe & Frewer, 2000). The workshop was perceived as a different
setting by most participants, allowing for other than usual contacts and conversations.
The ingrained power relationships were affected by the joint decision to use ICT
and, in the aftermath, by a relative delegation of power to the IT team and the user
committees that were set up as a vertical cross section in one functional domain e.g.
education. These user groups were mandated to approve the plans and they exercised
this power. Their active participation and contribution is in line with the observation of von Hippel (1988) of users as important sources of innovation. Another aspect often implied in participation, but in essence a different concept, is dialogue – a free flow of meaning that allows tacit knowledge to become explicit. Trust, or at least an absence of mistrust, is a basic condition for a meaningful dialogue. Workshop procedures and facilitation paid explicit attention to assure dialogue, yet it was unclear to what extent it was experienced by the participants.

5.4.3 Exerting drive

Although the general idea of an ICT project was accepted at the start of the project by the management of KMC, their lack of ownership made progress difficult. Consequently integration of the project in KMC could easily lead to failure as indicated by various interviewees. This is illustrated by the following incident. The IICD programme manager expected to have about two hundred thousand US dollar available by early 2002. If Kinondoni could develop a project proposal, it could easily qualify for an expansion project. This was communicated in a meeting to the executive director, representatives of councillors and representatives of staff. Although everybody understood the message – there was response at that time – a proposal never came. Ownership strengthened somewhat as KMC became fully responsible for the infrastructure and could get the computers transferred to their own premises from the district commissioners’ office, where most equipment was installed by COSTECH. But progress remained slow. Exerting drive of external partners might be useful, but is insufficient. Some internal drive is required to initiate the CTA process.

In KMC the drive of the IT manager and the support for ICT by the municipal director were frequently mentioned as a cause to make the ICT innovation happen. The IT manager is a new appointment of relative junior status. For him the use of ICT was like a dream come true. In his former job he experienced the strong possibilities of ICT for governance and he wanted to realise this. A characteristic quote is:

"I try to convince people that computers are not temporary solutions and that they will become an integrative part of the organisation."

So the drive went with a vision, because at that time (2000) people saw computers as a temporary project only, or at most a minor tool in the organisation. It was his drive that made it possible to take the risk and speak to the councillors about the possibilities of ICT. Within the cultural setting this is not common for a relatively junior staff member. The municipal director initially considered computers as typewriters. After training and interaction with COSTECH, he realised the larger potential for the governance of Kinondoni, to the extent that he considered it critical to his mission. So gradually he started to promote ICT consistently and to provide sufficient positive stimuli for the IT section. It should be noted that many centrally directed reforms were ongoing in
KMC and none of them contained ICT, except the financial system. Most donors and their technical staff considered a wide use of ICT for Governance not feasible. But the IT manager and the municipal director held on to the idea 'to take ICT seriously'. The drive exerted by these persons is often mentioned by the interviewees.

‘Exerting drive’ reflects a deep belief in an idea and a strong commitment. All organizations with a good record for innovation foster individuals who can exert drive (Tornatzky & Fleischer, 1990). ‘Exerting drive’ is a concept that overlaps with leadership in terms of vision and determination, although ‘drivers’ are not always in positions of formal authority. It should be mentioned that the mayor, a former manager of the KLM airways company and accustomed to the effective use of ICT, was supportive, but a relatively less active ‘driver’. All together three core players and the CTA agents were able to exert drive for over four years, until ICT were broadly accepted and ‘owned up’ by the organization. Exerting drive was essential to keep the CTA process going, but by itself not enough.

5.4.4 CTA agent: organization and facilitation

CTA agents are ‘mobilizers’, advisors and change agents (Rip & Schot, 1995), who facilitate and organize the CTA process. This role was only taken up properly by COSTECH and IICD as of 2002. In the pilot project they acted apparently more as proponents of a certain technology and a course of action than as ‘mobilizers’ and change agents. After 2002 the roles of the CTA agent shifted to facilitation, organization, suggesting the methodology, support to the organization of the strategic and operational planning, providing encouragement, training and some expert advise, and some coaching on organizational and implementation issues. The guidance of the work flow was centralised at some decision points (organization a workshop for KMC, support of the development of a strategic plan), but also decentralised to user groups (see section 5.4.11). The pilot project and the facilitation were financed by external sources (IICD), but financing of ICT development was fully taken over by KMC as of 2002. The quality of facilitation was generally evaluated positively by participants.

5.4.5 Step-wise approach

The pilot phase started off with the elaboration of an idea and the development of prototypes (see 5.4.6 and 5.4.7 below). The innovation was elaborated by a small group, based on a ‘blue-print’ oriented approach. This was little successful as described above (section 5.4.3). This shifted in the follow-up programme to a ‘process’ oriented approach to innovation. The starting point was the three-day workshop of February 2003 of which the methodology included some demonstration, joint problem searching and vision building. KMC was depicted as a ‘whole system’ and the emphasis was on
the role of information in the functioning of KMC. Thereafter a strategic plan was
developed and after endorsement, the operational planning along with implementation
was initiated with the active involvement of user groups.

5.4.6 Idea generation
The idea for the Kinondoni project was the outcome of a process of systematic
exploration during the National ICT Round Table workshop mid 1998. This project
idea offered an answer to the urgent need for improved and integrated information
supply and decision-making at district level, yet it was new to the Tanzanian context.
The essence of the idea is that information provision cannot be forced from the top, but
has to be part of the data generated at lower levels for their own management needs.
The idea was articulated by the Director IT of COSTECH. In an early stage of the pilot
project, the idea was taken over by the newly nominated IT manager. The pertinence
of the idea was acknowledged by most staff in later phases of development of the
project. The Kinondoni experience shows that (1) ideas are generated and articulated
and improved through social interaction in networks, (2) ideas have to be based on
priorities within the relevant system of the overall municipality, and (3) ideas can be
transferred, but will not be implemented if not appropriated by the organisation itself.
Remarkable was that donor agencies hammered on standard centralised solutions and
hardly could appreciate this type of ‘bottom-up innovation’.

5.4.7 Experimentation: prototype development
The process of developing prototype(s) is meant to test the ideas with respect to the
innovation. During the first one and a half years of the project (2000–2001) some
prototyping was done. The implementation was weak, which reduced impact. However
the importance of prototypes is emphasized in the interviews, as it made the ICT
innovation tangible. Besides the possibilities for e-mail and internet, the quick wins
were databases. Quick wins are judged by the IT Manager to be essential in order to
develop and sustain the support for the innovation.

Prototyping feeds strongly into three other processes. Firstly it is the way to learn,
passing through the stages of the learning circle of Kolb (1991). This underlines the
argument that reflection in action is the way in which technical practices evolve; it is
an indigenous rationalization (Gremmen on cit. by Engel, 1995). It emphasizes the
aspect of innovation processes as social learning processes. Secondly, in line with
this argument, the emergence of a prototype creates a new social reality to which a
meaning should be given. It triggers a process of sense making as to incorporate the
innovation in daily life. Thirdly the emergent picture of changes in the social reality
helps to make clear the possible interests at stake and possibly stimulates a need to
align them with other actors involved.

### 5.4.8 Substantial and procedural learning

Knowledge generation related to ICT was a key process in Kinondoni and most often mentioned by the interviewees. Its purpose is not only to generate the knowledge required to develop and produce the innovation, but also to reduce uncertainty. Knowledge was required to produce the ICT-based innovations and to use them. There was sufficient knowledge to design the pilot project as it was rather simple. But the knowledge in the country was insufficient to develop the project on a larger scale. As with most innovations the possibilities to learn from experience elsewhere in the same type of context was limited. Learning-by-doing became important. Through IICD, knowledge was brought in from Europe concerning general principles on how to develop an ICT strategic plan and on some specific technical aspects. Knowledge development is only perceived relevant, if it can be connected to existing knowledge. Scaffolding in learning is required – a need for a certain knowledge base to build upon progressively.

The ICT staff of KMC was expanded over time from one person to a team of three. Together with consultants, they developed much knowledge, such as the earlier mentioned health facility management tool. Forging strong links with consultants and suppliers is, however, difficult as competent ones are scarce and their agendas are driven by short-term business opportunities. This hampered the speed and quality of the project. It also meant fewer stimuli for exploring and generating new ideas.

In the interviews the importance of the training of users on ICT was emphasized. The training courses for staff and councillors were essential to build up user’s knowledge, along with helping one another and the support of a service desk operated by KMC. Most of the learning can be characterised as substantial and procedural. Training also played an important role to raise awareness on the broader possible uses of ICT. As a senior staff member remarked:

> “It was after the training that I realized that I needed to know more about ICT. Because before I did not consider it, I just saw ICT as a tool for secretaries. Now it is easy to communicate with others and I am even involved in almost three ICT projects.”

So the training served to come to a better appreciation of innovating with ICT. At KMC every year the facilities were expanded, so people could practise. Training and practising spread out gradually and touched most of the more senior staff, who were trained by 2003 and their direct collaborators in the years thereafter. Though training was an essential process within the innovation process, it was not enough as the slow pace of the project up to 2003 demonstrated.
5.4.9 Reflexive learning and sense making

An ICT-based innovation apparently requires more than an idea, knowledge, physical control, a demonstration and a small motivated group. Most senior staff members and councillors were trained in the course of 2000 and 2001, but did not give a major push to the innovation. It was during the multi-stakeholder workshop in 2003, that the application of the technology got a clear boost. Participants realised that:

1. information is important for their work – the value of information;
2. ICT is a strong tool to assist in data collection, storage, retrieval and analysis and is used as such elsewhere, therefore it could be of interest to them as well;
3. there is a common interest as quite some information is shared;
4. in future, the social context at KMC will encourage the use of ICT and KMC management will include it in their strategic plan.

Training alone could not construct this meaning of ICT in the social reality of KMC as demonstrated by the ample training sessions during the pilot project and a lack of response to an invitation to come up with follow-up activities although ample finance was available. The workshop helped to make sense of the role and meaning of information in KMC. Before there was a more passive attitude like ‘you undergo information’. By realising the value of information and the possibility to act upon it, ICT became an accepted part of reality. Sense making means that the function of information was perceived differently and a new rule emerged on the importance of sharing. To ‘sit on information’ as a source of power is now challenged and socially declared less desirable. As was explained by one of the interviewees:

“… ICT was not very clear but when we attended the multi-stakeholder workshop, we realized that there is a lot of information we need in order to perform our daily activities and that information can be shared by many people. I remember when we were discussing about information flows …, we realized that when we have that information at hand or if it is available at the right time, it is useful in our work … And now we realize that as we go along, we can also formulate the way of capturing information, storage and the way we can share it with other departments.”

The atmosphere was positive and encouraged people to speak out. An anecdote is that an employee of the municipality reported back during the workshop, using PowerPoint for one of the first times in the KMC history. This was received enthusiastically as it was more useful than the classic plenary presentation and also boosted self-confidence and esteem. The Deputy Mayor pulled out some money spontaneously as a gift to the presenter. In Tanzanian culture this is a clear sign of approval and of being delighted;
enactment of seniors on a new way of working. Since then PowerPoint is regularly used during council meetings. Sense making contributed substantially for senior and junior officials to perceive ICT as a working instrument, which was clearly demonstrated later on by the active use of ICT by the executive director and senior officials. Apparently ICT at KMC was considerably more integrated than the cases for Kenya reported by Ryckeghem (1995).

The importance of sense-making is acknowledged in literature (Avgerou & Madon, 2004). Sense making as Weick (1999, p42) states “sets the frame within which decisions are made”. Sense making is a way to place the innovation in the social context and it generates the language necessary to communicate about the innovation. For radical innovation the need for new codes to appreciate the new paradigm is indispensable (Lundvall, 1992). In fact sense making is a part of the often mentioned importance of intermediaries or boundary spanning organizations (Lynn et al., 1996). Sense making includes the perception of interests and hence the possibilities to align with other actors involved.

### 5.4.10 Alignment

A key point stressed and mentioned frequently by most interviewees was the practical value of the ICT-based innovation, which served their interests. Most staff felt it made their job easier, and more interesting. It also gave a greater earning capacity in the labour market. However less literate people or those in supporting functions, like messengers, feared for their jobs. Some experienced better control and a higher pressure for performance as negative aspects associated with ICT-based innovation. A number of heads of department were rather reluctant, if not resistant. The ICT-based innovation meant quite a change in working procedures, access to information, transparency, and hence the power they could yield. Councillors esteemed they were better informed. A head of service from Town Planning remarked on the occasion of presentation of records on land titles to the councillors:

“... So the councillors say: “we have ICT, what are you doing with it, you don’t use it?” They insist on using ICT. I can assure you that ICT is highly demanded even by councilors.”

The participatory approach of the project and the focus on user involvement pushed the ICT staff and consultants to search for customer value. The strongest push came from the councillors, who realised that information would give them more power and control over staff. Being informed and capable to react quickly to demands of their electorate is important to them. So they can articulate a clear demand to the staff.

This customer focus may disappear again when third parties get a strong voice in the development of the ICT-based innovation. For example in the pilot project, when a database for a dispensary was built by a consultant, according to the official
requirements, he largely reproduced the ‘top-down’ model of data collection as to reinforce his position with the Ministry of Health. The Kinondoni user needed computerization of the patient records to be of value, now it was ‘burden added’. This happened under the heading of expert knowledge. In contrast the consultant who built a simple database according to the wishes of the education officer, made something that lasted and that served greatly.

It is the perception of the user that defines the customer value. This is influenced by the users knowledge and felt needs. Customer value evolves over time and triggers continuous innovation. Customer value is hard to predict. Involving (different) groups of users improves the design and makes it more robust (Bunders et al., 1999; Thomke & von Hippel, 2002). However, users reflect better on the innovation, if they feel ownership. When lessons learnt sessions with users were held at COSTECH in 2001, some feedback came from them, but during the multi-stakeholder workshop of 2003 the response was strong in terms of needs and motivation to contribute and to work with the innovation. It should be noted that special allowances hardly played a role as most activities were conducted according to the regular procedures of KMC.

To make the innovation happen a number of actors have to take an interest in it. Developing and articulating this perceived interest, can be conceptualised as at least two interdependent processes. Firstly, the search for customer value for the user by the developers of the innovation. Secondly, the process of forming some sort of coalition by those involved in the development, production, maintenance and use of the innovation. This process of aligning interests requires understanding of the interests of others, negotiation and coalition building, and a regular review of the own position by actors. The multi-stakeholder workshop contributed substantially to alignment of interests. It was the coalition of councillors and staff that forced the heads of department who were reluctant, to accept. It also minimized possible hidden resistance during implementation. It encouraged other staff to press for adequate facilities and training.

This alignment of interests is illustrated by the fact that the project is now fully financed by KMC and widely supported by staff and councillors. Alignment of interest was stimulated during the preparation and restitution of the strategic plan. It was intensified in the users groups during the detailed preparation of the operational plan. This process of alignment is a critical input to the processes of strategic planning, managing change and institutionalisation. In the case of Kinondoni the coalition was soon strong enough to drive the ICT-based innovation and to solve conflicts.

5.4.11 Collaborative decision making

Collaborative decision making was initiated during the three days workshop in February 2003, but only on main points. Strategic planning (see next section) was largely done by consultants with guidance from a KMC steering committee. However,
the translation of the strategic plan into an operational plan was highly collaborative. For each sector (education, health etc.) a user group was formed that included representatives of all layers of that sector. This group had the decision power and the consultant was placed in an advising and a facilitating role. This worked well and was supported by the methodology for more detailed information systems planning, called ISSP (Information Systems Strategic Planning). Though not mentioned explicitly, it was observed that this way of working was taken seriously and generated enthusiasm.

5.4.12 Agenda setting and interactive policy making

To develop a societal agenda, or in this case a broadly accepted strategy that integrates the ICT-based innovation in the organisation, requires a more detailed programming of the objectives, priorities, resources to be engaged and the way of organizing the implementation. Strategizing is the progressive incorporation and relative fixation of the results of alignment in the main strategic course of the organization. The integration of the ICT-based innovation in the strategic plan of the municipal council was a very explicit process. The municipal authorities gave the green light to develop the strategic plan after the multi-stakeholder workshop of February 2003. A team of consultants, of whom most had attended the workshop as observers, prepared it. They were guided by the IT section and supported by COSTECH and IICD. They consulted the municipal authorities and staff twice. Nine months later a strategic plan was presented, discussed, adapted and endorsed. A large number of staff and councillors attended this meeting and put up pertinent questions. The high level of attendance and the broad support for the strategic plan was due to the alignment of interests and the groundwork done in terms of knowledge (user training), sense making and the visibility of the prototypes. The incorporation of the ICT-based innovation in the planning and budgets of KMC is a main output of the overall CTA process.

KMC put up a steering committee that functioned smoothly without any external presence or pressure. As of that moment, COSTECH and IICD who had clearly acted as catalysers, started to withdraw. Their role became supportive only, with provision of some training and consultancy support that phased out in 2006. Strategic planning allowed the innovation to be mainstreamed in the organisation. IT became a separate department with a formal status equal to other departments in the course of 2005.

5.4.13 Managing change

Two closely intertwined processes turned out to be essential during the implementation phase as to assure integration of the novel ICT-based practices at KMC in a generally perceived productive way: change management and institutionalization.

As of 2003/2004, KMC made more budget available for ICT. The network at the
headquarters was improved and more wards were connected. The main activity was building up of databases. By early 2005 the ten priority themes identified in the strategic plan were spelled out in detailed operational plans by user committees and their implementation was initiated. The role of the user committees is acknowledged as important to design the proper implementation mechanisms. The operational management was done by the IT department. Tactical management was assured by the KMC Steering Committee on ICT.

The importance of change management was brought forward several times and was a subject during the replication workshop. Computerization in Kinondoni implied information sharing, which required a clear communication and assignment of responsibilities as well as clear guidelines. Key points are to test and prioritise changes, to communicate clearly, to assign responsibilities and to reinforce changes. A part of change management was also convincing and coercing certain heads of departments and services to comply to the new emerging work practices and to adapt their roles accordingly. The IT manager turned out to be a good change manager, which was important in a large and political organisation like KMC. The change process most likely also served the IT services to be upgraded to a department, which underlines the political nature of change management within an organization. The change management approach itself was not studied in detail. It seemed to rely on the development of congruent meanings (Grin & van de Graaf, 1996), increasingly formalising work procedures and work flows and coercion. Most staff perceived an interest of using ICT to facilitate their work and therefore were willing to participate in the rather endogenous change.

**5.4.14 Institutionalization**

To integrate the ICT-based innovation in the daily activities of KMC as an established way of working is subject of the process of institutionalization. This includes both formal and informal rules of the game – the way we do things around here – and their enforcement arrangements (North, 2005). Institutionalization is a complex process of anchoring the novel ICT-based practices in the organization. This is a continuous process of production and reproduction of rules, with a tendency to converge to stability and persistence (Barrett et al., 2006).

Manifestations of institutionalization are the more-or-less obligatory use of PowerPoint for making presentations to the full council, intensive use of e-mail for reporting and tracking work progress, the focus on the GIS applications for registration of land titles and tax collection and the general use of the different databases for loans etc. An increasing demand for (additional) training, a continuously raising budget allocation to ICT and a larger part of the workflow supported by ICT points to the effective on-going institutionalization of this technology within the organization. A focus group session with a cross section of KMC staff held in February 2007 on the functioning of the ICT
in KMC yielded a very lively role play and internal discussion on the appropriateness of the present rules for ICT trouble shoot and the need to institutionalise properly the ICT service desk.

5.4.15 Communicative actions

No reference was made by interviewees to communicative actions. Within the organization the general established communication channels were used to inform staff and councillors, who were not part of the user groups. Externally, the rumour on the success of KMC with ICT apparently spread rapidly, which resulted in requests for assistance from other municipalities and districts. In 2005 a replication workshop was held by KMC staff where they exposed their experiences to 14 other municipalities and districts.

5.4.16 Integration of processes

A chronological organization of the fore-mentioned innovation processes at KMC is hard to make. There was some sort of progression from problem analysis, to decision making to implementation. However, it was iterative, diffuse and multilevel, i.e. individual, service, department, overall organization. Most processes ran largely in parallel. However, in the flow of the innovation, one process was more intensive than others at a certain stage. The innovation process started with an idea, knowledge development and drive by ‘would be owners’ and CTA agents. Together they set up the infrastructure of multi-stakeholder, participation, organization and facilitation, which is characteristic for a CTA intervention. Within this setting the different processes were enabled to take place. The beginning of a process is hard to pin down exactly; rather, it is emerging. Below a simple sketch (Figure 5.1) is given of indicative value only and to stimulate research.

The sketch and arrows do not want to suggest a linear process, because it was iterative, recurrent and mutually influencing. This depended on the level of detail (granularity) and the time span considered. For example, idea generation resulted in a plan (a project) for the development of prototypes. Several applications were built as a part of these prototypes. Some worked, but others failed, and better ideas were required.

Each process had people who were the main carriers. Their personal attributes and decisions are important to steer events. For example, the executive director gave room for manoeuvring to the IT manager, although he was not convinced of the value of ICT yet. Similarly the director of COSTECH insisted on training many seniors of KMC beyond the scope of the project. But simultaneously it points to paradoxes. The drive of the director of COSTECH pushed the project, yet it retarded transfer of ownership necessary to stimulate the process of developing ownership among KMC people.

Also the context or structural features of the organization and the wider context are
more conducive to one innovation project than the other. For example, the IT section was a service only with little formal power. External support of COSTECH and IICD was desirable to have the opportunity to develop prototypes. Now IT is a separate department on equal footing with health, education, and other departments. Moreover, it is expected by other departments to develop new applications.

The innovation (sub) processes that make up the CTA approach, took nearly seven years. Factors that slowed it down included: the number of independent actors involved, the large size of KMC, the limited technical support base, and the reality of difficult operational conditions in Sub Saharan Africa. Yet it is still faster and with less implementation problems than large top-down systems, like the central health management information system. With hindsight and knowledge on the studied innovation processes, it could have been done faster. A subjective estimate by just cutting out unnecessary waiting times, errors, and a stronger technical support could have brought it back to about four years. As ICT becomes more common in the environment, it could be further reduced to an estimated three years. But the normal rhythm of the bureaucracy would make further time reductions unlikely.

5.5 Discussion

Real life cases make it difficult to disentangle causal relationships. Were the factors mentioned indeed the only causal factors or could some other, contextual, factors have contributed to the success of the ICT-based innovation in Kinondoni? Probably not, as KMC is far ahead of the two sister municipalities of Dar es Salaam and the contextual differences are limited. One contextual factor of some influence seemed that more pressure was put on performance in KMC after the transformation of the district into a municipality in 2000. The elections for the new councillors brought in some real competition for political posts and the expectations of the public for improved service delivery. However, this applied similarly to the other municipalities and is clearly not
a decisive factor. There were no special ICT programmes for KMC. It should be noted that KMC was also far ahead of other municipalities in Tanzania.

What was the role of the pilot project? To what extent was it just a matter of time to turn the ICT project into a success? Indeed the pilot project provided awareness and basic knowledge. But this was apparently not sufficient to put ICT on the municipal agenda and integrate it in daily practice. This is confirmed by the declined offer of an expansion project in 2002 (see section 5.4.3). The response to the workshop of February 2003 or as a councillor remarked:

“Now you opened our eyes”

This also aligns with experiences with other ICT projects in Tanzania and the general notion in literature that training – often a standard part of ICT projects – is not sufficient to realize successful implementation. It raises the question whether it would be useful to initiate ICT projects in which a participatory workshop, allowing reflexive learning and alignment, is organized at an early stage.

In our opinion, the innovation processes and their outputs make up a consistent story of developments in KMC. The processes – a collection of intertwined activities labelled under the name of an umbrella process – are classified to the best of our knowledge to correspond meaningfully to practical analytical purposes and to theoretical insights. Together these processes make up the ICT-based innovation. The processes are listed in the right hand column of Table 5.4. All the processes mentioned in CTA literature are confirmed. Only communicative actions were hardly brought forward in this case. The output includes the ICT-based innovation being part of the strategy of the organization, with substantial budget allocations, and widely used and appreciated.

If we situate the CTA literature in the perspective of technological transitions (Geels, 2005), it is clear that this case reflects technology development at niche level for which innovation management theory is relevant (Geels, 2005; Broerse, 1998). Janszen (2000) developed a dynamic model of seven generic innovation processes within an organization from a system perspective. This includes:

1. team building;
2. generation of ideas;
3. knowledge generation, acquisition and exploration;
4. prototyping;
5. management and decision making;
6. implementation I (ramp up and production for external or internal market);
7. implementation II (introduction of innovation and user acceptance).
Table 5.4 innovation processes leading to success in the development and use of ICT in Kinondoni municipality

<table>
<thead>
<tr>
<th>General characteristics of Constructive Technology Assessment:</th>
<th>Process highlighted in Kinondoni as contributing to success:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Infrastructure (processes to create the conditions for substantial CTA processes to happen)</td>
<td></td>
</tr>
<tr>
<td>Relevant stakeholders involved (the whole system involved)</td>
<td>Relevant stakeholders: involving all relevant stakeholders voluntary or obligatory as a consequence of influence by the CTA agency.</td>
</tr>
<tr>
<td>Participatory</td>
<td>Participatory: taking part in the CTA process, being heard and being able to exercise effective influence on the decision-making.</td>
</tr>
<tr>
<td>Exerting drive</td>
<td>Exerting drive: the process of building up intrinsic motivation and out of it, pushing the development and realisation of the innovation as to better accomplish higher level (organisational) goals. This largely overlaps with the concept of leadership and becomes CTA agency if pursued participatory.</td>
</tr>
<tr>
<td>CTA agent(s) providing organisation and facilitation</td>
<td>Organisation and facilitation: provided and initially financed by external actors and taken over by the stakeholders ('imposed' or self-organised).</td>
</tr>
<tr>
<td>II. Step-wise approach</td>
<td></td>
</tr>
<tr>
<td>Joint problem analysis and visioning prior to agenda setting and implementation</td>
<td>Joint problems analysis and some visioning during three day workshop in February 2003.</td>
</tr>
<tr>
<td>Idea generation</td>
<td>Idea generation: the process of defining a do-able new combination not thought of before in that specific context, based on an analysis of the whole system concerned.</td>
</tr>
<tr>
<td>Experimentation</td>
<td>Experimentation through prototype development: the design and testing of a series of prototypes that become increasingly detailed and real.</td>
</tr>
<tr>
<td>III. (Social) Learning (processes that relate the 'Mental Frames' to the innovation)</td>
<td></td>
</tr>
<tr>
<td>Substantive and procedural learning</td>
<td>Knowledge generation, sharing and exploitation: the process of acquiring substantive and procedural knowledge, which feeds into idea generation and is needed for the development, implementation and use of the innovation.</td>
</tr>
<tr>
<td>Reflexive learning and sense making</td>
<td>Reflexive learning and sense-making: the process of reflecting and inquiring between the stakeholders on the 'inner worlds' as related to the innovation.</td>
</tr>
</tbody>
</table>

*Table 5.4 continues on next page*
These processes largely correspond with the CTA approach. Differences are that the concept of a team is broadened to a network of relevant stakeholders in CTA, which results in differences in group dynamics and trust. Organization and facilitation are largely taken care of by a third party (CTA agent). And decision making might be more participatory.

Compared to the initial CTA framework (see Table 5.1), the case revealed four additional processes as relevant: Exerting drive, prototype development, change management and institutionalization. It should be noted that these processes are well-recognised in innovation management (Janszen, 2000; Scozzi, 2005; Tidd et al., 1997; Tornatzky & Fleischer, 1990). ‘Exerting drive’ is new to TA literature, yet deemed essential to initiate and keep CTA processes going. Whether direct citizen participation could have added to the success is an open question. Citizen presence might have challenged the councillors and created other dynamics in the February 2003 workshop. The importance of ‘prototyping’ is well-known from the IS and innovation literature and gets growing attention in TA literature (Ornetzeder & Rohracher, 2006). It plays an important role in the reduction of uncertainty or in this case the ‘tangibility’ of the technology.
Change management is little developed in CTA literature. Related to implementing CTA policies, Downey (1995, p. 85) remarks “the area in which CTA theory is least developed and most vulnerable, is to make these strategies work by sensitively overcoming local opposition and fitting them into local scenes”. In more recent literature the term ‘mediation’ is coined for joint problem solving, although change management to facilitate implementation processes, still receives little attention (Decker & Ladikas, 2004). ‘Institutionalization’ is included in the concept of reflexivity, yet it is hardly operationalized. However, in policy studies related to implementation, institutionalisation is considered a highly relevant issue (Piotti et al. 2006; Barrett, 2004; Moulton et al., 2002).

Another question is whether the innovation processes identified, can be compared to other case study findings in developing countries? Although there are very few similar case studies Krishna and Walsham (2005) are an exception. They describe another rare success story (with a larger scope and scale) – a case of developing public information systems in Andhra Pradesh, India. It points to a number of success factors including leadership, involvement of multiple groups, innovative organizational structures, a people orientation in the selection of projects and learning and persistence. Although the angle of analysis is different, the same processes seem to appear. Idea generation, sense making and institutionalization are, however, less pronounced. A main difference between the two cases is also that support and guidance by the leadership was crucial in the Indian case as of the beginning, while in Kinondoni this only developed over time.

Ownership is an often mentioned success factor in development, and the question arises how the Kinondoni case relates to this? Ownership is hard to define in the development context (Leandro et al., 1999). At least three aspects are part of ownership (1) the right to decide, (2) the accountability for the results and (3) commitment or intrinsic motivation. This commitment has to be developed endogenously, without imposing, not even in a subtle way. Ownership is a legal concept, but its strength – in this context – is in its psychological meaning. It contains cognitive and affective elements (Dyne & Pierce, 2004). Ownership is a feeling of possessiveness and is associated to positive attitudes towards the target, enhanced self-concept and a sense of responsibility (Furby, 1978, 1991 in Dyne & Pierce 2004, p. 443). We assume that ownership strongly influences the belief one can attain the goal triggered by an idea and/or vision, and it strengthens positive normative beliefs related to the object of possession. Hence it influences the main constructs that influence intentions according to Azjen theory of planned behaviour (1991). In the case of Kinondoni, a small group of key people with ‘drive’ were needed to kindle the ICT-based innovation through idea generation, knowledge generation and prototyping. It was only after the two-day multi-stakeholder workshop in February 2003 that strong ownership emerged. This was observed by the commitment displayed and the language used. Sense making seems the main
contributing factor to the process of generating ownership, along with alignment, which makes it politically acceptable. Also exerting drive by a few enthusiastic people ‘transmitted and kindled energy’, which contributed to motivation. Ownership is thus a combination of underlying processes and apparently can be ‘grown’. Most likely for ownership to develop, people should experience some real decision making power.

5.6 Conclusion

The perception of ICT-based innovation as being socially constructed proved a useful approach to the understanding of the unfolding events in this situated case of Kinondoni. Techno-rational considerations that dominated the inception and the pilot phase turned out to be insufficient to understand the behaviour of KMC and to explain the relative inertia. With hindsight it can be argued that the approach followed, allowed people to construct the meaning of the new technology and to assess its usefulness. Through learning, especially reflexive learning, and the construction of partly shared and congruent meanings the ICT artefact and the novel ICT-based practices could be accommodated in the political setting of KMC. This is proved by the commitment to elaborate a strategic ICT plan and by subsequent budget allocations. This assured both scaling and sustainability, which are key problem areas with ICT in most developing countries (Puri & Sahay, 2007) and particularly in Sub Sahara Africa. Constructive technology assessment proved a useful model to understand the development of technology in the case studied. The innovation processes identified could be helpful to further elaborate the prescriptive theory of CTA.

The Kinondoni case showed the importance of innovation processes for creating the appropriate conditions or infrastructure for CTA to take place. This included to have all relevant stakeholders involved, to follow a participatory approach, to exert ‘drive’ within and outside the organization, to facilitate and organise the process. Before getting more tangible results, it seemed necessary for the stakeholders to experience an evolving ‘inner world’. Substantial and procedural learning occurred that enhanced the capabilities to develop and to use the ICT-based innovations. But the most important learning process was sense making, which enabled internalisation, the ICT-based innovations. Sense making is also the starting point for institutionalization processes (North, 2005). Political alignment was another key process. Alignment is a process of articulating configurations of value propositions and constructing congruent meanings between stakeholders as well as shaping coalitions strong enough to realize the ICT-based innovations. An interesting finding of the research is that ownership could apparently be ‘grown’, based on sense making, alignment and inspired by those who exerted drive. Ownership is enabled by giving real decision power as was done through the user committees.
In summary CTA seems a promising participatory approach or model to generate sustainable ICT-based innovations. These findings are in correspondence with the conceptualisation of the RT process as developed in the previous chapter and hence support the argument of CTA as a promising approach to the development and implementation of ICT projects. A model has a right to exist if it is (1) consistent and clear, (2) can guide research and analysis and (3) offers clear benefits over the existing models (Lamb & Kling, 2003). The fourteen innovation processes constitute a consistent framework for ICT-based innovation at organizational level. A main question for follow-up research is to what extent the processes leading to success can be initiated and influenced as to generate lasting ICT-based innovations? And to what extent does the development of the processes depend on the context? CTA is applicable at micro level (Broerse, 1998), but its strength is at meso level (Rip et al., 1995). Is it possible at sector level to kindle and influence these processes? And what are the conditions governing their development?

What are the implications for development co-operation? The Kinondoni case helps to understand why donor and expert-driven approaches and sector development programmes often are neither successful nor sustainable. Bunders et al. (1999) point out that in a development context, many failures in innovation occur, as the fit between technological design, user practises and the socio-economic context is not satisfactory. This is similar to the central thesis of Heeks (1999) that successful ICT applications require a design-reality gap that is manageable. Top-down and expert-driven approaches often depart from a specific perception ‘on what the desired reality should be’ with many implicit and tacit assumptions. Interests are (un-) consciously distorted as the expert or policy-maker is part of a specific social environment. Recent evaluations in Tanzania suggest that a number of centrally conceptualised and rolled out solutions tend to fail. The case shows the importance of making technology and innovation a largely endogenous process by jointly creating a social reality and by actively negotiating interests.

The Kinondoni experience argues for more room for innovation at local level. A wider replication can be stimulated or even induced through national programmes, based on bottom-up initiatives that are genuinely owned up. Such an approach requires time and persistence of efforts. It also implies that initiatives from elsewhere are not just replicated, but cultivated: grown on their own terms after the image of the example. This is a different way of looking at sector development, monitoring, the role of the different actors and setting targets for results. Also the value of prototypes is underestimated. Generally there is a lot of talking and even policy making prior to action, otherwise “inefficiencies might creep in”. However, having a prototype makes the innovation to be considered seriously by the development partners and is in fact the starting point of the right conversation.
Initiating a CTA approach:
Evaluating the Round Table workshop

6.1 Background
6.2 The RT workshop
6.3 Developing and evaluative framework
   6.3.1 Process criteria
   6.3.2 Output criteria
6.4 Research method
6.5 Study findings
   6.5.1 Findings on process criteria
   6.5.2 Findings on output criteria
6.6 Context features
6.7 Conclusion and discussion
6.1 Background

ICT failures are widespread (Heeks, 2002; Krishna & Walsham, 2005) as argued in the introductory chapter. An important reason is that ICT projects are often not adequately and sensitively moulded to the local context. An information system is not only technological, but also incorporates social and organizational factors. ICT vendor or donor-driven information system projects tend to transfer attitudes, values, social, political, and cultural structures that do not suit local requirements. Participatory approaches are needed to close this design-reality gap and to incorporate the knowledge and perspectives of the stakeholders involved in ICT projects (Puri & Sahay, 2007). Sen (1999) highlights the intrinsic value of participation as a freedom to influence the decisions that affect them; participation is both a means and an end of development.

The RT process is a participatory approach and an operationalisation of CTA. The introduction of ICT in Kinondoni municipality was an application of CTA and resulted in a sustainable project. Therefore, it is worthwhile to further research the RT process. This chapter seeks to answer the research question: to what extent is the RT workshop an effective methodology to initiate a social shaping of technology approach and more precisely a CTA approach? Literature is scarce in this field and there have been limited attempts to link ICT to meaningful development aims from a local perspective and with an action reflection connotation (Walsham & Sahay, 2006). Furthermore, as Rowe and Frewer (2004) argue, there is also a lack of evaluative studies on participation exercises.

This chapter starts off by recapitulating and expanding on the RT workshop, followed by the development of an evaluative framework. Thereafter the research methodology is set out. The findings are divided in an analysis of the quality of the process and an evaluation of the output generated. Thereafter, the influence of contextual factors is explored, based on a cross-case analysis. The chapter concludes with a discussion of the findings, the flaws in the RT workshop, and the theoretical implications for participatory approaches.

6.2 The RT workshop

CTA offers a multilevel framework to help to mould the technology to societal needs and to make the participation of relevant stakeholders more effective (Broerse, 1998). One of the first activities in the RT process is to organize the so-called RT workshop. This workshop is meant to initiate all CTA processes. It brings together relevant stakeholders in a dialogue setting. The RT workshop focuses on joint problem analysis, visioning, defining priority areas for intervention, and developing annotated ideas on experiments. For the case of ICT, the notion of experiment is replaced by
the development of prototypes for novel ICT applications in the local setting. These annotated ideas are developed by the organizations that own them. This might take two to three years. Thereafter, the focus is on improving and enlarging the ICT application and its full integration into the organization. Initiatives are taken in parallel to stimulate general awareness and to develop an ICT policy in the relevant domain. This should lead to a more conducive environment for replication and scaling up or scaling out of the novel ICT applications. The RT process lasts four to seven years, and aims to help mould the development, spread, and use of ICT applications to local needs, including poverty alleviation. The development of the prototypes is a CTA process at the organizational level, whereas the development of an ICT policy in the relevant domain is a CTA process at the meso level.

Preparing and conducting the RT workshop takes about 3-6 months. The workshop brings together for three or four days about 25 to 40 participants, who represent the relevant stakeholders within a sector or a part thereof, guided by a host organization, and facilitated by the IICD. A small steering committee is generally formed to guide the process. Reference reports on main issues in the sector and the development of ICT in the country are sent to each participant before the workshop and are discussed at the RT workshop. The objectives of the RT workshop are derived from the overall RT process, and include social learning related to the technology and the definition of locally relevant areas of application. The aspect of poverty alleviation received more emphasis over time and became an additional objective by 2001. Political agenda setting is a desired output, but not an explicit objective. The RT workshop methodology and its application in the three cases studied are presented in Box 6.1.

### 6.3 Developing and evaluative framework

CTA is participatory by definition (Schot, 2001) and is not only process, but also outcome oriented. Evaluation of a CTA process, therefore needs to consider both process and output criteria (Caron-Flinterman, 2005; Rowe & Frewer, 2004). Process criteria track whether the method is properly applied and if the influence of contingencies is negligible or can be isolated. Output criteria indicate the level of effectiveness realized, reflecting the match between the achieved and intended results. A practical challenge is the measurement of intentions as they are often not articulated fully or may change over time. Intentions also may differ based on personal and political perceptions and stances. One solution is to have a priori statements on what is meant by effectiveness, agreed upon by all parties. Another approach is to make contentment or acceptance by the parties involved part of the criteria of effectiveness (Rowe & Frewer, 2004). In the RT workshop the approach is to approximate effectiveness by using a set of criteria that ‘measure’ the process, based on the principles underlying the RT process, as well as the output generated.
Box 6.1 RT Workshop methodology as applied to a case in Education, Agriculture and Health

An example of an RT workshop, which is also used as a case in this study, took place in Tanzania in 2002 (called Edu Tz). The theme was the role of ICT for primary, secondary education and teacher training. The RT workshop was prepared by a small team of consultants, headmasters and in consultation with the chief education officer. The RT workshop regrouped students, teachers, headmasters, the three agencies in education and the ministry. It was inaugurated by the deputy minister and two students of the primary school.

The core of the methodology of the RT workshop is scenario development, based on the GBN method, allows for strategic conversations between the stakeholders and anticipation of the behaviour of the technology and actors in the ‘simulated’ social setting (Ringland, 1998; Van der Heijden, 1996). This is followed by a short visioning exercise and the definition of leverage areas for change. To illustrate: a scenario representing the future of education in Tanzania under circumstances of effective policies and governance yet with low economic growth was labelled the frustrated society. Another scenario represented the opposite with little effective governance, but high economic growth concentrated in pockets and was called ‘dynamite’. Confrontation of all these perspectives, helped to develop a vision and to define leverage areas such as improved communication (not one way, but network like with feedback and faster), awareness and support by local communities, changes in teaching methodologies etc. The leverage areas are ranked according to their importance by the participants. Next participants reflect on the role of information and communication flows and hence ICT within the selected leverage areas. Thereafter ideas on prototypes are generated, discussed and prioritised. In small teams these ideas are turned into project briefs and reviewed by a larger group of participants. During the RT workshop 11 annotated ideas were identified. For example the development of a website for students, teachers and parents, a web based data base for data collection, analysis and exchange for inspectorate, connecting all teacher training colleges and development of contents by them. One idea related to policy making.

Another case dealt with agricultural production with emphasis on marketing in Mali, 2004 (Agric Mali). It regrouped producers associations, marketing cooperatives, traders, district agricultural officers, farmers, women organizations etc. The third case was about the use of ICT in health in Tanzania in 2005 (Health Tz), but with less emphasis on drug supply. The theme was defined by a steering committee representing a number of important stakeholders in the sector and they were also closely involved in the preparation of the RT workshop. The three cases were rather similar in terms of steps taken. A minor differentiation was the way the current situation was analysed in Agric Mali. In Health Tz, some more emphasis was put on keeping project ideas together that relate to one or very similar leverage areas. The contents and the transition between the steps varied slightly per case as the methods were fine-tuned over time. The RT workshop and its preparation consist of 15 steps according to the ideal-type indicated in Annex 6.1. The three cases are summarized below:

<table>
<thead>
<tr>
<th>Abbreviation:</th>
<th>Edu Tz</th>
<th>Agric Mali</th>
<th>Health Tz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country:</td>
<td>Tanzania</td>
<td>Mali</td>
<td>Tanzania</td>
</tr>
<tr>
<td>Year:</td>
<td>2002</td>
<td>2004</td>
<td>2005</td>
</tr>
<tr>
<td>Location:</td>
<td>Bagamoyo</td>
<td>Segou</td>
<td>Mwanza</td>
</tr>
<tr>
<td>Theme:</td>
<td>ICT for enhanced teaching &amp; learning</td>
<td>ICT for improved agricultural marketing</td>
<td>ICT for affordable district health services</td>
</tr>
</tbody>
</table>

1 Fields in a sector where change will contribute to the realization of the desired societal objectives in such a way that the benefits largely outweigh the costs.
6.3.1 Process criteria

The process criteria presented here reflect the creation and implementation of the right infrastructural conditions for the CTA process as described in Table 4.2. The three main criteria are: relevancy of stakeholders involved; participatory processes used; and organization and facilitation mechanisms. Networking between stakeholders is initiated during the RT workshop and therefore considered an output. The criteria are described below in more detail.

**Relevancy of stakeholders involved**, consists of four sub-criteria:

- **Boundary setting** i.e. what is the system considered? The theme selected and its boundaries have to represent a meaningful system, sufficiently aggregated to provide adequate solutions, yet enough disaggregated to be perceived as concrete and recognisable by the participants (Moens & Broerse, 2006).

- **Endorsement and support**: A broad support brings legitimacy to the process. The greater the endorsement by senior staff is, the stronger the support is. Increased support is therefore also an output.

- **Balanced representation** is a multilevel and complex criterion. At the meso level, multi-stakeholder means that the main actors of the sector participate in the process. It also means that relevant fields of knowledge are represented. Multi-stakeholder participation enables an exchange of knowledge, leading to a mutual understanding and exchange of tacit knowledge through personal involvement (Janszen, 2000; Nonaka & Takeuchi, 1995). Indicators for a good coverage of relevant fields of knowledge include: (a) subject matter knowledge, (b) managerial knowledge, (c) the insights of end-users (Bunders et al., 1999; Janszen, 2000) and (d) the ‘touch and feel’ of the innovation. At organizational level representation of ‘visioning leadership’ is sought for and the practical experience of the operational core.

- **Inclusion of the poor**: Poverty alleviation is pursued by giving the poor a ‘voice’ in the RT workshop. The poor are capable of forwarding their needs effectively (Zweekhorst, 2004), also with regards to ICT (Cecchini & Scott, 2003).

**Participatory processes used**, consists of three sub-criteria:

- **Transparency**: An effective participation process needs to be clearly and transparently structured (Rowe & Frewer, 2004). This implies direct and early involvement of participants, with few relevant decisions taken in advance, although with a clear prior understanding of the broad aims and expectations of the workshop.

- **Dialogue and ‘power sharing’**: Participation implies power sharing (Caron-Flinterman, 2005) and requires an atmosphere encouraging a dialogue defined as a ‘free flow of meaning’ between participants (Senge, 1990). Therefore distortions
based on hierarchy, clan differences, local stigmas etc. should be minimised (Senge, 1990). The facilitator has to be indifferent towards the output of the RT workshop (Rowe & Frewer, 2004).

Organization and facilitation mechanisms concern:

- **Methods and techniques**: The methodology deployed is theoretically adequate. As a consequence the participants experience the methods and techniques used in the process as relevant and helpful in achieving the objectives.
- **Adequate workshop settings**: The workshop setting allows for the process to develop well.

### 6.3.2 Output criteria

The output criteria are developed through the methods-impact relationship analysis in Technology Assessment (TA), of which CTA is a particular strand. Hennen et al. (2004) developed a framework for assessing the impact of TA, defining it as:

“any change with regard to the state of knowledge, opinions held and actions taken by relevant actors in the process of societal debate on technological issues” (p. 61).

Impact is assessed on a matrix comprising of the following dimensions: raising knowledge, forming attitudes/opinions and initialising actions. This is juxtaposed against three fields of attention i.e.: technological/scientific aspects, societal aspects, policy aspects. Based on this matrix, outputs are defined that may lead to impacts over time. While this framework captures the broad range of TA, it also recognises the specific emphasis of CTA on shaping technology according to social needs in an early stage of development (Hennen et al., 2004).

The CTA framework aligns with the broad range of impact criteria for TA, including the criteria of anticipation, reflexivity and social learning. Anticipation concerns the societal effects of the technology and the search for possible synergies between designers, users, citizens, policy makers etc. Reflexivity concerns “to shape technological development processes in such a way that social aspects – in the long run – are symmetrically considered” (Schot, 2001, p. 41). Social learning is concerned with “new technologies evolve in a mutual learning process: technological options, user preferences and necessary institutional changes are not given ex-ante, but are created and modified along the way” (Schot, 2001, p. 44).

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2 The analysis was carried out by 13 TA institutes who used the "twin group principle", where one group focussed on the practice of TA and the other on the development of the framework for assessing impact. The conclusions of both groups aligned, setting a landmark in the field of TA.
Based on the above, we retain three groups of output indicators of social learning (including awareness raising), the initialisation of actions (such as the development of annotated prototype ideas), and networking and collaboration between stakeholders. Within this set of criteria, we will accommodate anticipation, reflexivity and social learning as particularly relevant to CTA.

Learning
Learning starts with awareness. New knowledge is required to develop the technology and to reduce uncertainties. Besides the creative process of idea generation, three types of learning occur in participatory processes (Guston 1999; Irvin & Stansbury, 2004):

- **Substantive learning**: this concerns substantial matters like what is ICT, what purposes could it fulfill etc. Substantive learning is of importance as proper problem definition is a key to idea generation, and the reduction of uncertainties.

- **Procedural learning**: this concerns learning about the methods used, e.g. vision building, procedures for developing the innovation. This learning stimulates and enables going through the circles of learning as formulated by Kolb et al. (1991) as single loop learning.

- **Reflexive learning** concerns a reflection on one's own and other's knowledge, perspectives, roles, etc, and is the basis for double loop learning (Argyris & Schön, 1978; Kolb et al., 1991; Senge, 1990) in which existing paradigms are redefined. Reflexive learning contributes to sense-making (Weick, 1995), which is about the continuous process of an individual, in a certain role, of creating a mental frame to incorporate cues. Enactments help to get a better grasp of the sense it makes, in this case the incorporation of ICT based innovation in daily life (Weick, 1995). Reflexive learning therefore contributes to the definition of own interests and the perception of interests of other actors.

Initialisation of actions
In innovation, the process of prototyping refers to the design and testing of models that become increasingly detailed and real (Janszen, 2000). Prototypes should be identified against the backdrop of anticipation and prioritization of future social impacts. They should be shaped as concrete projects inscribing real needs of the stakeholders involved, thus contributing to their involvement, ownership and commitment. Ownership is a multi-faceted concept that contains, besides the notion of authority and accountability, cognitive and affective elements (Dyne & Pierce, 2004; Furby, 1991). Reflexive learning implies sense making and shapes discourses that play a central role in the social construction of organizational change (Barrett et al., 2006). All actors (try to) exert their individual and conflicting influences on the shaping of the technology, and their actions thus need alignment. The core of CTA is to enhance this alignment, which
implies intertwined processes of learning, power sharing and negotiation. These processes should lead to the development and legitimization of common or congruent goals (Grin & van de Graaf, 1996), based on a common sharing of ‘language’, norms and values. The following three sub-criteria reflect the incorporation of societal needs and collaborative decision making:

- **Prototypes should be moulded to local needs** and should reflect the ‘problems’ and priorities on the ground, and be relevant to the overall sector.

- **Collaborative decision making** refers to participation in the decision-making process on the development of decisions that are largely based on similar and congruent goals.

- **Contribution to poverty alleviation** is reflected by the share in annotated prototype ideas held by the representatives of the poor.

### Networking

Another output of the RT workshop concerns building networks among the actors to generate knowledge and to collaborate on societal agenda setting. Three aspects of the relationship between actors in a network are important: (1) power and control, (2) trust, and (3) the value generated for the partners involved (Janszen, 2000). The RT workshop is expected to influence (2) and (3) only. Therefore sub-criteria on networking are: (a) the **appreciation and the purpose of meeting ‘others’**, and (b) the **kind of coalitions that might emerge**.

In Table 6.1 below, the process and output criteria adopted in building the evaluative framework are summarized.

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**Table 6.1 Process and output criteria**

<table>
<thead>
<tr>
<th>Process criteria</th>
<th>Output criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant stakeholders involved</td>
<td>Learning</td>
</tr>
<tr>
<td>Boundary setting</td>
<td>Substantial</td>
</tr>
<tr>
<td>Endorsement &amp; support</td>
<td>Procedural</td>
</tr>
<tr>
<td>Balanced representation</td>
<td>Reflexive and sense making</td>
</tr>
<tr>
<td>Inclusion of pro-poor representatives</td>
<td>Initialising actions &amp; Societal agenda setting</td>
</tr>
<tr>
<td>Participatory</td>
<td>Annotated ideas on prototypes</td>
</tr>
<tr>
<td>Transparency</td>
<td>Commitment by participant to develop proto-type</td>
</tr>
<tr>
<td>Dialogue and participation</td>
<td>Prototypes moulded to local needs</td>
</tr>
<tr>
<td>Organization &amp; Facilitation</td>
<td>Collaborative decision making</td>
</tr>
<tr>
<td>Adequate methods and techniques</td>
<td>Contribution to poverty alleviation</td>
</tr>
<tr>
<td>Workshop settings</td>
<td>Networking</td>
</tr>
<tr>
<td></td>
<td>Appreciation and purpose of meeting others</td>
</tr>
<tr>
<td></td>
<td>Kind of coalitions emerging</td>
</tr>
</tbody>
</table>
6.4 Research method

Case study approach
The research draws upon an interpretive perspective (Klein & Myers, 1999), and is based on case studies, using both quantitative and qualitative research methods. Three RT workshops were studied in depth. They were compared and contrasted to help develop a deeper contextual understanding of the processes, and to help uncover unanticipated influences (Maxwell, 1998). The three RT workshops were all based in sub-Saharan Africa and held in two countries, both moving from a socialist to a market-oriented development model and both ranking low on the UN development index. The three workshops were conducted by the same lead facilitator. Two of the sectors studied were in social services, while the third was in the market sector. A brief overview of the three cases is presented in Box 6.1. The cases studied were the application of ICT in education in Tanzania (Edu Tz), in agriculture in Mali (Agric Mali) and in health in Tanzania (Health Tz).

Data sources
Different data collection methods and sources were used to facilitate triangulation (Maxwell, 1998). The different methods included: closed-ended questionnaires, observation, open-ended questionnaires and semi-structured interviews. The data sources included: (1) the participants, (2) the observers and (3) the documentation of the preparations prior to the RT workshop, and (4) the deliberations of working groups and plenary sessions during the RT workshop.

The basic data sources were eighty-six closed-ended questionnaires distributed and filled in by workshop participants directly after the workshop. A second important source of data was the observations gathered by a team of observers (three to seven persons), specifically related to the process and output criteria. Observation data was complemented with that obtained through the seventy-five open-ended questionnaires, to develop a deeper understanding on learning and networking. Statements were screened for the points emphasized and subsequently categorized. For example: To the question of the usefulness of meeting other participants, an answer like: “It was very useful specifically on the exchange of the knowledge and skills”, was categorized first as positive and second as having emphasis on knowledge exchange. A third source of data were nine semi-structured interviews held with participants of the Edu Tz workshop more than a year thereafter and fourteen semi-structured interviews with participants of the Agric Mali workshop. Interviews were conducted by an experienced consultant. The interviewees included both owners of prototypes as well as participants who did

3 N=26 (Edu Tz), 31 (Agric Mali), 29 (Health Tz).
4 N=19 (Edu Tz), 29 (Agric Mali), 27 (Health Tz).
not follow up. Findings were largely discussed with about fifteen participants of Edu Tz and shortly discussed with twelve participants of Agric Mali. Also within IICD, sessions were held to exchange experiences on the preparation and implementation of RT workshops and to identify relevant contextual factors.

For the closed-ended questionnaire a Likert scale was used of one to seven, ranging from 'strongly disagree' to 'strongly agree'. This was filled in by the participants. The findings for a statement were not considered valid, if more than fifteen percent of the respondents did not answer. Responses with differences in mean of greater than 0.15 were taken as significant. The reliability analysis indicated that the scale used in the closed questionnaire was coherent. The closed questionnaire contained some negative statements, responses to which were more distributed (standard deviation of 1.9). This implied that a degree of confusion amongst these respondents around these negative statements may have occurred. However, the responses on the negative statements pointed in a direction consistent with other statements by participants and observers.5

Data from other sources were converted to a similar Likert scale of one to seven. The protocol used was an independent assessment by two researchers. In the few controversial cases a third, knowledgeable person was consulted. The final number was given in consensus. For the output criteria, results were described in terms of occurrence (was ownership generated or not) and quality (e.g. type of learning).

**Indicators and quality of data**

In total, thirty process indicators were used, plus eleven for the output criteria, making a total of forty one indicators to evaluate the RT workshop. The quality of the results of the survey data could be described as high in view of the low number of missing respondents, and the openness and warm atmosphere in which the research was conducted. The different data sources mentioned above, were complemented by comments of bystanders and the unfolding events that build on the RT workshop in the first year thereafter. This countered the criticism of Caron-Flinterman (2005) that evaluative research on participatory exercises is regularly based only on the views of the participants. By taking into consideration issues such as group size and quality of scenarios, a richer contextual base of information was developed.

### 6.5 Study findings

The findings of the three case studies are presented according to the evaluative framework mentioned above.

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5 Questionnaires have been tested (Wieman et al., 2001). However some minor problems were observed for some of the participants in Mali, since the questionnaire was available in the official national languages only and not in the local languages.
6.5.1 Findings on process criteria

The scores on the process criteria are summarized in Figure 6.1 and presented in more detail in Table 6.2. The appreciation of the participants expressed in the closed-ended questionnaire was around 6 on a scale of 7 (86\%). This quite strong overall score on the process criteria was lowered by observed flaws in its preparation.

Relevant stakeholders involved

Boundary setting

Boundary setting was assessed by the observation teams. It was described to be rather ‘natural’ and adequate to define directions for solutions.

Endorsement and support

Organizational endorsement was built up through visiting organizations and assessing their interests prior to the RT workshops. These personal visits to the senior decision-makers turned out to be important to set expectations right, to allow them to take up the status of the initiator and hopefully to become a ‘driver’ of these new developments in their organization. It also allows formalizing the participation of the organization. However, it proved hard to get the theme on the political agenda. Support by the

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6 The standard deviation varies around 1.1 in general. For some criteria it is 1.9-2.2. This is elaborated in the findings.
Table 6.2  Process criteria: Score on indicators for each case study and the enlarged group

<table>
<thead>
<tr>
<th>Process criteria</th>
<th>Sub-criteria</th>
<th>Indicators</th>
<th>Data source</th>
<th>Health Tz Mean</th>
<th>Agric Mali Mean</th>
<th>Edu Tz Mean</th>
<th>Mean</th>
<th>Mode</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Endorsement &amp; Support (E &amp; S)</td>
<td>E &amp; S at sector level</td>
<td>Support of main parties</td>
<td>Obser/Doc</td>
<td>6,0</td>
<td>3,0</td>
<td>3,0</td>
<td>4,0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>E &amp; S at organizational level</td>
<td>Seniority of inaugurator</td>
<td>Obser/Doc</td>
<td>6,0</td>
<td>4,0</td>
<td>5,0</td>
<td>5,0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Senior management aware and approved</td>
<td>Obser/Doc</td>
<td>6,0</td>
<td>4,0</td>
<td>4,0</td>
<td>4,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subtotal</td>
<td></td>
<td>6,0</td>
<td>3,7</td>
<td>4,0</td>
<td>4,6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2  Balanced representativeness</td>
<td>Sector representation</td>
<td>Good rep. of key sectors of economy</td>
<td>Closed Quest</td>
<td>5,9</td>
<td>-- **)</td>
<td>6,2</td>
<td>6,0</td>
<td>7</td>
<td>1,0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I did not miss representatives of important stakeholders *)</td>
<td>Closed Quest</td>
<td>4,0</td>
<td>2,4</td>
<td>-- ***)</td>
<td>3,3</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quorum of senior decision-makers participating</td>
<td>Obser/Doc</td>
<td>5,0</td>
<td>3,0</td>
<td>3,0</td>
<td>3,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>End users</td>
<td>Quorum present &gt;15% direct or indirect</td>
<td>Obser/Doc</td>
<td>7,0</td>
<td>7,0</td>
<td>7,0</td>
<td>7,0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Managerial experience</td>
<td>Quorum present &gt;15% direct</td>
<td>Obser/Doc</td>
<td>6,0</td>
<td>4,0</td>
<td>4,0</td>
<td>4,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subject matter knowledge</td>
<td>Main disciplines present</td>
<td>Obser/Doc</td>
<td>6,0</td>
<td>4,0</td>
<td>6,0</td>
<td>5,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ICT front runner</td>
<td>Quorum present about 10%</td>
<td>Obser/Doc</td>
<td>7,0</td>
<td>2,0</td>
<td>4,0</td>
<td>4,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td></td>
<td></td>
<td>5,8</td>
<td>4,0</td>
<td>5,1</td>
<td>5,0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3 Transparency

<table>
<thead>
<tr>
<th>Transparency in agenda setting</th>
<th>Multi-stakeholder consultations</th>
<th>Obser/Doc</th>
<th>5.0</th>
<th>4.0</th>
<th>3.0</th>
<th>4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realistic expectations setting</td>
<td>Organisations visited and properly briefed</td>
<td>Obser/Doc</td>
<td>6.0</td>
<td>4.0</td>
<td>3.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Clear objectives</td>
<td>Clear objectives</td>
<td>Closed Quest</td>
<td>6.4</td>
<td>6.2</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Clear procedures</td>
<td>No confusion observed on tasks assigned</td>
<td>Obser/Doc</td>
<td>7.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6.1</td>
<td>4.8</td>
<td>4.3</td>
<td>5.1</td>
</tr>
</tbody>
</table>

### 4 Dialogue and participatory

| No different treatment observed | Obser/Doc | 6.0 | 6.0 | 6.0 | 6.0 |
| Well facilitated | Closed Quest | 6.6 | 6.3 | 6.4 | 6.4 | 7 | 0.8 |
| Facilitator seen as resource person | Closed Quest | 6.3 | 6.2 | 5.9 | 6.1 | 7 | 1.4 |
| My needs were heard | Closed Quest | 6.3 | 5.9 | 6.4 | 6.2 | 7 | 1.0 |
| All participants were involved in decision making | Closed Quest | 6.3 | 5.7 | 6.7 | 6.2 | 7 | 1.1 |
| Composition of group experienced as not intimidative *) | Closed Quest | 4.7 | 3.6 | -- | 4.5 | 6 | 2.2 |
| | | | 6.0 | 5.6 | 6.3 | 5.9 |

### 5 Adequate methodology

| Objectives were achieved | Closed Quest | 6.3 | 5.8 | 6.1 | 6.1 | 7 | 1.3 |
| Scenario building and brainstorming was effective | Closed Quest | 6.3 | 6.1 | 6.2 | 6.2 | 6 | 1.2 |
| Within time we could not have done more *) | Closed Quest | 4.3 | 3.0 | 4.0 | 3.8 | 3 | 2.0 |
| | | | 5.6 | 5.0 | 5.4 | 5.3 |

Table 6.2 continues on next page.
### Table 6.2 Continued

<table>
<thead>
<tr>
<th>Process criteria</th>
<th>Sub-criteria</th>
<th>Indicators</th>
<th>Data source</th>
<th>Health Tz Mean</th>
<th>Agric Mali Mean</th>
<th>Edu Tz Mean</th>
<th>Mean</th>
<th>Mode</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6</strong></td>
<td>Adequate workshop settings</td>
<td>Venue was good</td>
<td>Closed Quest</td>
<td>6,5</td>
<td>6,1</td>
<td>6,4</td>
<td>6,3</td>
<td>7</td>
<td>1,3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Catering was good</td>
<td>Closed Quest</td>
<td>6,2</td>
<td>6,3</td>
<td>6,6</td>
<td>6,4</td>
<td>7</td>
<td>1,4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I did not miss some necessary facilities for presentation *)</td>
<td>Closed Quest</td>
<td>5,8</td>
<td>5,6</td>
<td>5,3</td>
<td>5,6</td>
<td>6</td>
<td>1,9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No disturbances (incl. issues on travel costs etc)</td>
<td>Obser/Doc</td>
<td>5,0</td>
<td>3,0</td>
<td>6,0</td>
<td>4,6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right work pressure (Not too busy, not too much time off)</td>
<td>Obser/Doc</td>
<td>4,0</td>
<td>4,0</td>
<td>4,0</td>
<td>5,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subtotal</td>
<td></td>
<td>5,5</td>
<td>5,0</td>
<td>5,7</td>
<td>5,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td></td>
<td>5,8</td>
<td>4,7</td>
<td>5,1</td>
<td>5,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>Inclusion of pro-poor representatives</td>
<td>Quorum present &gt;15% direct or indirect</td>
<td>Obser/Doc</td>
<td>5,0</td>
<td>6,0</td>
<td>2,0</td>
<td>4,3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) To facilitate comparison the negative statements are transposed to positive by correcting with 8 minus the initial score. This might bring distortions as the fact of phrasing a question negative might influence the answer. The wording has also been changed into positive in the table above.

**) Not valid, more than 25% blanc questionnaires.

***) Not valid between 15-20% blanc questionnaires.

****) If multiple nodes exist, the smallest value is shown.
relevant sector ministry and key semi-public agencies was lowest in Agric Mali, and was probably caused by poor preparation of the organizer and weak participation of high level sector representatives. In Edu Tz, the support reduced with the sudden death of the Chief Education Officer, which also resulted in a low participation of ministry officials as many travelled to assist in his funeral.

**Balanced representation**

General characteristics of participants are presented in Annex 6.2, representing a reasonable balance of up-country and capital. This helped in realizing a positive mix of different areas of knowledge and interests. For example while the central level strongly pushed for ideas related to issues that, amongst others, favoured central policy making, central control and a ‘centralized supply’ of services, the up-country interests were reflected in the push for issues like community/hospital access, e-learning, empowerment etc. Scores on balanced representation differed significantly between the cases, e.g. between Health Tz and Edu Tz. While in the former case, there was a good and balanced representation in terms of institutions, levels of seniority, and the areas they came from (rural, provincial and capital), in the other case this diversity was less marked. In Health Tz, the score on managerial experience was high, which had a strong positive influence on the depth of the conversation and the prototypes developed. Participation by less or lower ranking government officials in the other cases lowered the depth of the conversations and hampered prototype development.

The number of (end-)users involved was high (over 40%) in all cases, including those directly affected by changes in service development and delivery, e.g. medical personnel. End-users brought real issues to the floor and highlighted customer value. However, they often focussed on short-term results only and lacked creativity in reaching new solutions. Most participants had limited ICT knowledge, but this was rarely experienced as a constraint. The number of ICT frontrunners was limited to about three per RT workshop. They were very helpful in explaining ICT-based innovations and improved the quality of the annotated ideas. They risked introducing too much ‘hype’ with respect to technological developments (see also Barrett et al., 2006), at the expense of considering practical challenges in making these ICT solutions deliver practical value. It was also observed that some people wanted to have ICT artefacts as they attribute to it a kind of ‘magic’ to deliver benefits without understanding why, what and how.

Differences in social status did not significantly influence the process. However, a trade-off existed for the practice of inviting two participants per organization, a senior decision maker and a senior implementer. The advantage was to have a more balanced representation and thus a higher probability of acceptance of the prototype. The disadvantage was in some cases that it ‘inhibited’ dialogue and created tensions,
especially within the more hierarchical or internally politicalized organisations. For example in one case a lower ranking official indicated she could not speak freely on the quality of services supervised by the ministry, if a higher ranking official of the same department was also there.

On the outset of the RT process in 1997, the poor were generally defined according to the international standard of one US dollar a day, which applies to the majority population in the countries studied. In the course of time this was refined by generally using local definitions of poor e.g. to distinguish poorer segments among the poor. True representatives of the poor were more difficult to identify. Criteria for selection were only loosely defined and included; interest in ICT, representing a larger interest group e.g. poor rural women, and/or a partisan reputation. A basic problem was that the poor were little formally organized. Generally they were part of a larger organization e.g. a rural cooperative. Prototype ideas reflected rather opportunities for the whole cooperative or the larger community, than the specific interests of the poorest segment. It also happened that the interests of the headquarter staff was served more than on-the-ground activities. In Agric Mali, cultural influences diluted true representation of the target group among the poor e.g. a women-cooperative had to be chaired by a man.

**Participatory processes used**

**Transparency**

The scores on transparency differed between the cases. For Health Tz, the main stakeholders were consulted in an early phase of preparations. For Edu Tz, these consultations were less exhaustive and took place at a later stage. For Agric Mali, neither the top of the organization, nor the participants were sufficiently briefed. Transparency is also related to setting the expectations right. Particularly since the owner has to invest substantially in the development of the prototype after the RT workshop. Personal visits turned out to be essential for a proper briefing of the participating organizations, including on the practical terms of the RT process. The lack of proper briefing in the cases of Edu Tz and Agric Mali was the main negative feedback of the participants on the RT workshop. During the workshop the objectives and procedures were clear. The methods and exercises were new to most participants and required ‘independent thinking’ and ‘getting out of the comfort zone’ (Weisbord, 2004).

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7 The terms of the RT process included the reimbursement of travel costs and a daily subsistence allowance during the workshop according to the national guidelines. All other costs including staff time etc were born by the participating organization. The organizer of the RT process offered brokerage to find financing, but did not promise funding themselves, although they indicated they had some seed funds.
Dialogue and participation

In all cases, the overall score for dialogue and participation was high. The methodology required every one to speak out and each ‘voice’ was considered equal in voting procedures. Everyone was encouraged to give input, and few barriers were observed with respect to social status, political position and power based on expert knowledge. The participatory character of the RT workshop, its methodology, the facilitation and knowledge sharing were highly appreciated by most participants as illustrated by the following quotes:

“This way of working was an eye opener to many participants …” (Edu Tz).

“Very methodological, practical, involving and allowing participants active participation” (Health Tz).

“Facilitators did not infringe ownership of ideas, actually we brought our own ideas” (Edu Tz).

“The most positive is the way people can participate fully and openly. If you have an idea, no one stops you from putting it up … then at the end of the day you find this thing is ours” (Edu Tz).

“People really discuss what they feel compared to what is happening in their places” (Health Tz).

Facilitation ensured that the ‘tone’ of the group remained conversational and gained depth, especially by bringing out systemic relations by linking events to causes and consequences. We found that conversations allowed the surfacing of tacit assumptions and minimized defence routines. This exchange of tacit knowledge gained momentum during scenario development and the discussions that followed on the leverage areas for change, as well as group work on annotated prototype ideas. For example: students and headmasters were working together to define key information for a national website on secondary education. Another example was a deputy dean of a major university, who conceptualized with a medical assistant an e-learning programme. This bridging of social differences, at least temporary, inspired and excited participants.

Nevertheless, some conflict and tension arose a few times, which required careful facilitation and reframing of the issue. Also the focus on the future helped to reduce conflicts. The facilitators strived to act as neutrally as possible with respect to the interests of the organizations and controversial issues. Often cited examples of controversies were related to decentralisation, hierarchical decision making, and conflicting roles or interests between organizations. Also the influence and role of donors was often assessed negatively.
Participation by representatives of the poor, and more in general of grass-roots groups was sometimes hampered by their lesser exposure to abstract thinking. An example was the difficulty experienced by this group to understand the concept of ‘mapping information flows’. In the case of Health Tz some training on this concept was given before the RT workshop and this seemed to be helpful. In Mali, cultural features like respect for seniority, higher positions and caste differences tended to reduce speaking up by poorer groups. In Agric Mali there was also a language barrier. These difficulties were reduced through increased attention from resource persons, careful facilitation and quick translations to the local language. Speaking out was mostly reinforced by facilitation, the working procedures and the high value that most representatives of the poor generally attached to their participation. The representatives of the poor helped to re-focus on the real problems of poorer groups and the reality of implementation of prototypes in such an environment.

Methods and techniques
The adequacy of the methods and techniques was acknowledged by the participants. The methodology was often initially difficult to be grasped, but as it unfolded, it surprised and captured the participants.

“It is a very successful methodology, keep it up!” (Health Tz).

Though most participants judged the RT workshop as too short, some felt it was a bit lengthy on elaboration of annotated project ideas. Scenario building, brainstorming and joint priority setting through voting were generally mentioned as the most interesting parts of the workshop. This is followed by the formulation of the prototypes. These ideas for prototypes were jointly reviewed. By the end of the RT workshop steps were discussed to turn ideas into projects. One participant in Agric Mali remarked:

“These project ideas enabled to better understand our problems, preoccupations and to turn them into projects. Still they are only dreams that can be realised, if efforts are made from both sides to reduce certain worries.”

Workshop settings
The workshop settings were generally rated as adequate by the participants. Work pressure was mentioned by about a quarter of the participants as too high; a workshop day was between eight to ten hours. People experienced the workshop as very intensive.

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8 Translated from French.
9 Defects of the sound installation caused problems in Agric Mali.
6.5.2 Findings on output criteria

Learning
Most participants (89%) indicated that they had become more aware of the possibilities of ICT in the sector, and had acquired new insights. Learning was also often emphasized in the post interviews as an output of the RT workshop. The occurrence of learning was supported by the findings on motivation and the achievement of objectives. Observers also noted the use of new ‘language’ by participants, which pointed to the emergence of an ‘organizing vision’ (Swanson & Ramiller, 2004). The type of learning that occurred was approximated by analysing the open-ended questions to find out which new insights were acquired. An emphasis on reflexive learning was found. This is also brought forward in the post interviews, with illustrative quotes, from general to more precise, from participants in Edu Tz:

“The Round Table workshop changed my perception on how the world behaves.”

“There is an ICT revolution taking place.”

“To work together and to interact with others and with the help of ICT to change educators.”

“Child-centred learning can be realised with ICT.”

Both in Health Tz and Agric Mali, the larger picture of the sector and the dynamics of driving forces and uncertainties were frequently cited as major learning points.

“An absolute discovery of strategy,” \(^{10}\)

highlighted a key learning moment of a participant in Agric Mali, who got an overview of the agricultural chain involved and realised the advantage of mutual learning and adjustment. Other quotes, like for example from participants in Health Tz, referred to changed levels of motivation:

“It was incredible, very much encouraging …”

“Very helpful, inspiring, educative and collaborative.”

Reflexive learning apparently aroused most interest and excitement. It made the biggest impression on the participants. For example during a workshop, about one and a half years later, reference was made to a scenario from the RT workshop. Directly an ‘excited buzz’ started as participants exchanged memories. Also individuals recall actively the scenarios one or two years later. Scenario planning is acknowledged as a strong tool for ‘stepping out of established mental models’ and for double loop learning (Janszen,
2000; Van der Heijden, 1996). Reflexivity in the sense of considering social aspects symmetrically to technological ones (Schot, 2001), was perceived by the observers as rather ‘natural’. This was confirmed during the development of the ICT applications in the year following the RT workshop. The only exception observed, was in the case of Edu Tz. During an ICT training course for Edu Tz, some prototype owners started to over-emphasize technology. They made it an ‘end’ in stead of a ‘means’. This was adjusted in group discussions that followed.

Procedural learning was rated as second most important. A number of participants were quite intrigued by the methods and techniques used. Ranking third was substantive learning on ICT itself, as well as the theme of the RT workshop. These findings coincided with the observation that limited ICT knowledge was not a blockage in the RT workshop. In Health Tz, the analysis of the type of learning was done for each of the five programme units (scenarios, leverage areas, idea generation, elaboration of actions and presenting & discussing actions). Reflexive learning dominated in the first and last part of the programme and procedural learning during the elaboration of the annotated prototype ideas.

**Initialising actions and societal agenda setting**

The workshops produced a number of annotated prototype ideas (see Table 6.3). Ideas were articulated after the scenario building and the identification of leverage areas for change in the sector (10 for Health Tz, 11 for Edu Tz and 7 for Agric Mali). For each case, the number of ideas was higher (over 40), but it was not feasible to work out more than roughly 10 prototype ideas per workshop. Larger numbers would not be conducive to quality, as it would mean too little time for scrutinizing the ideas in a plenary session. Priority setting was achieved with a large consensus, with prototype ideas being well distributed over the different themes in the sector. The participants judged the ideas on whether they reflected (a) priorities on the ground and (b) national priorities. For both indicators, the average score was very good (6.2 or 89%) with little difference between the cases. The exhaustiveness of the criteria of selection of ideas was rated as good (79%), with again little difference between the cases. This pointed to collaborative decision making and societal agenda setting. Results were documented and reported back to the responsible ministries.

It is interesting to know to what extent participants changed their ideas on what they wanted to accomplish with ICT during the RT workshop. The answers varied according to the cases. Generally 25-50% of the respondents indicated: ‘Yes, I developed new ideas’. About 25-40% indicated that they had sharpened and improved their ideas, and 10-30% indicated that they did not change their ideas. In comparing the cases, the most plausible explanation is that the lower the level of preparation of the participants of the RT workshop and the lower the general awareness of ICT, the higher were the number of new ideas (Agric Mali). However a higher number of new ideas did not
Table 6.3  Output criteria: Score on indicators for each case study and the enlarged group

<table>
<thead>
<tr>
<th>Output criteria</th>
<th>Sub-criteria</th>
<th>Indicators</th>
<th>Data source</th>
<th>Health Tz Mean</th>
<th>Agric Mali Mean</th>
<th>Edu Tz Mean</th>
<th>Mean</th>
<th>Mode</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Learning</td>
<td></td>
<td></td>
<td>Open Quest</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Initialisation of actions</td>
<td>(prototypes identified &amp; ownership)</td>
<td>Number</td>
<td>Obser/Doc</td>
<td>10,0</td>
<td>7,0</td>
<td>11,0</td>
<td>9,3</td>
<td>7</td>
<td>1,1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ideas true reflection of problems on the ground</td>
<td>Closed Quest</td>
<td>6,2</td>
<td>6,0</td>
<td>6,5</td>
<td>6,2</td>
<td>7</td>
<td>1,1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selected ideas reflect national priorities</td>
<td>Closed Quest</td>
<td>6,5</td>
<td>6,1</td>
<td>6,2</td>
<td>6,2</td>
<td>7</td>
<td>1,1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Criteria for selection were sufficiently exhaustive</td>
<td>Closed Quest</td>
<td>5,7</td>
<td>5,4</td>
<td>5,6</td>
<td>5,5</td>
<td>6</td>
<td>1,3</td>
</tr>
<tr>
<td></td>
<td>Ownership</td>
<td>More aware of capability ICT in sector</td>
<td>Closed Quest</td>
<td>6,1</td>
<td>6,1</td>
<td>6,3</td>
<td>6,2</td>
<td>7</td>
<td>1,1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Follow up: Are you (thinking of) initiating a project</td>
<td>Closed Quest</td>
<td>95-100%</td>
<td>95-100%</td>
<td>95-100%</td>
<td>95-100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>% owners still working on idea 6-12 months later</td>
<td>Obser/Doc</td>
<td>130%</td>
<td>43%</td>
<td>73%</td>
<td>82%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Networking</td>
<td>Share in prototype ideas by representatives of poor</td>
<td></td>
<td>Obser/Doc</td>
<td>4,0</td>
<td>6,0</td>
<td>1,0</td>
<td>3,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Usefulness of meeting other people(stakeholders)</td>
<td>Open Quest</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Joint proposal development of prototype</td>
<td>Obser/Doc</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
subsequently lead to more developed prototypes, as we will see later. A mix between new ideas and ‘chewing and tossing’ existing ones, seemed the best from an output point of view. This deliberate pondering and shaping of ideas was based on enriched insights on future developments. This also reduced uncertainties. This is expected to contribute to the intrinsic motivation of the prototype owner and the acceptance of the prototypes.

Statements pointing to reflexivity and empowerment were often cited by participants as main success factors of the RT workshop. People could speak out, launch their ideas, be motivated and make decisions. This contributed to ownership (Handy, 1976). All participants indicated they wanted to undertake follow-up actions, most often with a prototype (project) at the organizational level. Strong indicators on both tangible outputs as well as ownership, were the number of prototypes still actively pursued by the owner(s) six months later, even while financing was not yet assured. In Edu Tz, eight prototypes were in the process of formulation. In Agric Mali, two prototypes were formulated with an additional interest in formulating three others. In Health Tz, the nine ideas of the RT workshop were under formulation and seven additional ideas had been developed by the owners. This high score in Health Tz, despite the low follow-up by IICD in the first six months after the RT workshop, could only partly be attributed to the higher number of participating organizations. Also the staff transfers between the cases were not dramatically different, though higher for Agric Mali. The most plausible explanation is a higher level of commitment in the case of Health Tz. This has also been observed during follow up activities six months later.

To what extent were participants involved in the RT process after the workshop? The number of participants who were still involved in prototype formulation six months later was 75% for Health Tz, 55% for Edu Tz and 30% for Agric Mali. Though there are no norms, we estimate that a participation rate of over 50% after six months is high. The drop-out was highest for civil servants, mainly due to reasons of transfer of staff, lack of follow-up by the organizers, existing work pressures and a lack of endorsement for prototype development in their organizations. Most representatives of the poor continued their participation.

The results of including representatives of the poor generated prototypes for poor communities, but not for the poorest segments only. For Agric Mali, over 15% of the participants were representing the poor and three prototypes relating to agricultural development in rural and poorer areas emerged from it. In Health Tz, only about 10% of the participants could be considered directly related to the poor, and two out of ten prototypes were related to this community. In Edu Tz, there was one representative of the poor and she developed a prototype. Besides prototype generation, the RT workshop could be seen to empower representatives of the poor through knowledge and inclusion in a network.
Networking
In all cases, the participants emphasized the usefulness of meeting and exchanging information with other stakeholders. Three issues were stressed: (a) the social aspect (‘getting to know each other and networking’), (b) learning, and (c) the political aspect of mutual adjustment (or concertation). Learning was described as the most important category. The RT workshop created a social arena for lively exchanges between participants and a sense of a group. A participant in Edu Tz illustrated this by saying:

“The RT workshop gave me the capability and the power for making decisions. [...] I had some ideas on IT, though it would be very difficult to implement them. However, after the RT, I realized I was not alone, and in case of any problem I can communicate with others and share some knowledge and move forward.”

Nearly all respondents answered positively to the question: ‘did you find new partners/ organizations to work with’, and mentioned a number of organizations. In the last part of the workshop, participants worked together in small teams to develop annotated ideas on prototypes. This could trigger collaboration. It turned out that participants were anxious to learn from one another and even to work together in the formulation of the prototypes, but joint implementation was rare. Partisan interests seemed a main driver and distrust a main obstacle. The post interviews indicated that conflicts of interest easily arose if representatives of different organisations worked on the same or similar prototypes. Generally each organization wanted its own prototype.

6.6 Context features

Five dimensions are marked as relevant for the appreciation of the context prior to a technology assessment (TA) project (Bütschi et al., 2004). The three case studies were largely comparable in this respect. The technology was relatively new in the local setting and applied to a domain e.g. ICT in education. Knowledge on the technology is still limited. Socially there were no main values at stake, except for potentially bad use of ICT. Politically, ICT is still at a stage of agenda setting with limited understanding on its potential effect on power relations. Also in all cases, the capacity and willingness to innovate was rather low. Against this backdrop, the question arises what contextual features influence the RT workshop? Our analysis leads to the identification of the following interdependent contextual conditions:

11 Remarkably they hardly mentioned names of individuals, while during the workshop, collaboration seemed largely based on personal interests and personal affinity with institutional linkages being of secondary importance.
1. *The centralisation of political power and the room for manoeuvre for decision making and changes it leaves to organizations.* This was very clear in the social sectors of education and health and less in agriculture. This was clearly illustrated by the gradual withdrawal of public organizations involved in Edu Tz when the ministry withdrew (temporarily) its support. Most likely this is the consequence of a culture with a strong ‘power difference’ and a strong dependency on the ‘top’ for resources and career opportunities.

2. *Hierarchy and delegation within organizations.* Many organizations are strongly hierarchical, and the findings pointed to the importance of making the top of the organization aware as of the start of the RT process.

3. At organizational level, *the culture regarding new ideas* is important. Are ideas invited and encouraged? What risks does someone take to bring up new ideas? Especially in bureaucratic organizations, we found that ideas on ICT by senior officials were suffocated by the highest level. In some large NGOs, it was observed that it is not the idea that counts, but the potential funds of donors it might bring.

4. *The general competences of participants related to strategy development and to manage change* proved helpful e.g. the ability to be visionary, to be able to plan, to oversee the consequences of implementation etc. Especially the ability to work out a project was critical.

5. *The attitudes towards engagement* i.e. are people inclined towards an active attitude of taking action and responsibility or are they more passive and awaiting? For example a prototype owner – a large institution – that wanted to create a dedicated ICT service provider, just went ahead neither waiting for support, nor making themselves dependent on it. Another prototype owner – also a large institution – just waited and waited for the facilitator to respond to them after the RT workshop. In both cases there were no organizational reasons impeding action.

6. *The general awareness on ICT* plays a role, but limited if ICT is still in early stages of its introduction at national and sectoral level. For example in Health Tz in 2005, ICT was neither on the political agenda of the Ministry nor that of donors organizations. ICT was not used in hospitals or health facilities. Some isolated (small) ICT projects were ongoing in health largely driven by expatriates. It should be noted that both in health and education, computerised central management information systems were initiated, but without success.
7. *The pressure to perform* on the organization; are there incentives and other institutional arrangements conducive to performance? For example, government agencies that get a greater responsibility to generate their own income, were generally more active.

8. *The level and quality of interaction between the actors in a sector*; this includes the level of interconnectedness between the actors, the frequency and quality of interaction, especially of the feedback. Within well connected sectors – or parts thereof, like Health Tz or the Headmaster association in education – news and new possibilities spread faster than in a loosely coupled sector like agriculture in Mali.

It appears that the only condition sine qua non, is the following political factor: the room to manoeuvre that is allowed at both sector and organizational level. The other contextual factors only slow down the pace of the RT workshop and might lower the quality of the annotated prototype idea.

6.7 Conclusion and discussion

**Conclusion on cases studied**

The research objectives of this chapter were (1) to assess whether the RT workshop is an effective methodology to initiate a process of CTA, and, (2) to explore the contextual conditions that may influence the conduct of such a RT workshop. The results indicate a robust CTA process in its initial phase. The output included reflexive learning as to make sense of the new technology and to identify locally relevant prototypes. The relevant stakeholders perceived these prototypes as to have the highest impact at sector level. A strong sense of ownership evolved. This ownership was primarily at individual level and in a number of cases, also at organizational level. Proper preparation of the RT workshop was an important explaining factor for the level of ownership by the participating organizations. A firm and tangible output was the start of the development of generally 8–10 prototypes of ICT based innovations in priority leverage areas for sector development. The output varied with the quality of the process. The initiation of the CTA process was rather context independent, provided a minimum political room for manoeuvre is allowed at organizational and sector level.

The findings of comparable RT workshops\(^\text{12}\) – not elaborated in this study – indicate a similar high appreciation of the participants of the process conditions. Also similar

\(^{12}\) RT workshops held in Bolivia 2002 on Agriculture, Burkina Faso 2003 on Agriculture, Ghana 2003 on Agricultural marketing, Ecuador 2005 on (District) Governance, Uganda 2003 on Health, Zambia 2002 on Livelihood Opportunities and Zambia 2003 on Education. The Bolivian, Ecuador and Uganda workshops were carried out by a different lead facilitator.
output was produced in terms of prototypes identified, learning, especially reflexive learning, and networking in three other cases examined on this aspect (Ghana, Zambia and Burkina Faso). These findings point to reliability and robustness of the RT workshop.

Areas of improvement of the methodology

On three points the findings indicated flaws in the RT workshop methodology: empowerment of the poor, the need for proper preparation, and the development of the societal agenda related to the technology. These points are discussed below.

First, the findings point to empowerment of participants. Empowerment implies that the agenda is set by the stakeholders involved, according to their needs and knowledge. This may even mean to reject the theme of ICT, which indeed happened a few times. The role of the external agency is confined to facilitation, funding, and monitoring/auditing physical and financial aspects of the action plan. Empowerment implies building the capabilities to participate (Puri & Sahay 2007), including: (1) access to resources necessary to participate, (2) acceptance and internalization of responsibility to participate, (3) ability to communicate effectively and freely in conditions established to elicit participation, (4) the knowledge participants have about the problem domain, and (5) authority to carry out the consequences of participatory action and to take relevant decisions. While the first three capabilities were realised prior and during the RT workshop, the fourth capability of knowledge was build up gradually over time.

A weakness of the RT workshop was insufficient impact of inclusion of the poor in terms of specific prototypes generated for the poorest segments. One probable reason was a lesser exposure to abstract thinking. Capacitating them in advance on conceptual issues like ‘information’ and on procedural knowledge, especially on problem analysis and planning, should eliminate this capability gap. Another reason was the difficulty in identifying true representatives of the poor. A third reason was the potential lack of financial sustainability of prototypes geared at the poorest segments. This suggests a strategy of inclusion of the poor in the RT workshop as to have a number of ‘group’ or community based ICT prototypes. At the same time, the poor are empowered through information (e.g. on market prices) and knowledge (e.g. on agricultural practices, on social services, training of youth on ICT skills for better job opportunities). This increases their control over resources and access to services as acknowledged in several cases in Tanzania. In a second stage, more empowered representatives of the poor could articulate their own activities and ‘piggy-back’ on the existing ICT infrastructure and knowledge. It should be noted that costs of infrastructure are substantial higher per head in Africa. From a theoretical perspective the lack of control over resources and the lack of access to services are main causes for poverty (Narayan, 2000). Therefore the RT process contributes directly to empowerment of the poor and poverty alleviation, but probably more so in a second stage. A condition is their continuous inclusion and
encouragement to participate in ICT activities.

Secondly, flaws in preparation turned out to have a negative effect on legitimacy and balanced representation. The findings underline the link between extensive briefing of the participatory organizations and the output realised. Weak preparation reduces the authority to carry out the consequences of participatory actions. It seems essential in the preparatory phase to obtain legitimacy for actions to be taken as it involves power (‘who is the boss here?’) and status (‘I am the champion of this new technology’). The RT workshop methodology could be further improved by a joint assessment on the capacity to change of the organization, as a way to stimulate empowerment and acceptance of ICT within the organization.

Thirdly, during the RT workshop, a vision emerged that embodied shared meaning on the potential role of ICT in the sector as related to the key or target areas of application. This vision contained elements for developing a dominant discourse. This was, however, insufficiently pushed, because the RT workshop methodology implied a refocusing on prototype development. The vision building done, was apparently insufficient an input for the participants for a lasting effort to push for the development of a societal agenda related to ICT. This highlights a trade off in the methodology between nurturing ownership of prototypes and the development of a societal agenda. Developing a parallel trajectory for societal agenda setting could improve the RT process methodology.

Comparison to literature on TA and participatory design

The findings on the output of the RT workshop are in line with the dimensions of impact in TA: Scenario-based reflections on priorities in the societal agenda, self-reflection among actors, insights in the consequences of the technology, some ‘bridge-building’ between actors and actions initialised for the development of ICT based innovations (Hennen et. al., 2004). At the micro-level, the RT workshop contained many elements of participatory design, especially Future Search (Muller, 2003; Weisbord, 2004). The RT workshop puts more emphasis on ‘futuring’ around coherent and plausible stories in which the behaviour of actors evolves over time as constructed by the participants in the particular scenario. Also the translation of ‘visions’ is centred around ideas with owners and less around clusters of issues elaborated by a workgroup of relevant stakeholders as in Future Search. The RT workshop proved effective as the sequence: ‘futuring’, idea generation and elaboration of prototypes per organization resulted in reflexive learning and empowerment, which generate ownership. In Future Search the outputs are equally ‘common ground’, action plans and commitment (Weisbord, 2004, p. 429), However this commitment cannot be translated into lasting ownership, as organizations are insufficiently willing to collaborate on the development of ICT-based innovations in the cases studied. Therefore the RT approach is more effective in a multi-organizational setting in an environment with limited social capital. Moreover, empowerment can be nurtured in a particular organizational setting, but erodes in a
governance setting – like most development programmes – where key decision making is beyond control of the participants.

**Benefit from theory on participation**

The findings showed that empowerment can be realised effectively in the setting of the RT workshop. But will it also influence institutional change? Participation is socially defined (Puri & Sahay, 2007) and the potentially blocking interests and institutions to participation should be distinguished at an early stage. While during the RT workshop, real blockages were hardly observed, they may become more relevant in the longer term. New perspectives on the future might trigger commitments to change, a re-definition of interests, but also instilling resistance to change. Participants’ learning is conditioned by institutions (North, 1990) that shape the way individuals perceive the world surrounding them. Reflexive learning refers to changes in these perceptions, which lead to the reproduction of the institutions, and the creation of new social discourses fundamental to organizational change (Barrett et al., 2006). As reflexive learning is a main output, the RT workshop is an instrument for institutional change.

Change is not a straightforward rational process, but is complex, analytical, political and is historically situated. Institutions only change incrementally (North, 1990) and therefore a cultivation approach has to be used. Piotti et al. (2006) based on a study on health information systems reform in developing countries, demonstrate the importance of informal institutions and the difficulty of enforcing new desired institutions, if the overlap is limited or the divergence between formal rules and informal constraints is large. During the RT workshop, the situated rationality of work practices and embedded or related power processes, are subjects of conversation. This helps first to minimize the gap between the formal and informal and secondly to align differences in interest. Hence, the RT workshop enables action to occur and change to happen. The level of change depends on many factors amongst others the perceived value of the novel ICT based practices and the controversies it generates.

The emphasis on participation in the RT process is not limited to users, but geared to the co-production of technology and technology enabled organizational practices. The key issues in participation are therefore the involvement of all relevant stakeholders including suppliers and the agenda of the financiers (‘donors’) in a longer term process. Decision-making is not necessarily based on consensus. Joint actions are possible if meanings are congruent (Grin & van de Graaf, 1996). The RT workshop offers a methodology to discover congruent meanings based on the joint development

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13 Observations made by national observers who are familiar with most (sub) cultures involved.
of expectations around a shared theme. Making it precise and tangible through the identification of concrete actions enhances the quality of the meanings. Weaknesses in capabilities to participate can be made up, if a longer term process is supported in terms of facilitation and capacitating. The dynamics of interaction among participants surface impeding institutional arrangements and areas of conflict. The RT process enables to negotiate solutions based on a jointly developed attractive future through scenarios on the use of ICT. It could be a way to tackle embedded work practices that represent entrenched interests by groups that search to maintain the status quo (Krishna & Walsham, 2005). At organizational level, this study shows that a thorough preparation with the stakeholders involved, leads to greater acceptance and interest at organization level of novel ICT mediated practices. This contributes to structural changes within the participating organizations. At sector level this requires some room of manoeuvre by bureaucratic government and donor structures over a longer period of time.

**Concluding remarks**

Theoretical contributions of this study are the proposition of process conditions for evaluation (Rowe & Frewer, 2004) and the argument that micro aspects of participatory methodologies matter. But the main contribution of this study is that it provides the CTA approach with a methodology to combine anticipation, reflexivity and the design of ICT-based innovations. Reflexivity, room for initiative through idea generation and empowerment, enabled ownership to be ‘grown’. Apparently, the RT workshop is able to mobilize and focus actors to invest in technology development that will generate novel technology mediated practices. The annotated prototype ideas included practices that could have potentially strong impact on transactions costs (e.g. on-line publication of exam results, registration for enrolment in universities, vacancy announcements etc.), social positions (e.g. e-learning revises the role and hence the power of a tutor), spread of information and feedback mechanisms (e.g. all teacher training colleges connected and grouped to develop their own services and decide on applications; principals of secondary schools made knowledgeable on how to install and operate cost effective computer class rooms in schools). Also literature indicates strong benefits of ICT applications for the poor (Cecchini & Scott, 2003). However, the RT workshop is only a first stage of a four to seven years RT process. The ability to learn and to persist is essential to arrive at sustainability and scalability (Krishna & Walsham, 2005). Follow-up research is required and ongoing to assess the outcomes and impact of the CTA process and its value as a tool for ICT applications for development.
## Annex 6.1 RT workshop methodology

<table>
<thead>
<tr>
<th>Steps</th>
<th>Method(s) deployed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Preparation</strong></td>
<td></td>
</tr>
<tr>
<td>1 Reconnaissance theme</td>
<td>Overview sector, Screening against criteria</td>
</tr>
<tr>
<td>2 Initiation of a steering group</td>
<td>Selection on relevance and willingness. Some team building</td>
</tr>
<tr>
<td>3 Demarcation theme</td>
<td>System analysis</td>
</tr>
<tr>
<td>4 Selection of participating organizations and participants</td>
<td>Inventory with several informants, visit to gauge interest, get approval and manage expectations</td>
</tr>
<tr>
<td>5 Development reference report</td>
<td>Analysis by experts</td>
</tr>
<tr>
<td>6 Preparatory workshop/seminar for participants</td>
<td>Mix of conference, training and demonstrations</td>
</tr>
<tr>
<td><strong>(b) RT workshop</strong></td>
<td></td>
</tr>
<tr>
<td>7 Analysis current situation</td>
<td>Lecture-discussion</td>
</tr>
</tbody>
</table>
| 8 Scenario development | Scenario method of Global Business Network (GBN)
An analysis of external driving forces and their level of uncertainty that impact on the theme. Two main and fundamental uncertainties are selected and placed along two axes. The four quadrants created, constitute four different plausible stories of the future (Ringland, 1998). |
| 9 Visioning | Story telling
Participants tell each other what the vision looks like (a facilitated plenary session). |
| 10 Analysis of sectoral leverage areas for change through ICT | Selection of leverage areas and analysis of information flows and a variant on Nominal Group Technique |
| 11 Idea generation | Brainstorm |
| 12 Setting priorities | Clustering and Multi-voting |
| 13 Prototype identification | Analysis and project planning by participants |
| 14 Plenary feedback and advice | Presentations & feedback |
| 15 Dissemination RT workshop results | Reports/booklets, feedback to policy-makers |

1 Method developed by Global Business Network founded by Peter Schwartz and Jay Ogilvy, based on Pierre Wacks’ work at the Shell (Ringland, 1998).

2 Participants tell each other what the vision looks like (a facilitated plenary session).
Annex 6.2 Background data on participants RT workshops for selected cases

<table>
<thead>
<tr>
<th>In what kind of institution are you working?</th>
<th>Valid percentage</th>
<th>Health Tz</th>
<th>Agric Mali</th>
<th>Edu Tz</th>
</tr>
</thead>
<tbody>
<tr>
<td>National NGO</td>
<td>14%</td>
<td>14%</td>
<td>19%</td>
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</tr>
<tr>
<td>International NGO</td>
<td>6%</td>
<td>14%</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td>Local Government</td>
<td>12%</td>
<td>24%</td>
<td>0%</td>
<td>12%</td>
</tr>
<tr>
<td>National Government</td>
<td>16%</td>
<td>7%</td>
<td>16%</td>
<td>27%</td>
</tr>
<tr>
<td>Small company (1-5 employees)</td>
<td>3%</td>
<td>0%</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Medium-size company (6-25 employees)</td>
<td>1%</td>
<td>0%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Large company (above 25 employees)</td>
<td>3%</td>
<td>3%</td>
<td>0%</td>
<td>8%</td>
</tr>
<tr>
<td>University / Research institute</td>
<td>10%</td>
<td>21%</td>
<td>0%</td>
<td>8%</td>
</tr>
<tr>
<td>Co-operative</td>
<td>5%</td>
<td>0%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>Grass-root organisation</td>
<td>9%</td>
<td>3%</td>
<td>23%</td>
<td>0%</td>
</tr>
<tr>
<td>Other</td>
<td>20%</td>
<td>14%</td>
<td>16%</td>
<td>31%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What is your position in your institution?</th>
<th>Valid percentage</th>
<th>Health Tz</th>
<th>Agric Mali</th>
<th>Edu Tz</th>
</tr>
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<tbody>
<tr>
<td>Director</td>
<td>15%</td>
<td>17%</td>
<td>10%</td>
<td>19%</td>
</tr>
<tr>
<td>Manager</td>
<td>15%</td>
<td>21%</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Administrative staff</td>
<td>14%</td>
<td>14%</td>
<td>7%</td>
<td>23%</td>
</tr>
<tr>
<td>Technical staff</td>
<td>30%</td>
<td>21%</td>
<td>58%</td>
<td>8%</td>
</tr>
<tr>
<td>Teacher</td>
<td>7%</td>
<td>7%</td>
<td>0%</td>
<td>15%</td>
</tr>
<tr>
<td>Support staff</td>
<td>2%</td>
<td>0%</td>
<td>3%</td>
<td>4%</td>
</tr>
<tr>
<td>Self employed</td>
<td>1%</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td>Student</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>8%</td>
</tr>
<tr>
<td>Other</td>
<td>13%</td>
<td>21%</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>Total</td>
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<td>100%</td>
<td>100%</td>
<td>100%</td>
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</table>

<table>
<thead>
<tr>
<th>Your age is:</th>
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<th>Agric Mali</th>
<th>Edu Tz</th>
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<td>20 or below</td>
<td>1%</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>21-30 years</td>
<td>5%</td>
<td>0%</td>
<td>3%</td>
<td>12%</td>
</tr>
<tr>
<td>31-40 years</td>
<td>28%</td>
<td>31%</td>
<td>42%</td>
<td>8%</td>
</tr>
<tr>
<td>41-50 years</td>
<td>31%</td>
<td>31%</td>
<td>29%</td>
<td>35%</td>
</tr>
<tr>
<td>51-60 years</td>
<td>33%</td>
<td>35%</td>
<td>26%</td>
<td>39%</td>
</tr>
<tr>
<td>61 and above</td>
<td>2%</td>
<td>3%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender:</th>
<th>Valid percentage</th>
<th>Health Tz</th>
<th>Agric Mali</th>
<th>Edu Tz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>23%</td>
<td>30%</td>
<td>13%</td>
<td>27%</td>
</tr>
<tr>
<td>Male</td>
<td>77%</td>
<td>70%</td>
<td>87%</td>
<td>73%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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</table>
### Annex 6.2  *Continued*

<table>
<thead>
<tr>
<th>Valid percentage</th>
<th>Health Tz</th>
<th>Agric Mali</th>
<th>Edu Tz</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How far have you gone in school?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary education</td>
<td>7%</td>
<td>3%</td>
<td>13%</td>
</tr>
<tr>
<td>Secondary education</td>
<td>23%</td>
<td>31%</td>
<td>23%</td>
</tr>
<tr>
<td>Tertiary education</td>
<td>70%</td>
<td>66%</td>
<td>65%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>In what area are you living at the moment?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural area</td>
<td>11%</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>Provincial or district town</td>
<td>43%</td>
<td>48%</td>
<td>58%</td>
</tr>
<tr>
<td>Capital city</td>
<td>47%</td>
<td>41%</td>
<td>26%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>What is your household income related to other people in your country?</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below average</td>
<td>8%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Average</td>
<td>70%</td>
<td>69%</td>
<td>71%</td>
</tr>
<tr>
<td>Above average</td>
<td>22%</td>
<td>21%</td>
<td>19%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
CHAPTER 7

Evaluating the development, impact and the integration of the ICT applications generated through the RT process

7.1 Recapitulation

7.2 Introducing ICT in education in Tanzania

7.3 Evaluative framework
   7.3.1 Organizational level: Number of prototypes formulated and integrated
   7.3.2 Impact on users
   7.3.3 Impact on poverty reduction
   7.3.4 Stimulating the ICT integration at sector level

7.4 Research method

7.5 Process conditions

7.6 Outcomes
   7.6.1 Organizational level: Number of prototypes formulated and integrated
   7.6.2 Impact on users
   7.6.3 Impact on poverty
   7.6.4 Integration of the ICT-based innovation at sector level

7.7 Discussion

7.8 Conclusion
7.1 Recapitulation

The RT workshop proved to be a rather robust start-up of the RT process, if well prepared and well conducted. In this chapter we evaluate the subsequent cycles of the RT process. The general characteristics of CTA are rather broad and include the creation of the social conditions to enable stakeholders to meet and exchange. All relevant stakeholders have to be involved to ensure that the different view points of the system concerned are tabled. The CTA process goes step-wise and moves from joint scenario development and visioning to idea generation, followed by agenda setting, and thereafter – in parallel – both implementation and policy making.

Developing and integrating a new technology is a process in which various actors (try to) exert influence on the shaping of the technology. Alignment indicates the mutual and well-functioning adjustments between different actors involved as to produce collaborative decision making on the technology. An important aspect of CTA is agenda setting in order to cater for societal needs, followed by interactive policy development. Finally communicative actions are undertaken (Decker & Ladikas, 2004),1 with the function to inform better, a wider, but concerned audience on the CTA process and to stay in ‘touch’ with actual developments in society, science and technology.

At organizational level the objectives of the RT process are (1) to develop ICT applications molded to local needs and hence (2) to have impact on end-users, including (3) to contribute to poverty alleviation. A main task is to empower individuals and teams, as to develop prototypes of ICT applications and to integrate them into the organization. The prototypes are innovations in the local context without tangible ‘examples’ of these innovations in the sector concerned. At sector level, the objective is (4) to develop a societal agenda related to the technology that is responsive to local needs including poverty alleviation and to create a conducive environment accordingly. Another contribution of the RT process could be (5) to speed up the ICT-based innovation processes.

The RT process lasts four to seven years. The ideal-type currently consists of about 35 steps (see Ch 4, Table 4.1) that are clustered in three development cycles. The first development cycle is a participatory multi stakeholder workshop to generate annotated ideas for prototypes of ICT applications relevant to local needs. The second development cycle is about the formulation and implementation of the prototypes. The third development cycle is about the integration of the prototypes at organizational and sectoral level.

The structure of this chapter is as follows. First the situation on ICT in education in

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1 The Technology Assessment – Methods and Impacts (TAMI) represents an effort by 13 European institutes to explore the major issues of TA in Europe and to draw conclusions on a common TA “reference system” using the “twin group principle”. They considered their effort successful. In their study they added communicative actions as part of TA processes.
Tanzania is presented. Next we develop an evaluative framework and we present the research methodology. The process conditions are of importance to appreciate the outcomes of the RT process and are elaborated shortly. This is followed by an analysis of the outcomes. These findings point to the effectiveness of the RT process. The findings are validated against other RT processes implemented during the past five years. In fact, most interesting are the weaknesses and the obstacles encountered as they are indicators of more structural barriers to the implementation and scaling of ICT applications. The issue of scalability is taken up more in-depth in next chapter.

7.2 Introducing ICT in education in Tanzania

In 2000, Internet access was very expensive and mainly limited to urban areas. In 2006, thanks to deregulation, most districts had some connectivity, but this was still relatively expensive. Mobile phones were popular and their number grew from 50,000 in 1999 to nearly 3 million by the end of 2005. A survey in 2004 in six rural districts in East and West Tanzania revealed a low awareness of Internet and email (UNDP & SIDA, 2005).

The use of ICT in education was very limited in 2002. To apply ICT in schools, four basic elements were needed: (1) physical infrastructure, (2) educational software, (3) competences of users, and (4) an adequate educational philosophy (ictopschool, 2006; Tuijnman & Brummelhuis, 1993). In 2002, the ICT infrastructure in schools was very poor, with only a few schools equipped with computers. Most computers were donated and not even refurbished. Sometimes computers were left in storage, simply because there were no knowledgeable users available. ICT was not used in teacher training. Most decision makers were neither aware of capabilities of educational software, nor had any philosophy on the use of ICT in education (Tilya et al., 2006). In 2002, in the Ministry of Education (hereafter called the Ministry) and the Tanzanian Institute for Education, computers were provided by international donors, but their use did not go beyond ‘type writing and e-mail’ for several years thereafter.

The first development cycle of the RT process started in November 2001 with ICT training for a number of principals of secondary schools in Dar es Salaam. At that time, awareness on ICT was very low. A memorandum of understanding was established between the Ministry and IICD to formalise the Ministry’s approval and support of the RT process. A schematic overview of the RT process is presented in Figure 7.1.

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1 Ictopschool is a NGO, supported by the Dutch Government to provide advice, professional support and to monitor progress on the use and beneficial effects of ICT in education. Tuijnman and Brummelhuis developed the principles of the approach, which were refined over time and subject of several PhD studies.
In February 2002, the Round Table workshop (4 days) was held. It regrouped representatives of most relevant stakeholders in the education sector, i.e. the Ministry, three specialised institutes, two NGOs, representatives of schools and resource persons. It should be noted that there were only a few public actors and specialised NGOs in this field. Consequently, three new NGOs were created. The RT workshop resulted in 11 annotated prototype ideas. Examples were: (1) a website by and for secondary school students; (2) training of teachers on ICT in teaching and learning; (3) a mobile ICT resource unit; and (4) an interactive website for inspectorate.

The RT workshop, both process and output, were subject of in-depth evaluation (chapter 6). The key criteria for CTA advanced by Schot (2001) – anticipation, reflexivity and social learning – were largely confirmed. Outputs included:

1. Learning, with reflexive learning as most noteworthy;
2. Initialising actions through generation of ideas for prototypes that were owned by individuals or teams of participants involved. Participants indicated that the prototype ideas had a high impact from a societal perspective;
3. Collaborative decision making was realised and the societal agenda was set by identifying priority areas for leverage;
4. Networking was perceived as useful and therefore the RT workshop could become a platform for subsequent CTA processes.

In the second development cycle the attention shifted to the individual organizations. This cycle lasted about three to four years. The emphasis was on the formulation and
implementation of the identified prototypes. The prototype teams were engaged in a process of ‘learning-by-doing’ through workshops, coaching and expert advice. Potential users became involved in prototype development. The teams also paid attention to awareness raising and training of users. The prototype teams started to constitute a network for the regular exchange of knowledge. On purpose, the size of the prototypes was limited with a financial ceiling of about US $ 120,000. IICD promised to assist in searching for financial support. Most plans were presented to IICD for (co-) funding, but not necessarily.

During the third development cycle, a prototype should become fully integrated into the organization in an improved and enlarged form. In parallel, attention was paid to sharing lessons learnt, advocacy and efforts for interactive ICT policy making at the sector level. Networking and lobbying were key activities to stimulate policy development. However, the scope of the 3rd development cycle had not fully been worked out at the time of this study.

7.3 Evaluative framework

As the RT process spans four to seven years, a reductionistic approach of assessing the intermediate output of each intervention only, risks being short of reality. Even the evaluation itself has effects (Bütschi et al., 2004). The starting point for the evaluation is a successfully completed RT workshop. The outcomes of the RT process can only be evaluated in the light of the process leading to it and the different contextual settings (Rowe & Frewer, 2004). The main process conditions for a CTA process have been set out in section 2. Within this CTA infrastructure, the core processes of (social) learning, societal agenda development and communicative actions should take place. Their outcomes are integrated in the objectives of the RT process.

The evaluation of the outcomes of the RT process is done in two complementary ways: to compare the outcomes firstly against the objectives of the RT process and secondly against a ‘norm’ from literature. The main categories for evaluation are summarised in Table 7.1 and elaborated below.

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3 The term prototype is used to indicate a first functional version of a new ICT application in that local context. This evolutionary development approach is more commonly used than methods of ‘rapid prototyping’, in which a prototype is developed and after testing, replaced by a larger scale and fully functional version.

4 Most prototypes were financed by IICD and bilateral donors.
7.3.1 Organizational level: Number of prototypes formulated and integrated

Number of prototypes
Formulation and implementation are the first steps after the RT workshop. Lessons learnt should be drawn and the prototype can be perfected or revised and be applied on a larger scale. For a prototype to be integrated it is necessary that it is institutionalised, e.g. is part of daily life. However, Kimaro and Nhampossa (2005) remark that only institutionalisation is not sufficient: new practices should also be perceived as generating value to the organization. This is reflected by the prototype being included in the strategy of the organization with resources allocated to it. This largely covers the different stages of ICT implementation (Saga & Zmud, 1994). The competency of the organization to manage the further development of ICT applications is another criterion for full integration.

<table>
<thead>
<tr>
<th>Prototypes at organizational level</th>
<th>Number of prototypes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Implemented out of the number of annotated ideas</td>
</tr>
<tr>
<td></td>
<td>• Revised and/or up-scaled out of the total number of implemented prototypes</td>
</tr>
<tr>
<td></td>
<td>• Integrated in daily activities and used by various staff members (prototype not isolated)</td>
</tr>
<tr>
<td></td>
<td>• Perceived as contributing to effectiveness through performance improvement, increased market share and/or development of new markets (areas of service delivery)</td>
</tr>
<tr>
<td></td>
<td>• Integrated in the strategy of the organization and resources allocated to it</td>
</tr>
<tr>
<td></td>
<td>• For which the organization is competent to operate the prototype and to manage further ICT developments</td>
</tr>
</tbody>
</table>

| Impact on users | • Awareness |
|                | • Empowerment |
|                | • Economics |

| Impact on poverty | • Prototypes integrated that were developed by or for poor groups |
|                   | • Percentage of users that are classified as ‘poor’ |
|                   | • Conditions for poverty reduction structurally improved |

| Integration of innovation at sector level | • Networking between prototype owners for knowledge exchange |
|                                          | • Network of prototype owners as driving force to innovate with ICT and to integrate the technology in the sector |
|                                          | • Business opportunities for ICT in the sector opened up |
|                                          | • The development of an ICT sector policy ongoing and perceived as useful and legitimate by main stakeholders |
|                                          | • Public funds allocated to ICT |

| Impact on poverty | • Prototypes integrated that were developed by or for poor groups |
|                   | • Percentage of users that are classified as ‘poor’ |
|                   | • Conditions for poverty reduction structurally improved |

| Integration of innovation at sector level | • Networking between prototype owners for knowledge exchange |
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|                                          | • Business opportunities for ICT in the sector opened up |
|                                          | • The development of an ICT sector policy ongoing and perceived as useful and legitimate by main stakeholders |
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| Integration of innovation at sector level | • Networking between prototype owners for knowledge exchange |
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|                                          | • Business opportunities for ICT in the sector opened up |
|                                          | • The development of an ICT sector policy ongoing and perceived as useful and legitimate by main stakeholders |
|                                          | • Public funds allocated to ICT |

| Impact on poverty | • Prototypes integrated that were developed by or for poor groups |
|                   | • Percentage of users that are classified as ‘poor’ |
|                   | • Conditions for poverty reduction structurally improved |

| Integration of innovation at sector level | • Networking between prototype owners for knowledge exchange |
|                                          | • Network of prototype owners as driving force to innovate with ICT and to integrate the technology in the sector |
|                                          | • Business opportunities for ICT in the sector opened up |
|                                          | • The development of an ICT sector policy ongoing and perceived as useful and legitimate by main stakeholders |
|                                          | • Public funds allocated to ICT |
Comparison against an international norm

Comparison against a norm places the effectiveness of the RT process in perspective to other practices. It is hard to find a ‘norm. Reports on failures are widespread, but rarely quantified. Heeks (2002) made an effort to develop a norm related to the successful integration of prototypes. He postulates that only a minority of information system projects\(^5\) – a concept that includes the ICT prototypes – in developing countries is successful. He categorised ‘failure’ as never implemented or immediately abandoned after implementation. He defined ‘partial failure’ as:

> “an initiative in which major goals are unattained or in which there are significant undesirable outcomes… or a sustainability failure of an initiative that succeeds initially but then fails after a year or so” (Heeks, 2002, p. 103).

The major goals and the undesirable outcomes are defined by combining the perspectives of the major stakeholders involved. In industrialised countries Heeks estimated for the period up to 2001 that roughly 20-25% is a total failure, 35-60% is a partial failure and the remaining (15%-45%) can be labelled as a success. Based on different sources, Mann (2002) stated similar success and failure rates for IT projects in education. Other sources point in the same direction (Wade, 2004; Dada, 2006). We share Heeks’ observation that in view of the weak environment, failure might be expected to be higher in less developed countries. The success rate for the prototypes developed through the RT process needs to be comparable to Heeks’ norm.

7.3.2 Impact on users

Innovation generates value and also changes the positions of the actors involved (Janszen, 2000). Increased empowerment and economic opportunities are therefore main impact categories. The impact, as experienced by the end-user, is first measured through the awareness on the possibilities of ICT. Secondly empowerment is measured through statements based on increased skills levels, more self esteem, status and an increased ability to influence decision making. The economic impact is reflected through increased productivity, more income or better job opportunities.

7.3.3 Impact on poverty reduction

In a development setting, the main theoretical perspective on poverty is the lack of access to social services and control over resources including knowledge and market

\(^5\) Heeks (1999, p. 15) defines information systems as “systems of human and technical components that accept, store, process, output and transmit information” (see Ch 2).
opportunities (Narayan, 2000). A first indication is the number of prototypes integrated that are developed by the representatives of the poor. A second indicator is the number of users that can be categorised as ‘poor’. A third criterion is whether the prototypes contribute to the improvement of the structural conditions under which the poor live e.g. access to primary education. Indirect effects on poverty could be important, but have not been assessed in this study.

### 7.3.4 Stimulating the ICT integration at sector level

The sustainability and scalability of ICT applications can be analysed around three factors: (1) the actual demand of the technology, (2) usability of the ICT in the everyday activity of users, and (3) the availability of support services (Mursu et al., 2005). While the value added and usability of the technology is covered by the criteria mentioned above, more is required, especially for a public service sector like education. The development of an ICT policy is needed to assure the development of an adequate educational philosophy, to allocate financial and human resources and to stimulate and regulate the development of supportive services. Therefore agenda setting and policy development are essential. In CTA terms, the integration of the technology at meso or sector levels requires networking to develop a knowledge base.

### 7.4 Research method

The study includes substantial quantitative data on the number of users, the perceived satisfaction on the objectives achieved by the users and the perceived level of impact. Nevertheless, a main part of the research method is qualitative research, in order to understand the meaning and the context of the outcomes, as well as to identify unanticipated influences (Maxwell, 1998). Qualitative research can bring in and confront the perspectives of the different actors involved. To select an appropriate project for the evaluation of the RT process the following criteria were used: the project to be studied should (1) be the outcome of a successful RT workshop, (2) be ‘old enough’ to allow a mature view on the second and third development cycle, and (3) have been object of data collection, including participatory observation, right from the beginning. The project that fitted these criteria most was the RT process on ICT for learning and teaching for secondary and teacher education in Tanzania.

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6 The international criterion of the poverty line is a dollar a day. Tanzania is one of the poorest countries with a GDP of US $ 221 per capita (2003). The criterion used is the Tanzanian national basic needs poverty line. Around 37% lives below this line. Although the percentage decreases very slowly, the absolute number still increases. Though not exhaustive, it is sufficient an indicator within the scope of this chapter.
Different data sources were used: semi-structured interviews, questionnaires, focus groups, participatory observation, desk study and peer review. We elaborate on each data source. An important source was the perception of the participants and some knowledgeable third parties obtained through 12 semi-structured interviews by an independent freelance researcher in 2006. Questions related to the development of the prototypes within the organization, their added value, capacity development and their link to the wider context. The findings were discussed with the prototype owners.

To assess the impact on end-users and to have feedback on the IICD assistance, the data from the IICD monitoring and evaluation system (M&E) was used. This M&E system was developed by IICD in 2001 and allows for results to be compared between countries (Wieman et al., 2001). Constructs to measure impact were awareness on ICT, empowerment achieved, economic opportunities realized, personal skills and productivity. A closed questionnaire, which measured on a Likert scale from 1 to 7 (see Annex 7.1), was administered by a M&E consultant and filled in by 191 respondents. During annual focus group meetings, conducted by the M&E section of IICD, the prototype teams reflected on the findings of the M&E system. This included the assessment of the quality of the assistance and capacity building by IICD to the prototype teams. It also included the results of the feedback of the end-users on the realisation of their objectives by using the prototypes and on their perceived impact.

Another data source was participatory observation by the researcher, who was a facilitator and coach in the evaluated project. Possible researcher biases were minimised by reviewing data, findings and conclusions with freelance researchers, team members and some independent national observers. Advantages of participatory observation were an in-depth knowledge of the situation and its dynamics, a better understanding of the irrational and emotional aspects, and the interaction with the context. Important source for participatory observation were the intensive bilateral contacts and regular (every two or three months) joint meetings with all teams working on prototypes. During these meetings the prototype teams exchanged experiences, latest news and discussed specific themes. These conversations were generally marked by a great frankness. Also explicitly solicited was negative feedback. Of course also ‘socially desired’ answers were given, but these were minimized through the group process and the long-term relationship that developed.

Data collection is complemented by analysis of reports, peer reviews with staff and consultants directly involved in the RT process, in line with the principles for interpretive field studies (Klein & Meyers, 1999). This mix of methods and data sources contributed to triangulation (Maxwell, 1998). Data that converged is reported in this study without reference, if data did not converge, the divergence is elaborated.
7.5 Process conditions

The RT process for education in Tanzania largely followed the standard sequence of interventions of the RT process as set out in chapter 4. Prototype owners and their teams participated in nearly all interventions. The process was rather intensive the first six months with a workshop on project formulation and training on ICT skills. The process conditions as mentioned in section 7.4 include the involvement of relevant stakeholders, participation, dialogue, exerting drive by a few actors to maintain the CTA infrastructure and to organize and facilitate the processes of learning, societal agenda development and communicative actions.

A network for exchange of knowledge was created by the RT process. It served as a participatory platform and facilitated active exchange between prototype owners and main actors in the sector. The network gradually ‘lost’ representatives of the Ministry as political constraints emerged. This was triggered by a corruption scandal around a gift of ten thousand refurbished computers by a Northern donor, public upheaval as a number of telecenters stimulated visiting pornographic sites by students and uncertainty within the Ministry about the financial and managerial implications. As a consequence the memorandum of understanding was terminated by the Ministry. This slowly reduced the network and minimised communication between the prototype owners and policy makers. The network carried out awareness-raising sessions to the large public, and lobbying sessions towards the politicians and the Ministry. At sector level, networking and advocacy were insufficient to put ICT in education on the political agenda. Therefore a participatory multi-stakeholder intervention was designed and implemented.

It should be noted that users were involved in the development of the idea of the prototype during the RT workshop, but that only 50% of the prototypes involved the users in the formulation stage. Later on user feedback was obtained – more passively – through questionnaires.

The CTA agent (IICD) played multiple roles embodied by different persons. The programme manager focused on coaching, facilitation and networking. He separated the roles during interaction and had a relationship of trust with the prototype owners. Role conflicts were not put forward in interviews, nor experienced as problematic by the interviewees. Coaching is a delicate process, especially in an environment with an overwhelming donor culture. The IICD training manager provided technical expertise. Both were experienced and attached value to local ownership as the ‘sine qua non’

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7 The network was slowly reduced to prototype owners, two interested NGOs, some members of university, the ICT industry and a financial-legal advisor.
to success. Consultants, however, tended to infringe on dialogue and ownership. For example a consultant assisting in the formulation of mobile teacher training resource centres gradually distorted the project towards training in management information systems; an area he was acquainted with. The basic argument was sustainability, yet the ‘owners’ intended rather to support teaching and learning processes. The influence of expert power made them give in. Conflicts about financing were minimized as simple and clear rules were applied and a final decision depended on the outcome of a peer review within IICD.

The prototype owners found the prototype formulation process useful and stated that much learning occurred. It strengthened their capacity to conceptualise and to implement. The interviewees indicated that the prototype formulation process strengthened their sense of ownership, including motivation, and boosted their self-confidence. Statements by owners during focus group sessions were:

‘It is like nursing a baby until it is born’

‘Now I see... ha, ha, you made us suffer so that it is really ours’

‘It is very difficult for new comers to take over the project or to fully understand it’.

However, they also criticised. For example, they pointed out that training on financial management and marketing/lobbying should have been included much earlier.

Coaching stimulated alignment, collaborative decision-making and institutionalization at organizational level. The potential synergies between the prototypes were clearly acknowledged and resulted in some collaboration. However, the initiative to create a consortium for a stronger market position towards donors, other NGOs and the Ministry did not work out due to insufficient mutual trust.

7.6 Outcomes

Below we describe the outcome indicators as categorized in section 7.3.

7.6.1 Organizational level: Number of prototypes formulated and integrated

The RT workshop yielded eleven annotated prototype ideas, including a policy project. One of the prototype ideas, the virtual class rooms, was dropped as little time was available for its development and acceptance was anticipated as low as criticasters remarked:

“there is neither connectivity nor computers at schools”. 
Another prototype, teacher training resource center, never got funding. Due to the political constraints, one prototype had to be stopped (#4, Table 7.2) and the development of two other prototypes slowed down (#5 and #11). Eight were implemented (see Table 7.2), including the policy project.

The seven implemented prototypes received funding. Most prototypes started in 2002/2003, one in 2004 and one in 2005. The prototypes accomplished their objectives within the budget set. About three years later (June 2006), seven prototypes were still operating, albeit with objectives and functioning updated. In general, each organization had achieved its intended output in terms of the service or product to be developed. From one NGO, distance had to be taken as it suffered from misuse of funds and bad debts, although it fulfilled most of its objectives. The prototype for the National Libraries could not secure external finance over a long time. When a new manager came, it was picked up again and implemented on a larger scale from internal funds. The successful integration of this prototype can therefore only be partly attributed to the RT process.

The prototypes or projects within existing organizations were well integrated. Especially the prototype of the teacher training colleges scored strongly on the indicators for being integrated. Key aspects of success included the strong participation of all principles and their deputies in the overall process. An enlarged programme is now financed by a bilateral donor. The model school integrated ICT in teaching, planning and administration. It was largely financed out of its own meagre budget. The NGOs struggled to mobilise financial resources in the market. Their skills and drive to earn money in the market were moderate, but increased over time. The purchasing power of customers was low and education – like health services – used to be a free good. Moreover, it was hard to obtain public financing as public-private partnerships were not an established concept. The competences of staff members were for all prototypes sufficient to sustain and upscale activities, though weak on commercial insight. Some problems were more of an organizational nature as the NGOs progressed to a more mature stage. Two out of three NGOs were dynamic in the sense of developing and pursuing additional ideas to enrich their services.

Besides the specific financial problems for the NGOs and based on the outcome indicators (Table 7.1) by June 2006, we conclude that five out of the nine formulated prototypes are fully integrated at the organizational level and two partly. The interactive policy process was successful, but is discarded from this list as it is not a prototype. This implies that the RT process scores slightly above the norm advanced by Heeks (2002), on the number of successful projects.

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8 Funding was through IICD (own funds, or through brokerage with the UK Department of International Development (DFID) and the Swiss Development Cooperation (SDC).
Table 7.2 Overview of prototypes according to their stage of development at organizational level

<table>
<thead>
<tr>
<th>Name</th>
<th>Main owner</th>
<th>Type of organization</th>
<th>Annotated idea</th>
<th>Formulated</th>
<th>Implemented</th>
<th>Integrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Lobbying for public funds</td>
<td>Various incl. Ministry</td>
<td>Public Commission</td>
<td>+ *)</td>
<td>+ **)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2 Virtual class rooms</td>
<td>Ex-principal Sec. School</td>
<td>–</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Teacher training resource center</td>
<td>District Education Officer</td>
<td>NGO (new)</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Networking education inspectorate</td>
<td>Zonal Coordinator Inspectorate</td>
<td>Ministry</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 National libraries</td>
<td>Director National Libraries</td>
<td>Public Agency</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>6 Model schools</td>
<td>Municipal Secondary School</td>
<td>Ministry</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7 Teacher professional development</td>
<td>Prof. of Univ. of DSM</td>
<td>NGO (new)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
</tr>
<tr>
<td>8 Educational website</td>
<td>Principal Sec. School</td>
<td>NGO (new)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>9 Pro computer training &amp; maintenance</td>
<td>Vocational Training Agency</td>
<td>NGO (existing)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+/-</td>
</tr>
<tr>
<td>10 Student website</td>
<td>Student</td>
<td>NGO (new)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>11 Networking teacher training colleges</td>
<td>Agency for Edu. Management</td>
<td>Public Agency</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

*) + means fully, +/- means more or less.

**) Formulated in 2003 as an interactive policy-making project by the Commission on Science and Technology with intensive ICD support.
7.6.2 Impact on users

Estimated user data as of inception till mid 2005 are presented in Table 7.3. This was based on estimates per prototype, which included management and a subject matter specialist. The findings were validated during a meeting with all teams. Estimates were made carefully and provided an indication of the order of magnitude. Most decision makers in the Ministry and most users in teacher training colleges were reached. With

<table>
<thead>
<tr>
<th>Abbreviated title</th>
<th>Category of users</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT sector strategy</td>
<td>Decision makers Min. of Education</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Staff ministry, agencies, NGOs</td>
<td>50</td>
</tr>
<tr>
<td>National libraries</td>
<td>Staff libraries</td>
<td>No data</td>
</tr>
<tr>
<td>Model schools</td>
<td>Teachers</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Students</td>
<td>160</td>
</tr>
<tr>
<td>Teacher Prof. Dev.</td>
<td>Teachers in sec. schools</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Other staff</td>
<td>50</td>
</tr>
<tr>
<td>Educational website</td>
<td>National requests dealt with</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>International requests dealt with</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Estimated consultations of website</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Students *)</td>
<td>100000</td>
</tr>
<tr>
<td></td>
<td>Teachers</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Principals</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>Parents</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>Education administrators</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>Researchers</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Suppliers of edu. products</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Donors</td>
<td>25</td>
</tr>
<tr>
<td>Comp. training &amp;</td>
<td>Students</td>
<td>13200</td>
</tr>
<tr>
<td>Maint. at schools</td>
<td>Teachers</td>
<td>300</td>
</tr>
<tr>
<td>Networking teacher</td>
<td>Teacher training colleges **)</td>
<td>40</td>
</tr>
<tr>
<td>Training colleges</td>
<td>Principals</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Tutors and students</td>
<td>8000</td>
</tr>
</tbody>
</table>

*) Estimated users who regularly consult the site at least 4 times a year. The number of hits on the website per month has grown over 500000.

**) About 90% of teacher training colleges in 2005. Diles data is added as it is the only other prototype in the field of ICT for education.

Diles
Rural schools 300
Schools in capital city 50
Teachers and students reached 150000
a total number of students of secondary schools estimated at about 300,000 in 2003 (Osaki & Njabili, 2003), also the outreach to this group was substantial.

A survey (n=191) in 2005, among end-users of a number of prototypes indicated a frequent usage of the services. Satisfaction was high and 90% of the end-users stated to have achieved their goals. Details are provided in Figure 7.2. The bias towards the capital city was a consequence of differences of awareness, the willingness to pay for the services and the fact that the prototypes were developed in the capital city. However, the end-users of the educational website in the rural areas had not been reached in the survey, which meant an overestimation of the ‘capital city’ bias.

The criterion for a positive impact is defined conservatively, if the average for the aggregated constructs equals 5.5 or higher (on a scale of 7, see Annex 7.1). On impact, 64% of the end-users agreed, or strongly agreed to have an increased awareness on ICT through the prototypes. 45% of the end-users stated to be empowered through the prototype. It should be noted that the score on increased knowledge was higher than empowerment as a whole. The moderate economic impact of 44% could be expected in view of the time lag between being a student and having a job. Also the cost involved in using ICT was a considerable burden. Teachers scored a bit higher on economic impact as compared to students. The effect of ICT by reducing transaction costs (e.g. exam results on line) was not captured by the questionnaire on impact, and the usage of this kind of services was very high (over a million hits a month when the exam results were there).9

Since 2002 no major new initiatives on ICT for secondary and tertiary education had been started, besides the e-School programme, an initiative of the Swedish Agency for International Development Cooperation (SIDA) in 2005 and the ICT for teacher training colleges financed by SIDA which incorporated the corresponding prototype.

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9 The concern for access to negative content was definitely a reason for a number of parents not to allow their children access to Internet, or only if filtering was done.
Both drew largely on the prototype owners. Also the development of local content was still limited to the IICD supported NGOs. No other initiatives were undertaken, however the education website was copied by public agencies. Therefore we might conclude that the impact can be largely ascribed to the RT process, though other influences, like the mass media, played a role in creating awareness. However the latter did not seem to result in concrete actions.

**7.6.3 Impact on poverty**

Only one representative of the poor participated in the RT workshop; the headmistress of a secondary school. This school was located in a poor urban area and attracted kids from parents that mostly classify as poor (e.g. petty traders). ICT was appreciated by the students and increased their skill level and access to information. Already for more than three years, they sustained the prototype through some contributions of parents and students, but mostly by allocating a part of their tight operational budget to it.

Other prototypes targeted a wide audience and could have had a direct or indirect impact on poverty alleviation, especially by providing access to educational materials, knowledge and information, e.g. exam results, and by lowering transaction costs for this type of information. 86% of the respondents of the impact questionnaire indicated to have an average household income. This experience showed that, although there was a strong representation from up country, ICT became urban biased and geared to the higher and middle-income groups, at least in its initial stages.

**7.6.4 Integration of the ICT-based innovation at sector level**

The networking of the prototype owners was a driving force of ICT in the sector through knowledge exchange and awareness creation (demonstrations, media attention, conferences), both in the rural areas, but especially in the capital, Dar es Salaam. Awareness raising and networking with the Association of Headmasters strongly contributed to the establishment of fully operational and cost-effective computer labs for most secondary schools in Dar es Salaam by 2006.

The impact on the sector and the importance of the contribution of the RT process and especially the prototype owners to the e-school programme was fully acknowledged by the bi-lateral donor concerned, who perceived it as essential to their mission. The prototype owners brought in knowledge on why it is useful to integrate ICT in secondary education and teacher training, and how to do it. They embodied a vision of a more student-centred teaching and learning process. With more recognition of the importance of ICT in education and this large bi-laterally financed programme to introduce ICT in secondary schools on the brink to be launched, there were new
business opportunities for ICT in education. However, political and institutional intricacies delayed this process considerably.

The prototype owners developed good relationships with most seniors of the Ministry of Education, but failed to convince the top. Their prototypes stimulated similar initiatives in government institutions, for example the development of an official website of the Ministry and publication of the exam results on the web were clear reactions to the prototypes. However as the government officials pulled out of the network developed in the RT process, new modes had to be found to allow for exchange. Therefore an interactive policy-making trajectory was developed. It started in mid 2003 and resulted in a pre-white paper that was appreciated by the Ministry. August 2007, an ICT policy in education was officially accepted. By mid 2008, funds started to become available from the national budget to introduce computers at public secondary schools. It should be noted that few ministries in Tanzania have an ICT policy in 2008.

The network of prototype owners paid ample attention to involving the media. These communicative actions, together with tangible results, awareness raising and advocacy, have speeded up the introduction of ICT in education in Tanzania.

7.7 Discussion

The RT process on education in Tanzania showed that the CTA infrastructure as operationalized in the RT process functioned well, but initially less for policy making. The outcomes showed a generation of prototypes of ICT applications that develop novel ICT-based practices, that are replicated, that have a positive impact on end-users and a large outreach. Yet the direct impact on poverty was limited. About 55% of the prototypes were integrated successfully. One of the partial integrated prototypes stopped by the end of 2007, mainly due to the institutional barriers, which prevented financing of public services of NGOs from public funds.

To put these findings into perspective, the outcomes are firstly compared to other RT processes that were conducted in Bolivia, Burkina Faso, Ecuador, Mali, Uganda and Zambia. In these cases successful RT workshops at sector level were held prior to 2004. Two intervision sessions with members of IICD country teams and IICD’s M&E section were conducted and specifically focussed on sharing lessons learnt from the cases.

Applying the RT approach was a learning process within IICD. This learning was reflected, among others, in the increased number of effective RT processes. Out of the annotated ideas generated by properly executed RT workshops at the sector level, about 70% was formulated, which was lower than the case on education in Tanzania.
Achieving formulation was largely a result of the ‘drive’ of the owner and the quality of the facilitation. The number of prototypes implemented as a percentage of those formulated, increased to 90%, which was largely a result of a better RT process, including coaching skills of programme managers. Of the formulated prototypes, about 89% was implemented. Integration was slow and took generally four to five years after the start of the implementation. In this time span, 13% of the prototypes failed to integrate and 31% of the prototypes needed more time to integrate. 45% of the prototypes succeeded to integrate and were considered to have achieved their objectives without an excessive budget overrun. Compared to the norm proposed by Heeks (2002), the level of failure is lower. The level of success of the prototypes generated through the RT process is substantially higher. Heeks found for the industrialised economies up to 2001 about 30–45% being successful. The RT process resulted in 45% of the prototypes successfully integrated. Some prototypes need more time for integration. If the proportion that integrates successfully remains similar, the success rate may rise well above 55%, which would then be a convincing difference over the external norm constituted by the findings of Heeks (2002), especially in view of the environmental challenges in a low resource setting.

The impact on end-users of other RT processes on education was also positive. The direct impact on poverty was weak in the evaluated project. Experience from other RT processes indicated that impact on poverty alleviation was increased by including more representatives of the poor in the RT process and more intensive coaching and capacity building afterwards. Literature also shows that ICT interventions can have a positive effect on poverty alleviation (Cecchini & Scott 2003; Spence 2003; Swaminathan, 2004). Strengthening the capabilities of the representatives of the poor, prior to the start of the RT process, could possibly enhance the impact. Other measures could be to make negative consequences of certain structural features explicit by the RT participants during the RT process and to include them in the agenda for the interactive ICT policy sessions for the sector or for the national poverty alleviation strategies. Another line of action is increased access to knowledge for empowerment and lower transaction costs.

As mentioned before, the RT process on education in Tanzania is somehow a special case, as generally neither new organisations are established as a result of the RT workshop, nor is political resistance so ad hoc and strong. It is not related to the country. Another sectoral RT workshop was on ‘ICT for affordable and well-managed district health services’ (chapter 6) and held in Tanzania in February 2005. Ten

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10 The total sample is as follows: Bolivia: 26%, Burkina Faso: 5%, Ghana: 12%, Tanzania: 35%, Uganda: 23%. The impact on end-users was higher in other RT processes on education. Possible explanations are the socialist background of Tanzania with a culture of ‘being provided’ and being less competitive, the lower economic level of development and less importance attached to education yet.
annotated ideas on prototypes were generated, of which seven were implemented by the end of 2006. No political opposition is encountered and replication or up-scaling of prototypes has started.

**7.8 Conclusion**

We conclude that the RT process has contributed substantially to innovating with ICT in the education sector in Tanzania. Findings of other cases point to better results as the complexities of the establishment of new NGOs are avoided. The results in terms of successfully integrated ICT applications are above the norm advanced by Heeks (2002). The RT process can be labelled as successful on the criteria of integration at organizational level, impact for users, and increased speed of overall innovation processes with ICT at sector level.

CTA proves to be a fruitful approach to technology development, which triggers ICT-based innovations in the local context. It allows at the user side the domestication of the (radical) innovation. It enables through participatory processes, integration of contextual and apparently ‘irrational’ behavioural considerations into the design of the application of the technology. Sense making and ownership are key factors for individuals and organizations to develop and exert sufficient drive for the implementation of the ICT-based innovations. This aligns with earlier observations (chapter 5). In conclusion this CTA based methodology is an interesting approach to ICT design in developing countries.

Lessons learnt and areas to improve are the following: The impact on end-users is positive, but their input in the process of the co-construction of the technology could be stronger. Also, the direct impact on poverty alleviation was limited. Looking at other RT processes, we argue that this lack of impact is due to the less optimal implementation of the RT process in the education sector in Tanzania. ICT is a window of opportunity for poverty alleviation. It creates opportunities for most actors and such a ‘win-win’ situation enables to negotiate a redistribution of control over resources. Using opportunities for poverty alleviation requires the right applications, which only can be moulded with a major input of the poor themselves, concerted action, the right timing (Chambers 1983, p. 159) and political will.

While the RT process is rather effective at organizational level, it is less so at sector level. Collaborative decision making and policy development are areas not yet fully understood. An observation is that decision making at this level is less expedient than appears at face value, but rather is a part of a political and institutional seamless web with limited ‘room of manoeuvre’ and major uncertainties for the actors involved. A paradox emerges as novelty is easier generated by outsiders (Raven, 2005), but less accepted by the established actors.
Therefore a pertinent research question is: What influences the scalability of ICT applications that are novel to the local context? Institutional change is essential for radical innovations to assure sustainability and scalability (Braa et al., 2004). The CTA approach to influence institutional change at sector level proved valid, but the nature of institutional change related to ICT needs further exploration.
### Annex 7.1 Survey data: Constructs, questions and scores in percentage

<table>
<thead>
<tr>
<th>Construct and individual questions</th>
<th>Disagree (in %)</th>
<th>Neutral (in %)</th>
<th>Agree (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Awareness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Through this project I see opportunities in information and communication technology I had not seen before’</td>
<td>7</td>
<td>12</td>
<td>81</td>
</tr>
<tr>
<td>‘This project broadened my horizon’</td>
<td>16</td>
<td>11</td>
<td>74</td>
</tr>
<tr>
<td>‘Through this project I now see the opportunities of information and communication technology in education’</td>
<td>9</td>
<td>8</td>
<td>83</td>
</tr>
<tr>
<td><strong>Empowerment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘This project has offered me an insight on how to improve on my standard of living’</td>
<td>8</td>
<td>17</td>
<td>75</td>
</tr>
<tr>
<td>‘Through this project I have gained useful computer skills’</td>
<td>22</td>
<td>18</td>
<td>60</td>
</tr>
<tr>
<td>‘Through this project I have gained other skills’</td>
<td>9</td>
<td>15</td>
<td>76</td>
</tr>
<tr>
<td>‘Through this project I have gained more self-confidence’</td>
<td>18</td>
<td>9</td>
<td>72</td>
</tr>
<tr>
<td>‘Through this project I am more involved in decision making in my school / community’</td>
<td>20</td>
<td>15</td>
<td>65</td>
</tr>
<tr>
<td>‘Since I am participating in this project, other people look up to me’</td>
<td>28</td>
<td>16</td>
<td>56</td>
</tr>
<tr>
<td>‘Through this project I now help other people’</td>
<td>14</td>
<td>13</td>
<td>72</td>
</tr>
<tr>
<td><strong>Economic opportunities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘This project motivates me to work harder’</td>
<td>18</td>
<td>13</td>
<td>69</td>
</tr>
<tr>
<td>‘Through this project I now have a better job (will be able to get a better job)’</td>
<td>24</td>
<td>17</td>
<td>58</td>
</tr>
<tr>
<td>‘Through this project I now earn more money’</td>
<td>28</td>
<td>19</td>
<td>52</td>
</tr>
<tr>
<td>‘Through this project I am now more productive’</td>
<td>25</td>
<td>17</td>
<td>58</td>
</tr>
<tr>
<td>‘Through this project I am now thinking of getting a job abroad’</td>
<td>37</td>
<td>17</td>
<td>46</td>
</tr>
<tr>
<td><strong>Check on personal skills and productivity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Through this project I have gained more and better knowledge than I would have without this project’</td>
<td>19</td>
<td>11</td>
<td>70</td>
</tr>
<tr>
<td>‘Through this project, I now use computer for other lessons / personal use’</td>
<td>28</td>
<td>11</td>
<td>61</td>
</tr>
<tr>
<td>‘Through this project my course material has been improved’</td>
<td>24</td>
<td>14</td>
<td>61</td>
</tr>
</tbody>
</table>

End users score on the statements on a Likert scale with a range of 1 to 7. Disagree ≤ 3; Neutral = 4; Agree ≥ 5. Constructs are counted as positive only, if the average of the individual statements ≥ 5.5. Pearson’s chi-square tests only significant (0.04) by comparison between teachers and students. The quality of the constructs has been assessed through factor analysis.
Synthesis and reflection

9.1 Conclusion
9.1.1 Conceptualizing the RT process
9.1.2 Evaluating the RT workshop
9.1.3 Evaluating subsequent cycles of the RT process
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CHAPTER 9

ICT is widely considered as relevant for sustainable development and poverty alleviation. Nevertheless, the application of ICT in developing countries has known many failures, or partial failures. Moreover, successful pilots are difficult to scale-up or to replicate. We approached these problems from the perspective of the social shaping of technology; social, organisational, political, economic and cultural factors influence the shaping and the outcome of the technology and the changes it induces. As this development is path dependent (choices of the past condition the future), it is relevant to influence technology development in an early stage. In general, ICT is rather a new technology to many developing countries. Against this backdrop, the central question to this study was:

*How to identify, design and implement sector-wide ICT applications novel to the local context that are relevant to development and at the same time sustainable?*

The Round Table process was taken as case material to study the initiation, development, impact and sustainability of ICT applications.

In this chapter we draw conclusions and reflect on the RT process as a heuristic for ICT design. Again, we address the question of the validity of the findings. Thereafter, the theoretical implications of the study are presented. Next I suggest some topics for follow-up research. The thesis closes with a discussion on the implications for development co-operation.

### 9.1 Conclusion

In this section, we summarise the findings on the conceptualization and the evaluation of the RT process and on scalability. It concludes by marking some of the weaknesses of the RT process and by presenting an overview of the overall heuristics.

#### 9.1.1 Conceptualizing the RT process

The RT process was developed as an approach to integrate ICT in a sector and to empower both individuals and organisations, thereby contributing substantially to development and poverty alleviation. The process consists of 35 steps, divided into three development cycles (*Figure 9.1*). The first cycle, the initiation, comprises the RT workshop and its preparation. The second cycle – niche development – covers the prototype formulation and implementation. The third cycle comprises integration, first at organisational, then at domain level. This also implies scaling, both in the form of spreading to other sites (replication or scaling out) and enlarging the capacity of the application (scaling up).

First used in 1998, the RT process had by 2005 grown into a comprehensive process
at sector level. The third development cycle, however, was not yet fully clear and standardised at that time and still now needs further improvement. An exploratory inquiry into the RT process revealed that it resembles CTA. In order to organise the processes that make up CTA, five categories are distinguished, in line with literature (Broerse, 1998). These categories partly overlap, as the underlying CTA processes are by nature interlinked and iterative. The five categories are:

1. Social conditions or Infrastructure: creating a participatory infrastructure, where all relevant stakeholders can meet, exchange and progress with the CTA process.

2. Step-wise approach: moving gradually and iteratively from problem analysis and visioning to ideas, decision-making and action.

3. (Social) Learning in participatory processes includes substantive learning, procedural learning and reflexive learning.

4. Societal agenda development and decision-making includes mutual and well-functioning adjustments between actors, collaborative decision-making and agenda setting for policy-making.

5. Communicative actions have the function to inform better, a wider, but concerned audience on the CTA process and to stay in ‘touch’ with actual developments in society, science and technology.

Below, we mention the most outstanding characteristics of the RT process. The focal theme of the RT process is a system, which is represented by the relevant stakeholders. The most appropriate level of aggregation is a sector or a part thereof (e.g. secondary
During the RT workshop the methodology of scenario-building, visioning and the identification of leverage areas for change, reflect the dynamics of the system. For the participants this methodology enables them to build common ground, to set priorities and to identify relevant possibilities for prototyping. The RT process is highly participatory in order to avoid imposition on the choices made by the participants related to the technology. This implies the surfacing and confrontation of different interests, whereby the RT process fulfills a mediationary role. Participation enables dialogue; a ‘free flow of meaning’ between persons that allows the elicitation of tacit knowledge. It invites people to become observers of their own thinking, deepening reflection on their own paradigms, values, theories and practices. The RT process requires organisation and facilitation to make participation happen, to keep focus, momentum, to allow for coaching and capacity building.

During the RT process most participants develop a strong sense of ownership for the ICT prototype they identified. Ownership was initially solely defined in terms of ‘own responsibility’ and ‘accountability’. However, it became clear that ownership is broader and includes having a psychological relationship with a material or immaterial object and having real power over it. Ownership generates intrinsic motivation to exert drive to complete the CTA process. The RT process is gradual, it advances step-by-step, instead of designing and implementing large-scale blueprints. It starts with the RT workshop and is followed by experimentation, which strongly stimulates learning. Over time the expectations are adjusted, uncertainty is reduced and the new ICT-based innovations gradually become institutionalised.

Learning is a main characteristic of the RT process. It includes substantive, procedural and reflexive learning. Within the RT process, learning has an action connotation, as it is closely linked to the identification and development of ICT prototypes. Experimenting or prototyping is well-known in literature on information systems and an easy entry point for participation in design; an exchange whereby all parties can learn in a reflexive way. Also the methodology of scenario building proved very conducive to stimulate reflexive learning. This is closely related to making sense of the new technology; what are plausible applications and how to appreciate it. Or as Weick put it;

“How can I know what I think, until I see what I say” (Weick, 1999, p. 61).

Another characteristic of the RT process is networking that refers to the ongoing interaction between the participants in order to build up the knowledge and rules related to the ICT prototypes; innovation tends to take place in networks. Networking also provides the platform to develop the societal agenda related to the technology and to strive for its realisation. It allows for the articulation of configurations of value propositions as perceived by the stakeholders through a continuous process of

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1 The term sector and domain are used interchangeable, though the latter could be a sub system of a sector.
developing mutual perspectives, negotiation, collaborative decision-making and to manage the required change actively.

The case study on the introduction of ICT in the municipality of Kinondoni in Tanzania focussed on the question what are the relevant processes that lead to ICT-based innovation? The study indicated a failure at first, but when the approach was changed, it turned into a success. Conceptualising the design and implementation of ICT applications as an innovation in the local context allowed to understand the unfolding situation. The strong convergence between the findings of the Kinondoni study and the conceptualization of the RT process provides the confidence to define the RT process as an operationalisation of CTA.

9.1.2 Evaluating the RT workshop

The conceptualization of the RT process allowed to develop a consistent evaluative framework. The RT processes, as observed, lasted about four to seven years. Two phases can be distinguished for evaluative purposes: the RT workshop and the subsequent cycles of the development of the ICT prototypes, their improvement and integration in their respective organisations and the sector or domain at large.

The RT workshop has been evaluated for three cases (education and health in Tanzania and agriculture in Mali). The findings were validated against seven other RT workshops. The findings indicate a robust CTA process in its initial phase. The relevant stakeholders covered the different poles of a domain, like scientific, technical, political and market, but also represented a cross section of different roles relating to the technology such as developer, user, manager accountable for the functioning of the information system, policy-maker, etc. The RT workshop was sensitive to the quality of the preparation and to a lesser extent, to the process conditions during the workshop. The minimum contextual condition for initiating the RT workshop was some political ‘room for manoeuvre’ at the organisational and at the sector level. Other contextual conditions only seemed to have an influence on the speed of the RT process.

During the RT workshop, scenario-building proved to be a valuable instrument for thinking through upcoming changes within the domain concerned. It is followed by visioning and by defining and prioritising the leverage areas to enable the transition from the actual to the desired future. Within the boundaries of these leverage areas for change, ideas were generated on ICT applications. The priorities set to the novel ICT applications, were perceived as reflecting the priorities ‘on the ground’ and at policy level. This indicated both collaborative decision-making and societal agenda-setting. The most cited features of the RT workshop were the participatory character and learning. Participants reflected on their own and others’ knowledge, perspectives, roles and existing paradigms as related to the technology. This implied double-loop learning and sense making. These processes contributed to anticipating the societal effects of the
technology and fed into the aforementioned collaborative decision making. Moreover, double loop learning and sense making contributed to the emergence of ownership, initially at the level of individuals. A tangible output of these RT workshops was the development of annotated ideas of 8 to 10 prototypes of ICT-based innovations.

The prototype development teams could stimulate ownership at organisational level provided they were well connected within the organisation. This was more likely the case if the CTA agent had properly briefed the ‘top’ of the participating organisation. This includes exploring their interests in the topic, to provide a realistic picture of their efforts required and to manage their expectations related to the technology. The evaluation concluded that the RT workshop is a reliable and robust intervention.

9.1.3 Evaluating subsequent cycles of the RT process

The second and third development cycles of the RT process were analysed in detail for the case of education in Tanzania. Next, parts of the findings were compared to twelve other RT processes. In terms of process, the proper conditions could be maintained throughout the second development cycle. Yet, the network became less effective and lost its diversity when the public sector largely withdrew due to emerging political problems. Some further weaknesses in the process conditions were: late and insufficient training imparted in marketing and financial management. The RT process was effective in developing, implementing and, where needed, revising the ICT prototypes. The revisions were based on user feedback and scanning to detect better technological opportunities.

Change management was essential, in particular for the larger organisations. This required careful preparation to introduce, develop and implement the ICT prototype in a participatory manner within the organisation. For example: for the teacher training colleges it proved successful to organise a two day participatory workshop\(^2\) on the deployment of ICT in their college courses.

The outcomes of the RT process were evaluated against a number of indicators (see chapter 7). We subsequently discuss the impact and compared the results with a ‘norm’ for success and failure of the prototypes. The outcomes of the RT process for the case of education in Tanzania from 2002 till mid 2006 indicated that a substantial number of end-users were reached; nearly all the decision-makers, most principals of the teacher training colleges and a significant number of secondary school students, teachers and headmasters (estimated at least at one third of the total eligible population).

Concerning the impact of the ICT applications in the case study on education, most

\(^2\) This workshop contained many elements of the RT workshop, but the areas of application were limited and scenario-building was not included.
end-users indicated that they had achieved their goals and that the ICT services were used frequently. The impact was perceived as high by 60% of the end-users. However, one aspect of impact, empowerment, scored 45% only, which is low when compared to RT processes elsewhere. In the case study on education, only one out of the seven prototypes had a direct impact on poverty alleviation as it provided ICT training to schoolchildren of poor parents, thereby substantially improving their job opportunities. The conditions for poverty reduction were influenced positively by the RT process through increased availability of information and better training of teachers. When validated against RT processes elsewhere, it seems the impact on poverty alleviation was higher elsewhere in terms of more prototypes directly addressing poverty alleviation.

The outcome of the RT process was also compared to a ‘norm’ for success and failure as advanced by Heeks (2002). This ‘norm’ states that only 15% to 45% of the ICT projects are successful in developing countries. The RT process here discussed resulted in a success rate for the ICT projects of about 55%. Validation against other RT processes that were on going for four years or more (see chapter 7), indicated that the success rate was on average 55%, possibly higher in future as it was, for some projects, not fully clear whether they also would integrate successfully. A comparable exercise for all RT processes in 2009 indicated a success rate of about 60%. This is well above the ‘norm’ advanced by Heeks.

The success rate for the education case was high the first three to four years, but gradually dropped to about 55% in 2009, i.e. seven years after the start of the RT process. The main reason was a lack of funding for projects that were run as newly established NGOs. Although they were able to earn some income in the market, they nevertheless required some additional financial support to be sustainable, especially when they produced services of general benefit, like disseminating exam results or providing student counselling. They would have required public-private partnerships, but these proved difficult to establish in the Tanzanian context. For the introduction of a new technology and innovation in general, this reflects a tension between the established actors, who are able to scale but not very willing or capable to innovate versus new players that are strong innovators but less established actors.

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3 Follow-up research revealed that the trend for empowerment is upward in 2007 (Tilya, 2007). A general observation was that the expectations of end-users gradually increased over time. If the service level in terms of infrastructure or access to internet does not augment as well, the end-user satisfaction tends to decline. Therefore, empowerment also relates to the scalability of the ICT applications. Finally, negative impact mentioned by users was limited and largely linked to the costs involved, a fear for job losses due to the technology and the easy access to improper contents.

4 Two projects were scaled-up, and two replicated, while two were stopped. Another project tried to transfer activities to a relatively new semi-public institute. These efforts stranded in early 2009 and one of the owners (a student at the time of the RT process) restarted the ICT application at his own expense. It should be noted that ownership of the ICT prototype remained strong throughout the RT process, even if it had to fold.
This also illustrates that the notion of success rate, as measured on a certain date, conceals the direction of development: is it shrinking (and might it even fold) or is it in the process of expanding and scaling up? Understanding scalability is rather complex. Scaling apparently takes more than a participatory approach to the identification and design of ICT applications. Also whether ICT applications are perceived as relevant and have a high impact, does not necessarily mean they can be scaled.

9.1.4 Scalability

Scalability refers to the expansion of the system in scope and size. It includes the spreading to other sites (replication or scaling out) or enlarging of the ICT application capacity (scaling up). Scalability depends on the acceptance and the integration of the ICT application, not only at the level of the user, but in the wider context relevant to the social function of the technology. The approach of socio-technical transitions provided a framework for understanding scalability.

The case study on the introduction of ICT in education in Tanzania showed that the RT process generated ICT applications with favourable properties for scalability. These properties were defined in terms of extendibility i.e. the technical and organisational capacity to expand and from a user perspective as articulated in the diffusion theory of Rogers (1995). Designing scalable ICT applications should match these five aspects advanced by Rogers and generate sufficient value for the organisation concerned. But individuals and organisations function in a wider context. In general, the adoption by users of novelty is conditioned, facilitated or blocked by the wider context. Hence, a multitude of influences are relevant to arrive at scalability of an ICT prototype.

Scaling of the ICT prototypes went rather smoothly in the private sector, including the NGOs. However, as far as the public education sector was concerned, serious problems were encountered. As a consequence, inequity in quality of education further increases between the private and public schools. The main resistance was encountered from the culture and practice of teaching and the specific educational policy regime. A number of interventions and on-going developments led ultimately to the integration and hence the scalability of ICT in the public education sector. The ongoing developments and the processes and interventions are difficult to separate and to prioritise as each is relevant and has a precise timing. Main processes/interventions and ongoing developments were amongst others: bottom-up dynamics of niche development, interactive policy making, building up pressure, changes in the socio-technical landscape and modulation (see chapter 8).

This resulted in the formal institutionalisation of the technology in an ICT policy for primary, secondary education and teacher training colleges and subsequent budget allocations. Interesting to note is that interventions to bring about scalability like sense making, construction of congruent meaning and re-alignment and building
up pressure, are processes that can be instrumentalised to a certain extent. The study also suggested a further refinement in the concept of scalability by distinguishing four dimensions of the properties for scalability:

1. **Functional extendibility** in terms of load factor, geographical spread and/or the administrative capacity of serving more organizational units for accepted functionalities.

2. **User acceptance**, the relevant features of the ICT application that make it attractive to the user.

3. **Market extendibility** in terms of conversance with (upcoming) standards, interoperability and other requirements to be able to gain a market share beyond the niche.

4. **Perceived degree of regime change**. At the meso level and in the socio-technical landscape, actors judge ICT applications, apart from their functionality, also from their effect(s) on the socio-technical regime from their own perspective.

A finding of the education case was that changing practices due to ICT were accepted. Incremental and moderately radical ICT-based innovations were gradually adopted. Hence, a gradual trajectory of change became possible as demonstrated by a move towards student centred education at the teacher training colleges and by statements in the ICT policy for education. Apparently, ICT can act as a catalyst for social change (Sørensen, 2002) and an entry point to stimulate the dynamics of development.

A particular approach to change is required for persistent problems. The notion of persistent problems was useful to examine the structural barriers to development. Knowing the perverse couplings that drive the persistent problem may be helpful in developing coping strategies, and even to include favourable properties to this end in the design of the ICT application. Persistent problems like for example ‘a poor learning and teaching environment’ are often like a vortex that continuously frustrates development efforts. The repertoire of interventions has quite a similitude with practices in systems innovation (Grin & van Staveren, 2007). Similarities in epistemological and methodological aspects allow for further cross-fertilization.

The communicative actions undertaken during the RT process can be summarised as awareness-raising and building-up of pressure for policy change. During a later stage the emphasis in the communicative actions shifted to the use of the technology and its integration in an organisation. This contributed to the domestication of the technology. With hindsight, it is remarkable that the vision developed during the RT workshop is not exploited more systematically in communicative actions. This may be a missed opportunity.
9.1.5 Some weaknesses of the RT process

The research indicated (chapter 7.5) that there is a need for a more systematic inclusion of users in the design of the prototypes. Only about half of the formulation teams of the ICT prototypes actively included the end-users in the detailed design process. Involving end-users in the implementation phase is assured through structured monitoring using questionnaires and focus group sessions. Yet with hindsight, it would have been useful to involve (lead) end-users (von Hippel, 1988) earlier in the process for all the ICT prototypes; this would not only have increased the quality of the prototype but would also have contributed to the empowerment of the end-users. Poverty alleviation was envisaged through the inclusion of pro-poor representatives in the RT process, which was one representative in the case study. In other RT processes it tends to be more. But this approach needs to be further refined.

9.1.6 Overall conclusion

Overall, it can be concluded that the RT process is an operationalisation of CTA and an adequate and effective approach to identify, design and implement sector-wide ICT applications novel to the local context that are relevant to development and at the same time sustainable. Therefore the RT process has the potential to be a sector-wide ICT design heuristic geared towards societal needs and to bring about innovation in sectoral governance and development. The heuristics for the RT process are summarised in Table 9.1. Based on these findings, a major suggestion of this study is that there is considerable scope for improvement in most ICT practices in developing countries. Integrating a participatory and structured approach like the RT process could greatly improve outcomes.

9.2 Validity of the findings

In this section we first reflect on respondent biases. Secondly, the question will be explored whether developments that were already going on before the RT process could have generated similar results, even if, possibly, at a slower pace. Thirdly we look at the external validity.

9.2.1 Respondent biases

For the analysis of the RT workshop, the quality of filling in questionnaires was judged to be high, based on the following factors: a very high response rate, the time and dedication taken for filling out the questionnaires, the correspondence between patterns in scores and specific events during the workshop, the atmosphere of openness, the
Table 9.1 Heuristics for sector-wide ICT applications

<table>
<thead>
<tr>
<th>Main categories of processes constituting the RT Process</th>
<th>Main processes involved</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Social conditions (infrastructure)</strong></td>
<td>To create the conditions for the RT process to happen</td>
</tr>
<tr>
<td>Relevant stakeholders involved (The whole system involved)</td>
<td>Involving all relevant stakeholders voluntary or obligatory as a consequence of influence by the CTA agency.</td>
</tr>
<tr>
<td>Dialogue</td>
<td>A free flow of meaning between two or more persons.</td>
</tr>
<tr>
<td>Participatory</td>
<td>Taking part in the CTA process, being heard and being able to exercise effective influence on the decision-making.</td>
</tr>
<tr>
<td>Exerting drive</td>
<td>The process of building up intrinsic motivation and out of it, pushing the development and realisation of the innovation.</td>
</tr>
<tr>
<td>CTA agent(s) providing organization and facilitation</td>
<td>Organization and facilitation provided and initially financed by external actors and taken over by the stakeholders ('imposed' or self-organised).</td>
</tr>
<tr>
<td><strong>II. Gradual development</strong></td>
<td>Spirals of experimentation, analysis and improvement that result in scaling and expansion/replication cumulating in a large scale</td>
</tr>
<tr>
<td>Visioning</td>
<td>Progressive and continuous development of a vision on the effective use of the technology.</td>
</tr>
<tr>
<td>Joint problem analysis</td>
<td>Joint analysis of problems in the domain, with a particular attention for systemic errors.</td>
</tr>
<tr>
<td>Scanning</td>
<td>Continuously searching for clues/opportunities for innovation, or continuously searching for clues how to integrate the technology in the regime.</td>
</tr>
<tr>
<td>Idea generation</td>
<td>The process of defining a do-able new combination not thought of before in that specific context.</td>
</tr>
<tr>
<td>Experimentation</td>
<td>Experimentation through prototype development is the design and testing of a series of prototypes that become increasingly detailed and real.</td>
</tr>
<tr>
<td>Institutionalisation</td>
<td>The process of integrating the novel ICT-based practices, values and norms into the organization.</td>
</tr>
<tr>
<td><strong>III. (Social) Learning</strong></td>
<td>Processes that relate the 'mental frames' to the innovation(s)</td>
</tr>
<tr>
<td>Substantive and procedural learning</td>
<td>The process of acquiring, sharing and exploiting substantive and procedural knowledge, which feeds into idea generation and is required for development, implementation and use of the innovation.</td>
</tr>
<tr>
<td>Reflexive learning and sense making</td>
<td>The process of reflecting and inquiring between the stakeholders on the ‘inner worlds’ as related to the innovation.</td>
</tr>
<tr>
<td><strong>IV. Societal agenda development/Decision making</strong></td>
<td>Processes that realise and integrate the innovation(s) into the organisations and the domain</td>
</tr>
<tr>
<td>Alignment (networking, negotiation and coalition building)</td>
<td>The process of articulating configurations of value propositions (advantages, disadvantages and uncertainties) as perceived by stakeholders, through a continuous process of negotiation and development of mutual perceptions.</td>
</tr>
</tbody>
</table>

*Table 9.1 continues on next page*
responses to the open requests for comments by the facilitators to both observers and participants, and finally the clarity with which participants made their point, including their critical remarks. Therefore, it is unlikely that the respondents just wanted to please the facilitating organisation.

For the evaluation of the overall RT process, a similar quality was observed in the questionnaires and in the response during interviews by a consultant researcher. Also, the conversations between the project teams and the researcher (including from time to time the Monitoring and Evaluation (M&E) staff from IICD), could be characterised as open. The quality of the impact monitoring was generally good, but might have suffered during the start-up of the M&E system in 2002/2003, from incidental bias in the survey population or from socially desirable answers as the consultant researcher was not yet fully acquainted with the ICT prototype development teams. Time series and focus group discussions helped to reduce possibly erroneous data. Another important source of validation was a comparison with another RT process on health in Tanzania, as well as a number of RT processes elsewhere.

9.2.2 The ‘without’ case

The question whether similar results could have been achieved without the intervention of the RT process is partly addressed in chapter 8. Some complementary analysis is given below. ICT is a relatively new technology to Africa. Zeleza (2005) has shows that sub-Saharan Africa has the lowest teledensity. The telecom market was deregulated in Tanzania in the 1990s. This was driven by international pressure and the new neo-liberal ideology. Deregulation was a complex issue and it suffered from some sub-optimal decisions and weak implementation (Nielinger, 2006). Nevertheless, deregulation
boosted ICT development. But, like many other African countries, it failed to take up the challenge of developing rural telecommunication to an adequate level. A national ICT policy was put in place by the end of 2003, but was never really implemented except for the abolition of excise duties on computers that stimulated the use of ICT.

In terms of ICT applications, the Tanzanian government focused primarily on rolling out some central governance systems. Few initiatives were taken up at sector level. In the education sector, for example, no major ICT initiatives had been launched besides the e-School programme of SIDA. And these activities drew largely on the prototype owners of the RT process in terms of know-how and formulation capacity. Moreover, the development of local content was still limited to those NGOs that were generated through the RT process. Of course, mass media also played a role in creating awareness on ICT in education, but this, too, was partly triggered by events organised by the participants of the RT process. In this respect, the role of IICD is acknowledged by Nielinger (2006). In general, donor offices in the recipient counties had a very limited interest in ICT and little vision in this respect. “To merge ICT opportunities with sectoral competencies…includes a concrete definition of ICT for sectoral development and this is still an outstanding work step on the part of most donors” (Nielinger, 2006, p. 240-241). In conclusion, the uptake of ICT in education can be largely ascribed to the RT process.

9.2.3 External validity

The positive outcomes of RT processes elsewhere in sub-Saharan Africa and Latin America suggest some possibilities for generalization. Also CTA purports to be generic, although some contest this wider applicability beyond the Netherlands, the place it originated, so more evidence is required. Reliability is the degree to which the methodology can be repeated with positive results. In this respect, the main variables of the RT process are the CTA agent and the context. The findings from sub-Saharan Africa and Latin America indicate that the RT processes carried out by different CTA agents were reliable regarding outcomes for the first and second development cycle. Also, the influence of contextual features on the process and outcomes of the RT process was limited. Contextual factors merely seemed to influence the speed of the RT process and the efforts required in terms of capacity building. The context only became a limiting constraint where there was no political room for manoeuvre.

The third development cycle led to the integration of the technology in the socio-technical regime of education in Tanzania, and hence scalability. Here, the external validity is less obvious. For other RT processes there is evidence that scalability for ICT applications in some sectors was achieved, but not for all.5 The reasons for

5 In some cases successful scaling was not achieved, simply because it was not a goal; the goal being sustainability at a small scale only.
failure vary and require specific research due to differences in context and repertoire of interventions. In short, the third development cycle is too ‘young’ and not yet sufficiently studied to draw conclusions. This also makes it premature to draw conclusions related to the applicability of the RT process.

Is the RT process a useful approach for other sectors than those studied? The RT process was researched for the social service sectors of education and health and for agriculture, a market sector. In comparison with the market sector, the service sectors seem to be more regulated and the actors more interdependent. The RT process was effective for the first and second development cycle. The third development cycle was researched for education while ongoing work in the area of health care in Tanzania points to the applicability of the RT process for social service sectors. However, the applicability of the third cycle of the RT process for more market oriented sectors like agriculture has not been sufficiently researched as yet. Therefore, it cannot be concluded that the RT process is applicable to other sectors.

To what extent is the RT process a valid method to design later generations of ICT applications? The definition of CTA also includes the aspect of reshaping technology. This implies that the RT process, as an operationalisation of CTA, should have this potential. Important parts of the RT process, such as participation and change management, are recognised in IS literature as highly relevant for ICT design. Galliers (2004) points to the emergent nature of information systems. Therefore sense making is equally important for later generations of ICT applications in order to understand how novel technologies bring about new practices and vice versa. Moreover, it is erroneous to perceive the information systems to be continuously aligned with the strategy of an organisation. Consequently, sense has to be made of the new developments and ownership has to be created to undertake the required new courses of action successfully. Hence the RT process seems applicable, especially for sector-wide applications where a multitude of actors have to come to mutual adjustment.

9.3 Theoretical implications

From the viewpoint of theory building, one main conclusion from this study is that the RT process is an operationalisation of CTA; particularly suited to ICT in a development context with a sector-wide and multi-level perspective. More specific, this study contributes to theory on four subjects: (1) the development of ownership, (2) the role of conflict and change management, (3) the need to integrate system thinking more explicitly in CTA and (4) the contribution to the development of new heuristics for IS research as an emergent approach to organisational and sector-wide ICT design.
9.3.1 A look into the black box of ownership

Ownership is an important notion in development studies, often referred to, but little defined. The literature mentions few strategies to bring it about. In the literature different aspects of ownership are emphasized:

- a notion of self-determination (Chesterman, 2007), including aspects like control, accountability and commitment;
- the dynamics of “driving” a process (Helleiner, 2000) and being capable to do so (Lopes & Theisohn, 2003);
- the psychological nature of ownership (Pierce et al., 2002).

In this thesis, essential aspects of ownership turned out to be a psychological relationship with a material or immaterial object and having real power over it. Whether ownership leads to actually driving the development of the object depends, amongst other factors, on the nature of the psychological relationship, on the capabilities and on the external conditions. In chapter 5, we argued that the psychological relationship contains cognitive and affective elements. Ownership is a feeling of possessiveness and is associated with positive attitudes towards the object, with enhanced self-concept and a sense of responsibility. It implies the build-up of expectations, including a perception of risks. It influences the main constructs that influence intentions according to Azjen’s theory of planned behaviour (Azjen, 1991).

‘Growing ownership’

Initially, we focussed on the development of ownership, or lack thereof, at the level of the individual. In most cases, reflexive learning, sense making and idea generation created ownership or, more prudently, ‘grew’ ownership; the psychological commitment towards deploying the technology in order to realise an objective that is often still ill-defined. This commitment provides the intrinsic motivation to invest time and effort, to take risks, and to be willing to learn further. Below we have a closer look at the way ownership was developed in the early stages of the RT process.

Reflexive learning is the process of reflecting and inquiring between the stakeholders on the ‘inner worlds’ as related to the object. As a concept, it largely overlaps with double-loop learning. Sense making implies the development of insights in plausible applications and the formulation of criteria to make a judgement about it (Weick, 1995). The relationship between reflexive learning and sense making is unclear. Sense making has more of the notion of disengaging from a present view and adopting a newer one (Weick, 1999). In the RT workshop and thereafter, learning and sense making were stimulated by the participatory environment, the methodological steps, including the facilitated dialogue, and the diversity of participants.
The setting of the participatory process was, first of all, one where the imposition of power (like expert knowledge, cultural, political and to some extent the hierarchical power) was temporarily minimised. This created opportunities for participants to speak out and exchange their views more freely. Facilitation and the methodological process steps subsequently incited each participant to articulate his or her views and to think through causes and consequences of major changes. For example, ‘scenario planning’ allowed the participants to see new perspectives and confronted them with the unfolding perspectives of other actors. ‘Visioning’ served to think through a desired future situation. This stimulated participants to make mental simulations and to learn from them. The change triggered by a new perspective on the future enabled what Weisbord (2004) calls ‘to pass through the 4-room apartment’: from contentment to denial to confusion and finally to renewal.

Another stimulating factor with respect to sense making was the diversity of the participants. This was realised on several levels: (a) diversity of participants in terms of their positions in the different organisations and in the domain itself, (b) diversity in their possible roles towards the technology. Diversity is required because if social learning is focussing on one dimension only, it might neglect other important issues (Wynne, 1995) and lacks sufficient cognitive grounding. Without diversity there is a tendency to move towards ‘group thinking’ or idolising the technology without critically reflecting on the drawbacks and priorities. This happens easily if there are one or a few dominant examples. A continuous process of interpretive articulation and reflection on a variety of experiences is required as well as, at a later stage, a continuous negotiation of the direction that should be taken. Developing and maintaining various options concurrently will stimulate the wider perspective that is required for the psychological relationship, with its cognitive and affective elements, to mature and become more firmly set.

Idea generation was cited a number of times as being important to develop ownership. This contained connotations such as being recognised, having the opportunity to speak out, and pursuing what one really values. It seemed possible to transfer ideas too, but only at the very early stage of developing the prototype. The extent to which idea generation contributes in an essential way to ownership is not yet fully clear.

**Exercising ownership**

A main result of ownership is exerting drive. It reflects the inner motivation and attaches a high priority, if not a sense of urgency, to the development of a specific ICT prototype and the novel social practices this generates. The relevance of exerting drive became clearer in the light of the risks, efforts and complexity involved in pursuing an idea in the existing organisational and bureaucratic setting (see chapter 8).

Experimentation was very important for reinforcing ownership. It comprises formulation, development and further improvement. Owners often cited the sometimes
painstaking work of formulation of the prototype as important to strengthen their ownership. Formulation is about mental simulation of the future situation, the steps to reach it and the knowledge required to put it into practice.

Another factor that contributed to further ownership, was encouragement by peer groups i.e. the other prototype development teams. The CTA agent played a role in terms of coaching of the owner, influencing other actors to reduce the resistance to the object of ownership and to seek opportunities for scaling. In other words the encouragement by the CTA agent consists of: some advice, some ‘easing of the work’ and developing better perspectives to realise the objectives set.

However, the exact interaction between the processes leading to ownership is still insufficiently known, as is their link to personal characteristics (Figure 9.2).

9.3.2 Conflict and change

CTA is a consensus-based approach. This does not imply that conflict is denied, but how to deal with conflict and change management is a less developed area in CTA. Opposing interests and conflicts are identified and named; agree to disagree. Also a reluctance to participate in order to disclose sensitive information is observed. Yet, conflict is part of reality and there is a need to operationalise interventions to cope with it. Conflict arose in the Kinondoni case study and, had this conflict not been resolved, a number of department heads would have blocked the introduction of ICT. Similarly, in the case of education, a number of conflicting situations were described, including the way they played out. In this section, we would like to reflect on the role of conflict in the RT process, although we do neither carry out an exhaustive examination of this issue, nor reflect on all relevant literature in this field. We will, however, provide some hypothetical suggestions on how to deal with it.

The changes, on many levels, following the introduction of new technology, make such introductions inherently conflict prone. By definition, innovation affects value generation and causes shifts in positions (Janszen, 2000). From a Schumpeterian perspective, innovation is creative destruction and in its aftermath causes a
rearrangement of positions. CTA is involved in the shaping of the technology and starts at an early phase of policy-making. The key aspect underlying policy-making is power (Leftwich, 2000). Pfeffer (1992) defines power as the potential ability to influence behaviour, change the course of events, overcome resistance, and get people to do things they would not otherwise do. Innovation generates value and causes changes in positions, sooner or later (Janszen 2000). Positions are linked to the opportunity to generate or accumulate value. It can be assumed that actors will deploy all their influence, in other words exercise all their power, to maintain or improve their position. Thus we may assume that the emergence of a new technology will bring about conflicts. The importance of dealing with these conflicts is also advanced by the critical school who put forward the concern that ICT reproduces, and even reinforces, social divisions (Zeleza, 2005).

On the other hand, CTA contains unarticulated normative values with a concern for equity, emancipation, and sustainability. While the participatory character of CTA strives to reduce the errors of societal learning related to the technology as broadly indicated by the normative perspective on development, there is a risk that the process gets compromised by the exertion of power and thus becomes a tool for manipulation and domination. Dealing with conflict, or more positively formulated, assuring change management, should therefore be an essential part of CTA.

**What are the possibilities for change management?**

From a static perspective, the main option lies in the setup of the CTA infrastructure (e.g. who participates, which roles? etc.) and in the methodology deployed, including the rules and their enforcement. The limitation of this static perspective is that political ‘games’ by actors cannot be kept out of the conversation (Rip, 1986), although they might be attenuated during facilitated group sessions. A similar point is made by Klijn and Koppejan (2000) for interactive policy-making. For example, government actors tend to cling to their position, even when admitting this is against their long-term interest.

From a dynamic perspective the challenge is to influence the moments of choice of the relevant actors. Rip (1986) states:

> “In principle, ad hoc interventions in the socio-cognitive dynamics of the controversy, based on a diagnosis of the forces at work, will have the most effect”.

Change management at organisational level also relies on a situational approach (Boonstra, 2004; Caluwe & Vermaak, 2006). The relevance of a dynamic perspective is based on the following theoretical insight. In traditional policy development,

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6 Controversy implies not only a difference in opinion, but also in interests and perspective.
the underlying assumption is that all parties involved work toward maximising the importance of their particular interest. However, Grin (1996, p. 78-79) argues that:

“whereas ‘interests’ served as central explanatory variables in traditional approaches to policy science, the recent approaches tend to focus on a ‘struggle of meaning’, and the behaviour of policymakers (including the perception of their interests) is guided by their policy belief systems […] frames of meaning of a professional actor consist of problem definitions and preferred solutions, appreciative systems (value systems), and overarching theories that help to make sense of the situation” (Grin & van de Graaf 1996, p.77).

As we have seen, the way the interests of particular parties dominate the discussion can be influenced (chapters 6 and 8) if the dialogue is sufficiently precise and tangible and if sufficient attention is given to the construction of ‘congruent meaning’.

The RT process offers a number of mechanisms that influence the choices made and which may be helpful to solve conflicts, or at least to avoid deadlocks. The CTA agent stimulates ongoing interaction between institutional actors and the opening up of new perspectives to the participants. For example, during the Kinondoni workshop, some department heads opposed the use of ICT. The emerging insight into the value of information, the composition of the group, and the ability to make instantaneous decisions, enabled all vestiges of resistance to be overcome. Similarly, the interactive policy-making process and related interventions in the case of education overcame resistance at the policy level.

Mechanisms and tools for conflict resolution include:

- Scenario planning, visioning and value attribute analysis (which are tools for discovering and choosing development paths and exploring what matters to the other actors and what could be elements of exchange between actors). This is all about matching different points of interest and optimisation of individual outcomes;

- Analysis of problems, including untangling the dominant view and demonstrating how patterns of interactions and/or paradigms reinforce or reproduce problems. This is cited in the literature (Grin & van Staveren, 2007) and observed in the case of education;

- Communication strategies to enlarge the group involved and to exert pressure;

7 This point is not elaborated in the relevant chapters. It refers to the analysis with the teams of the prototype owners of “The poor learning and teaching environment” (see chapter 8, Box 8.1) and during a session with the Ministry of Education on the primary education development programme. The joint insights that emerged on the factors that drove the urban bias in the behaviour of the civil servants, was quite revealing to most participants, including the facilitator. The tool used was soft modelling. Also in other settings in Tanzania, this tool proved useful for generating insights. Also in literature it is cited as helpful in analysing messy problems (Vermaak, 2009).
• Redefining boundaries (i.e. what is included in the participatory exercise, or redefining responsibilities);
• Influencing the timing and concurrence of events.

Interactive policy making processes pre-suppose a degree of mutual dependency (Driessen et al., 2001) and a willingness to participate. This might imply the reduction of the attractiveness of other options for certain participants. The experience of the education case indicates that an analysis of the system concerned by a small group using soft modelling helped the CTA agent to make better informed assumptions about the perceptions of interests, the personalities involved, the powers working to protect these interests and the mechanisms and timing of interactions, including the trajectories created with institutionalised conflict and entrenched blockages. Hence, the nature of the potential conflict was better anticipated. Such mental simulation may also allow the CTA agent to be more flexible in handling conflict and be more timely in responding to it.

9.3.3 A systems view

CTA as an approach initially focused on actors and networks directly related to the development of the technology based on the quasi-evolutionary theory. This focus has been widened (Geels, 2010; 2005). The notion of an open-ended and inclusive approach is implicit in the definition of technology as ‘configurations that work’ (Rip & Kemp, 1998), which refers to the alignment between heterogeneous elements that fulfil a function. Geels (2004, p. 1258) states “configurations that work cannot easily be bounded from the rest of society”. Similar statements are made by Hughes (1987) with the metaphor of a ‘seamless web’. Also this study found that the theme of the RT process has to be defined as a system; represented by the different voices in the domain considered. Also the study on scalability showed that many other factors and actors play a role. While incorporating a more explicit system approach in CTA is not denied, the question is how to operationalise a system view in a practical manner.

In this study use was made of tools like soft modelling or value attribute analysis. They proved useful in supporting dialogue. The type of system thinking to apply is still under discussion. While a more cybernetic approach like System Dynamics is widely practised in group settings for problem analysis and decision making (Forrester, 1961; Sterman, 2000), approaches from the science of complexity, like complex adaptive systems (Braa et al., 2004; Merali, 2004), might offer a more promising route toward understanding complex phenomena and the dynamics of transitions. However, the latter approach is less articulated at this stage (Merali, 2004). But with more software becoming available for modelling of complex adaptive systems, this approach might gain popularity. Still, there is as yet little insight into the precise meaning of the concept of ‘complex adaptive systems’ as applied to social systems and this remains one of the main problems of this approach.
9.3.4 Implications for IS research

CTA is new to IS research. What can it contribute? A main contribution are heuristics for the design of sector-wide ICT applications. Secondly, it contributes to an 'emergent change' approach. Current ICT design is based on planned change, with at the core the classical 3-phase model of Lewin of ‘unfreezing, moving and freezing’. This approach necessarily has a top-down character. ‘Emergent change’ is a more recently developed approach (Muntslag, 2001). It assumes that fast-changing conditions in the environment make it impossible for top management to oversee, and react adequately and in a timely way to, events. Employees are therefore empowered, in the sense of authorised, to initiate and implement change themselves. In a development context, such empowerment is desirable, because successful change depends on an understanding of the context and the politics involved (Pettigrew & Whipp, 1993). Also, empowerment activates knowledge and motivates and energises staff. Empowerment is not only a shift in power; it also represents a cognitive change. It has to come from within (Townsend et al., 1999).

The participatory and learning approach taken in the RT process is a significant step to enable participants to bring forward and concretize ideas. This is all the more effective if the participants are empowered to initiate and implement changes by themselves, as in the approach of 'emergent change'. The RT process included different participants in terms of levels of seniority in their respective organisations and, if well prepared, these participants had some mandate to initiate ICT applications.

The RT process provides a shared framework on what changes are valuable from the perspective of the system represented by the focal team e.g. district health or value chains/collaborative networks. The participants, being the main stakeholders related to the focal theme, represent the system involved. The ICT prototypes, developed during the RT workshop, largely reflected new or improved ideas which were perceived as priorities within this framework. Therefore, it may be concluded that the RT process represents an emerging approach to ICT design. Emerging approaches in ICT design are still limited and the object of ongoing research and discussion (Katsma, 2008; Luna-Reyes & al., 2005; Muntslag, 2001). This research intends to contribute to this discussion.

9.4 Further research

Three topics for follow up research are suggested. First how to improve the positive impact of the RT process on poverty alleviation. Secondly, the cost-effectiveness of the RT process. A third suggestion for follow-up research is whether the RT process can be widened-up to an approach that addresses substantial and structural change enabled by technology; in other words a reflexive technology-enabled system innovation.
9.4.1 Improving the impact on poverty alleviation

ICT is a window of opportunity for poverty alleviation as it might create win-win situations for all actors involved. Yet, a finding of this thesis is that the direct impact of the ICT applications in the cases studied is limited. This may be due to the fact that poverty alleviation was only emphasized as an institutional objective of IICD as of 2001. It might also be due to the complexities of making ICT affordable for economic weak groups and developing an adequate and effective support structure. Economies of scale and scope seem to be needed to make ICT infrastructure and services locally available. Therefore the question is important whether and how the RT process can be improved in such a way that the resulting applications and institutional changes make a stronger contribution to poverty alleviation.

Poverty alleviation is a multifaceted and complex challenge. Far from being just a ‘technical’ problem, it involves moral, economic, political, and security issues. Narayan (2000) argues that poor people do not want charity, but opportunity. At the same time, there is also a notion of ‘circles of poverty’, meaning that poverty is handed down through the generations. This makes breaking the conditions that sustain poverty an even more complex task. In a large World Bank study on poverty, Narayan (2000) advances three options for acting: (a) work through organised groups of the poor, (b) work through communities, and (c) influence the conditions.

The first option has been discussed in chapter 6. The second option, working through communities, has not been studied in the context of this thesis. However, it is practised in livelihood activities in the Tanzania Country Programme of IICD. A price information project reports an average income increase for the participating farmers of over 20%. Working with specific groups, such as women, youths, etc., also indicates positive results. A further distinction in sub-groups might be useful, for example, between ‘working poor’ and ‘non capable and excluded poor’ (Streeten, 1995), or based on gender, age or family status like orphans and oppressed and abused women. The gender issue in particular, goes beyond simply mainstreaming in the ICT policy agenda (Munyua, 2005). The issues at stake not only refer directly to trafficking and sexual abuse, but also to influencing long-term changes in the socially and culturally constructed gender roles. Related to the second option, one of the problems with community-oriented projects is creating and maintaining a focus on poor groups. One general solution, which is often advanced in the literature, is to improve the infrastructure, to provide temporary subsidies to poor users, and to undertake specific R&D (e.g. Cecchini & Scott, 2003).

8 Chambers (1983) noted a similar potential during the 70s by bringing together the technology of the so called green revolution and the establishment of irrigation infrastructure in India.
The third option, to influence the conditions for poverty alleviation, seemed to have some result in the case of education studied. This is an important direction for further research and for targeted donor support. A practical suggestion for immediate improvement of the RT process is a more in-depth analysis of the system that maintains and reproduces poverty. This will help to bring poverty-related issues more explicitly into the scenario development and the identification of the leverage areas for change. Representatives of the poor can be the chief carriers of these viewpoints.

### 9.4.2 Cost effectiveness

Additional research is required to assess the cost effectiveness of the RT process. The economics of the ICT projects are rather complex. Benefits and costs are not always tangible and ICT might induce changes in strategic positions and hence cost and benefit patterns. Benefits might be difficult to quantify, or might only become apparent over a longer time-span. There can also be substantial indirect effects with associated benefits and costs. The assessment of the costs and benefits is set against the alternative time and resources spent by the actors involved. The point of cost effectiveness assumes a comparison with the cost and benefits of alternative approaches to the introduction and integration of ICT in a particular sector. Several case studies are required to reduce the influence of situational factors.

### 9.4.3 Towards reflexive technology-enabled system innovation

The acceptance of incremental and more radical change enabled by the technology, opens up the possibility to expand the RT process to address not only the moulding of technology to societal needs, but equally to address structural problems within a sector that can, directly or indirectly, be influenced by technology. The analytical model suggested in chapter 8 articulated a mutual influencing between the socio-technical system, the actors and the institutions. Not only actors, but also material artefacts can be agents of change, as brought forward in the actor network theory. Technical substitutions can thus affect wider socio-technical configurations and – in certain cases – bring about system innovation.

In the RT process, the opportunities to influence these changes are primarily incorporated in the design process and furthermore advanced by exploiting the different insights of the users i.e. exploiting the interpretive flexibility of the users, which allows for incremental or more radical redesign. The nature of ICT with rather unique aspects of versatility and reflexivity (Pipek & Wulf, 2009) further enhances the potential of the technology for change. The appreciation of change depends on the time horizon applied and is intrinsically normative. The experience with the RT process indicates that this participatory and multi-stakeholder approach is likely to
lead to coherent and complementary sets of ICT applications that are perceived as relevant to development. Compared to literature (e.g. Grin & van Staveren, 2007; Grin, Rotmans & Schot, 2010; Raven, 2005) the RT process provides basic elements to come to technology-enabled transitions. The positive impact, and the perception by most actors of a ‘win-win’ situation (at least on the short term), makes the RT process highly attractive to innovate in sectoral governance and development.

While the RT process is reflexive in nature, a question for follow-up research is whether a more continuous attention to overcome societal problems, especially persistent problems, could transform the RT process in a heuristic for transition management? The concept of persistent problems as ‘weaving errors in the system’ (Grin & van Staveren, 2007) implies that they are reproduced by the system as set out in chapter 8. The analysis of the underlying system with its perverse couplings that reproduce persistent problems enables to formulate novel concepts. These concepts transgress the existing framing of the persistent problem and open up new solutions. These solutions not only involve novel ICT applications, but a whole set of measures in order to come to changes that in the end lead to a desired transition. Amongst others such an approach could possibly require the following additional heuristics to be included in the RT process:

- **Scanning**, not only to detect technological opportunities, or possibilities for integration of the technology in the socio-technical regimes, but also to analyse the systemic patterns driving persistent problems.

- **Visioning**, based on a better understanding of the systemic causes driving persistent problems could offer a perspective that goes beyond established assumptions and anticipations, and be an alternative to the existing (dominant) view. Visions can also be used as a tool to bring out, and reflect on, the lessons learnt. This may be a continuous process. Interesting is the role of expectations as ‘bids’ of future-oriented propositions that fuel interaction, as well as the role of expectations in the emergence of path dependency (Borup et al., 2006). Presently, visioning is under exploited in the RT process.

- **Broadening experimentation**, progressively adding or revising some ICT prototypes that address the persistent problems in order to learn about the adequate properties for scalability.

- **Structured and increased communication** could enhance the impact of the RT process. Trans-learning is the label given to the search for appropriate means of knowledge sharing, storage and feedback within a growing network of actors, many of which are only involved from a distance. Experimenting with these forms of knowledge management is ongoing (Regeer et al., 2009) and highly relevant to the RT process.
considerable role might be for a focussed use of Web 2.0 and consecutive communication technologies that are perceived as empowering and altering the way of communication (Shirky, 2008).

9.5 Implications for development cooperation

Technology assessment came up as a deliberate effort by government to appreciate the effects of technology in an early stage and to intervene if required. This argument for intervention is underlined by literature. Bresson (1989) describes the importance of the role of government, especially in the early stages of the emergence of radically new technology systems. This includes the often overlooked complex and costly process of technological and organisational learning (Ernst & Kim, 2002). Examples we observed in Tanzania underscore this point. In the USA and the EU special programmes and policies have been rolled out to make best use of the technology and to strengthen the innovation potential. There is no reason to assume this argument would not apply to developing countries.

However, this study focuses on CTA not just as a means to accelerate technological development, but as a way to reduce the cost of societal learning and spread the benefits of the newly introduced technology more evenly among the population. It was observed (chapter 8) that ICT spreads relative easily in private urban schools. The students at these schools are, by definition as it were, children of rather well-off parents. This suggests that, when left to market forces, ICT would further inequity among income groups rather then reduce it and would aggravate the divide between the urban and the rural population. Nieling (2006) underlines this point. The applications resulting from the RT process in education, on the other hand, were targeted to a broad group of users and perceived as relevant for development by these users. Even though the studied RT process was, in my opinion, not optimally focussed on poverty alleviation, it nevertheless provided free educational materials, other relevant content relevant and services for a broad audience of students, teachers and parents.

The case study on education (chapter 8) further demonstrates the importance of active guidance by the political regime, which, in this case, did not take up new technology easily. Heeks (1999) observes that most policy makers either ‘idolise’ the technology or ‘ignore’ it. Both attitudes are unproductive. Swanson and Ramiller (2004) refer to an ‘organising vision’; a conceptual isomorphism that guides investment decisions in the public and private sector. So, better get such an organising vision productive for

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9 For example the Business Information Services, incurred during start-up considerable and needless costs in mobilizing UK expertise and hosting services for a price information system. Also the fore mentioned telemedicine experiment incurred significant costs and time losses in mobilizing the required expertise before they were able to start up.
development, or in other words “reduce the costs of learning by error” (Rip, 1986). Therefore technology should be again on the agenda of development cooperation.

The research presented in the previous chapters was both inspired and driven by the desire for a better understanding of the realities of development in the setting of the introduction of a new, promising technology like ICT in Low Income Countries. It stems from a firm conviction that every society has to come to grips with its own development and governance. This study underlines the fact that the development problem is complex and beset with messy and persistent problems. For this reason, development problems cannot be solved by quick fixes or by rapid shifts in the approach. For development aid to be effective, the concept of development should be defined in the local context: the ‘moving forward’ as perceived by the people concerned. The role of development cooperation can only be a limited one, that of assisting and enabling this process of ‘discovery, definition and realisation’. This has to be based on dialogue and participation.

Development cooperation struggles with its own limitations in terms of culturally and ideologically bound perspectives and solutions. It encounters dominant power structures that are necessary for stability, but which are not very productive for realizing development. In certain cases, development aid seems a solution to a problem only in the short term, while in the long term it may even undermine some institutions and make them more instead of less dependent on donor countries. It can also seduce some individuals to become corrupt. The virtue and art of receiving is, apparently, complicated.

In the course of this study, time and again the ‘heaviness’ of the political-bureaucratic-donor complex could be observed, creating its own realities and over-estimating the impact of policies and ‘structural measures’. There is a serious lack of feedback from the ultimate target group, the users, beneficiaries etc. To use a metaphor: it is like an economic sector in which only producers and vendors communicate with each other while consumers find their feedback either suppressed or distorted and their money spent without their consent. Even worse: the voice of those who rise to the challenge and find innovative ways to improve their lot, is hardly heard at all and given even less attention.

And yet these cradles of innovation have a lot to contribute, as this research shows. In the end, innovation and specialisation are the main roads to development (Verschoor, 2000) and need to be nurtured. Politicians, bureaucrats and donors, they all generally acknowledge the modernisation theory which holds creative destruction to be of utmost importance. The contradiction is that dominant ideology as expressed in the political-bureaucratic-donor complex praises change and empowerment in words, yet tends to kill it in acts.

Development cooperation should rediscover the importance of technology and use it
as a catalyst for development. The interactive approaches set forth in this study proved useful for triggering improved work practices and for inducing system innovations. The high rate of dialogue stimulates learning for all parties involved, including donors. The high rate of participation stimulates democratic values and encourages the institutionalisation of the value of power sharing. This could be helpful in realising the paradigm shifts that are so badly needed in development cooperation (Naudet, 2000) by the donors, the experts and the receivers.