REVISITING THE ROLE OF ICT IN DEVELOPMENT

Abstract: It is now widely accepted that Information and Communication Technologies (ICT) have an important role in national development. However, the nature of the link between the two remains unclear. Much of this state is due to lack of clarity on how ICT is conceptualized in this context. While some conceptual frameworks have been proposed, they lack important aspects that can give a more comprehensive picture. In this paper, we attempt to further clarify how ICT is conceptualised in development. Using secondary data, we evaluate two conceptual frameworks that bring together the range of views of ICT, their manifold impacts, and the assumptions and perspectives of the range of actors in any given development project that involves ICT. The specific case we examine is an e-Government initiative called e-Seva in the Indian state of Andhra Pradesh. We found that even when using the two frameworks in conjunction, many aspects of the ICT initiatives remain unclear. We suggest ways of combining different frameworks to provide a sharper lens to give us a better understanding of why ICT for development projects may fail or succeed.

Keywords: ICT, national development, e-Government, conceptual frameworks, ICT in development paradigms.
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1. INTRODUCTION

While the developmental potential of information and communications technology (ICT) has been widely discussed in the literature (for example, Heeks and Arun, 2006; Madon, 2005; Bhatnagar and Schware, 2000; Avgerou, 1998), we still lack conceptual clarity on the role of ICT in national development (Sein and Harindranath, 2004). Indeed we argue that the extent of success or failure of ICT interventions to enable development will depend on how national and local governments, national and international development agencies, non-governmental organisations and public agencies conceptualise ICT and development.

There have been some recent attempts to conceptualise ICT in the context of development (Sein and Harindranath, 2004; Wilson and Heeks, 2000; Licker, 1998). Of these, the framework by Sein and Harindranath (2004) takes a comprehensive view by combining concepts from the development and information systems literature to describe how ICT should be viewed, used and what effect to observe. However, this model does not say ‘who’ will do this. In other words, who should conceptualise ICT within a given development initiative?

Clearly, there is a need to further clarify the way we conceptualise the role of ICT in development. In this paper, we attempt to do so by using the Sein and Harindranath (2004) framework in conjunction with concepts of ICT in development paradigms and associated actor roles as identified by Sein (2005). We evaluate these two frameworks by using them to examine the e-Seva project, an electronic government initiative in India.

The rest of this paper is organised as follows. In the next section, we discuss the two key theoretical approaches we use in this paper: first, the framework by Sein and Harindranath (2004) conceptualising the role of ICT in national development, and second, the framework by Sein (2005) that categorises paradigms of ICT in development to illustrate the perspectives of the various actors. The section that follows presents and analyses the e-Seva initiative. This is followed by a discussion of the implications of our analysis for the theoretical frameworks used in this study. We conclude by offering some suggestions on how different frameworks can be used to understand the role of ICT in development.

2. CONCEPTUALISING ICT IN THE DEVELOPMENT CONTEXT

2.1. An integrative framework for ICT use, views, and impacts

The framework developed by Sein and Harindranath (2004) presents three different conceptualisations of ICT: its use, how it is viewed and how it impacts development (see Figure 1).

With regard to ICT use, they draw at least four different conceptualisations of the use of ICT in national development from the literature: as a commodity, as supporting development activities, as a driver of the economy, and directed at specific development activities.

With regard to how ICT is viewed, they use the classification of the ICT artefact proposed by Orlikowski and Iacono (2001) in terms of four different conceptualisations: tool view, computational view, ensemble view, and proxy view. They then argue that these views of ICT represent a hierarchy when applied in the context of national development.

With regard to impact of ICT on national development, they use the framework proposed by Malone and Rockart (1991) and adopted by Sein and Ahmad (2001) in the context of ICT and
national development. This model posits that new technologies impact society through three effects: the first order or primary effect (i.e., simple substitution of old technology by the new), the second order or secondary effect (i.e., an increase in the phenomenon enabled by the technology) and the third order or tertiary effect (i.e., the generation of new technology-related businesses and societal change).

The three conceptualisations presented above in terms of ICT use, ICT views, and ICT impact can be seen to affect national development (see Figure 1). Firstly, they argue that the manner in which ICT is viewed represents a hierarchy in that the tool and computational views, while essential for understanding the ICT artefact, do not have much developmental impact. They argue that we need to move up from the tool and computational view to the ensemble and ultimately the proxy view, where the proxy view is defined in terms of knowledge creation. Secondly, they state that the manner in which ICT is used categorise how different types of ICT-related development initiatives can be applied to affect development. Thirdly, although the impact concept has a hierarchy by definition (i.e., the tertiary effect of a new technology has a greater impact on society than the secondary effect), they emphasise that the primary and secondary effects are necessary conditions for development, but not sufficient. They argue that we need to look at the tertiary effects for an understanding of ICT influence on national development which they conceptualise in terms of human development.

![Diagram showing the integrative framework of ICT in development](source: Sein and Harindranath, 2004)

While the Sein and Harindranath framework aims to describe how ICT should be viewed, used and what effect to observe, it does not ask who the primary actors are in the ICT for...
development process. For example, who should conceptualise ICT, or who should observe the effects? Second, it does not question the ideologies and logic behind the behaviour of these actors. In other words, what motivates or propels them to take these perspectives?

2.2. Paradigms of ICT in development

To gain some insight into these questions, we turn to Sein (2005) who argues that ICT is not neutral and that the paradigmatic premises of the ICT intervention affect the outcome. Based on IS literature, Sein proposes four different paradigms of ICT in development: functionalism, social relativism, radical structuralism and neo-humanism (see Figure 2). The paradigms result from the intersection of two axes: epistemological (view of application of ICT) along the horizontal axis and ontological (view of development) along the vertical axis. At the objectivist end of the epistemological dimension, ICT is seen as neutral and applicable in a context-free manner, while at the subjectivist end, ICT use is seen as situated and that its exact meaning depends on the context in which it is used. The ontological axis is anchored at one end by “order” exemplified by the developed world - stable, orderly and functional. Development means moving to this desired state, which is the modernisation perspective of development. At the “conflict” end, the view is of a world in constant state of flux and conflict. Development then is contextual with each country taking a unique path to development. This is termed the “alternative” view of development (Black, 2002). A combination of these two axes gives the four paradigms.

![Figure 2. Paradigms of ICT in development (source: Sein, 2005)](chart)

2.2.1. Functionalism: modernisation perspective of development and neutral view of ICT

The main actors or roles in this paradigm are foreign experts from donor agencies who are the main drivers of the ICT intervention. The government of the host country takes a relatively passive role. Examples of this paradigm are projects aimed at reducing the digital divide, capacity building and infrastructure building. It is arguably the most common paradigm in ICT for development. ICT is viewed as a tool and often becomes the end instead of a means
towards development. Other criticisms include the danger that ICT can be a mechanism of control if existing social order prevails and increase the dependency of the underdeveloped countries on the donor countries.

2.2.2. Social relativism: modernisation perspective of development and situated view of ICT

The main actors or roles here are still from outside but are termed more as facilitators than as consultants. The host country is represented by an agent or representative of the local population (often an NGO) who is viewed as a partner. Examples include more “egalitarian” aid programmes such as the Norwegian agency Norad’s support for cooperation between Norwegian universities and universities of the “south”. ICT is viewed as an ensemble but the development perspective is still modernisation albeit with a “human touch”. This paradigm is vulnerable to “covert” control through subtle implants of ideological meaning. It is also considered analogous to the debate surrounding appropriate technology which is uncritical of the potential dysfunctional side effects of using particular tools and techniques.

2.2.3. Radical structuralism: alternative perspective of development and neutral view of ICT

The main actors or roles here can be either from outside or inside the host country in the form of activists or partisans for the “exploited” class. As Sein (2005) described it, it is best understood through the debate on call centre outsourcing which is either hailed as a great success story or as exploitation (developed world dominating the developing world) depending on the stance one takes. ICT is used as a commodity. In the heat of the often rancorous debate, potential possibilities of ICT are often overlooked and a search for a win-win situation does not occur.

2.2.4. Neo-humanism: alternative perspective of development and situated view of ICT

The main actors or roles here come from within the host country in the form of activists whose aim is emancipation. Academics can also take this role. While not providing an overt example, Sein (2005) mentioned such initiatives as knowledge networks, e-Democracy, locally developed software by local personnel for local needs and the so-called South-South initiatives (e.g. open source based development). More recent “social outsourcing” projects (Heeks and Arun, 2006) such as Kudumbashree in the state of Kerala in India, come much closer to the tenets of this paradigm. The development perspective is often human development.

2.3. Using the frameworks to examine ICT-linked development initiatives

Taken together, the insights provided by the frameworks discussed above can serve as a powerful interpretive lens that helps us in our effort to understand and explain the relative success or failure of ICT for development projects and initiatives. The Sein and Harindranath (2004) framework conceptualises the role of ICT in development. Sein’s concepts of paradigms, the actors and their paradigmatic assumptions complement Sein and Harindranath’s framework by focusing on the volitional and motivational aspects of the actors involved.

To illustrate, we examine an area in which ICT’s developmental potential has been widely recognised, namely, electronic government (Madon, 2005; ADB, 2002). A detailed review of the role of e-Governance in development is beyond the scope of this paper. Instead, we refer the reader to Heeks (2001) for a treatment of the topic in general and to Madon (2005) for an examination of the both the general area and the Indian context. The specific case we examine is e-Seva, the much heralded system implemented in the state of Andhra Pradesh in India. Our data was secondary consisting of published cases, government and agency reports and
evaluations. Our purpose here is not to analyse the e-Seva case per se but to evaluate the usefulness of our frameworks in this regard.

3. e-SEVA

3.1. Case description

The e-Seva project is a public-private partnership that offers a range of government-to-citizen services (G2C) at a single location. Located in the south Indian state of Andhra Pradesh, the services offered by e-Seva include payment of utility bills and taxes; issuance of certificates, permits and licenses, and, reservation of seats on public transport (Prashanth, 2004). Although e-Seva started by offering G2C services, it has now grown to encompass a range of business-to-consumer (B2C) services such as payment of credit card bills. The project had an immediate benefit for citizens in that they could now access a one-stop payment facility as opposed to dealing with multiple departments. e-Seva was also aimed at reducing corruption and improving government transparency.

e-Seva began as a government-funded pilot project called the”Twin Cities Network Systems” (TWINS) in December 1999. In June 2000, the state government decided to extend the project to cover the twin cities of Hyderabad and Secunderabad through a chain of 24 e-Seva centres. Currently, there are around 200 e-Seva centres located throughout the state’s capital city and its municipalities. The centres are run by a private sector IT service provider (Kochhar & Dhanjal, 2005). These centres provide over 130 G2C and over a dozen B2C services from 16 state government departments and 10 private businesses (Syal, 2005). The apparent success of the project could be seen in the increase in citizen transactions using e-Seva from an estimated 4800 during its first month of operation in August 2001 to 750,000 transactions in February 2003 (Prashanth, 2004). By October 2005, e-Seva had completed over 2 million transactions (Kochhar & Dhanjal, 2005).

3.2. Audit report of e-Seva

Despite these successes, an IT audit report (INTOSAI, 2006) has criticised the implementation of the e-Seva project on a number of counts:

3.2.1. Project management issues

No feasibility study was conducted to explore the potential for scaling up the e-Seva project, both technically and commercially. There were time and cost overruns in identifying locations for e-Seva centres, in updating data in participating government departments, IT procurement, and software development.

3.2.2. Technical issues

The project did not create a system requirements specifications document with the involvement of the various government departments and user groups. Instead, all specifications were the sole responsibility of the private IT services provider. In addition, adequate documentation relating to software, hardware, error handling etc was not provided by the IT service provider. The audit also criticised lack of appropriate processes for periodic updating of programs, weak documentation, deficient software application package that accepted incomplete data inputs often leading to incorrect outputs, and inadequate control over the database administrators.

There were irregularities in the e-payments module of the system with incomplete data and incorrect amounts being accepted by the system for electricity payments, and incomplete data was being accepted for property tax payments.
3.2.3. Management issues
The audit found irregularities in the tendering process for selecting the private IT service provider for the project. Roles and responsibilities for the various e-Seva directorates were not clearly defined and ad-hoc administrative processes were used on a daily basis. The audit discovered numerous data irregularities, such as inconsistencies between the e-Seva database and participating departmental databases, incomplete data records, inconsistencies between the total transaction numbers as reported by e-Seva and by the audit, and gaps in transaction numbers in some e-Seva centres. There were no procedures to deal with operation problems such as the ability to delete a record without trace.

Finally, the report also pointed out inadequacies in the error management processes used by e-Seva. For instance, some of the e-Seva transactions showed zero payments when in fact the transaction had been completed, and to compound this problems various departments did not reconcile the amounts due and received by them from e-Seva centres. Furthermore, there was the possibility of deleting offline transactions undertaken when the systems were down.

The audit found that the disaster recovery and business continuity plans for e-Seva were inadequate, given the 20,000 daily transactions at e-Seva centres. Security management arrangements were also criticised for poor access controls and network security

3.3. Interpreting the audit report
These audit criticisms seem to indicate that the project appears to have been implemented in haste without adequate consideration for good information systems development and management practices. However, e-Seva was intended as a service to improve substantially the citizen’s transaction experience with the government. As the INTOSAI audit report also states, “[the e-Seva initiative is] a unique and conceptually a good project to put e-Governance into action to provide a large number of services to the citizens on [a] one stop shop basis.” In this sense, e-Seva was conceptualised with the citizen at its core. In its reply to the INTOSAI audit, the state government responded that “e-Seva was innovative and a new concept having no precedents and the progress was made through a constant process of experimenting”.

3.4. Case analysis
In this section, we analyse the e-Seva case using the two theoretical frameworks presented above.

3.4.1. ICT use
The e-Seva initiative does not readily fall into any one of the four categories of ICT use in the Sein and Harindranath framework. The closest category we can identify is the one that is ‘directed at specific development activities’ because the aim of e-Seva is to improve transparency and reduce corruption.

3.4.2. ICT view
In the e-Seva project ICT is viewed as a ‘tool’. The absence of an ‘ensemble’ view is obvious. For instance, there was inadequate alignment between the e-Seva centres and participating government departments. This resulted in data irregularities, and gaps in transaction data. The poor role definition for e-Seva Directorate workers and ad-hoc administrative and operational procedures also point to the lack of an ‘ensemble’ view that situates ICT within a given socio-organisational context.

3.4.3. ICT impact
Clearly, e-Seva has had a phenomenal primary or first order effect in terms of ‘substitution’ of manual transactions at multiple locations by a one-stop shop facility. The primary impact is
clearly exemplified by the massive increase in e-Seva transactions from 4800 during August 2001 to 750,000 transactions in February 2003; by 2005, e-Seva centres had completed over 2 million transactions. We do not have adequate data to assess secondary effect. For instance, we do not know whether the e-Seva initiative has resulted in a reduction in the number of unpaid utility bills or an increase in the tax collected at the state level. In terms of tertiary effects, there is anecdotal evidence regarding reduction in corruption (for example, bribes paid to middlemen) and empowerment of women (Karan and Mathur, 2006). However, as the INTOSAI audit report shows, e-Seva could potentially have the perverse effect of providing new opportunities for abusing the system. For example, the lack of audit trails implies that the system itself could be compromised.

3.4.4. ICT paradigm

e-Seva has the characteristics of a functionalism paradigm. ICT is viewed as a tool and as neutral. The development perspective is clearly one of modernisation in that the ‘one-stop shop’ aspect of e-Government is a phenomenon developed in the West, and with e-Seva it was applied with little or no adaptation to local context beyond system localisation. One can of course argue that the ‘one-stop shop’ concept is universal and requires little or no local adaptation.

However, the main actor in the e-Seva initiative was not a foreign expert nor was the main driver a foreign donor agency. As opposed to the functionalist perspective, the government took a very active role in the project. Therefore it does not precisely fit functionalism paradigm as defined by Sein (2005). In fact, the project has the potential to move to the neo-humanism paradigm. It is apparent that there was a strong motivation and drive for e-Seva so much so that recommended good project management practices were bypassed in the interest of getting the project completed and on line. The main actors are in place. What is needed is to reorient the development perspective to some form that is appropriate to the local context (admittedly, it can well be modernization. However, that realization should come from critical reflection not simple adoption). In developing innovative governance, India has a tradition arguably as rich as anywhere in the world. Thus, India will have its own trajectory to development. In that endeavour, an ICT initiative such as e-Seva can be a great supporting technology. As we pointed out above, projects with a neo-humanism paradigm or ones coming close, such as Kudumbashree, already exist in India.

Table 1 summarises our findings.

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<th>Framework</th>
<th>Concept</th>
<th>e-Seva finding</th>
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<tr>
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<td>ICT use</td>
<td>Supporting specific development activity</td>
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<td></td>
<td>ICT view</td>
<td>Tool</td>
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<td>ICT impact</td>
<td></td>
<td>• Primary – phenomenal impact</td>
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<td></td>
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<td>• Secondary – inadequate data</td>
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<td>• Tertiary – anecdotal evidence of reduction in corruption: empowerment of women</td>
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<td>ICT in development paradigm</td>
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<td></td>
<td>Actor/Role</td>
<td>Local experts and local champion</td>
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Table 1. Summary of findings
4. DISCUSSION

4.1. Implications of the case analysis for the two frameworks

Our purpose in analysing the e-Seva case was to enable us to evaluate the two conceptual frameworks (Sein and Harindranath, 2004; Sein, 2005). Based on our case analysis, the verdict is mixed. In general, we found the two frameworks useful in evaluating e-Seva. However, in applying the frameworks, serious deficiencies were revealed. At the very least then, it calls for a re-examination of these frameworks and their possible enhancements.

In general, we found the Sein and Harindranath framework fairly straightforward to apply. It was quite obvious that ICT was being viewed as a tool and that an ensemble view was missing. As Kling (2000) notes, the standard ‘tool’ model of ICT often tends to underestimate the costs and complexities of computerisation and even when these are managed the resulting impacts are merely at the operational level. We see this to a great extent in the e-Seva case. We can clearly see its success in the G2C sphere in terms of improving service delivery and interaction with citizens. However, the widely held perception that ICT are merely tools that can be used to automate processes to improve governmental efficiency is perhaps a key reason for the as yet unrealised potential to achieve major developmental objectives. e-Seva needed to take an ensemble view which would have pinpointed the vital importance of aligning processes across different organisations such as the various agencies and government departments and the e-Seva centres.

How ICT was being used was less obvious. We resolved finally that e-Seva can be categorized as supporting a specific development activity. Whether an e-Government project can be classified as such is debatable. Clearly, a category that incorporates foundational applications such as infrastructure and e-Government is needed in the framework. Determining the impact of ICT was also fairly straightforward, especially the primary and secondary effects. While identifying tertiary effects is also mechanically straightforward, the catalysts for such effects need to be incorporated in the framework. We argue that those ICT for development interventions that are sustainable in the long run may actually lead to third order impacts. In turn, tertiary effect could be seen as essential for the sustainability of the developmental impact of the ICT intervention. The mechanisms and policies needed to sustain ICT interventions need to be studied. In the e-Seva case, a private-public partnership model was used which was instrumental in sustaining it.

When we turn to the paradigm framework, more deficiencies were revealed. For example, we found it difficult to place e-Seva into a specific paradigm. This is not entirely surprising since Sein (2005) cautioned that the paradigms were not as parsimonious as one would like and that simultaneous existence of multiple paradigms was possible. As we discussed in the previous section, it has features of functionalism but with local actors as the main drivers.

Yet, we see specific areas where deficiencies exist. One example is the role of the actors. It is clear that the origin of the actor – whether from outside or from the inside the country – is not as important as his/her perspective. We also note the absence of the ‘government’ as an actor in all but the ‘functionalist’ paradigm. While it can be argued that the role of the local actor in any of the paradigms could be played by the government, the framework still ignores competing stakeholders within the government (e.g., between local, regional and national authorities) or between groups of local actors (e.g., between an NGO and the local or national authority). Therefore, the framework needs to account for such potentially competing priorities amongst stakeholder groups or even within a particular stakeholder group. Stakeholder theory may provide us with insights to further enhance the frameworks. As Flak and Rose (2005) noted in the case of e-Government initiatives, stakeholder groups differ.
along the dimensions of power, urgency and legitimacy. Those who possess all three dimensions become the dominant stakeholder group and their priorities prevail.

4.2. Further work
The very fact that we used two frameworks immediately indicates that neither was adequate by itself as an interpretive lens to study ICT for development. We specifically chose to use these two frameworks because we recognized that the volitional component was missing in the Sein and Harindranath framework and that Sein’s paradigm framework provided this aspect. We found that using the two in conjunction sharpened the interpretive lens. To carry the work further, two alternatives are open to us.

The first alternative is to combine the two frameworks to form a new enhanced framework. One straightforward way is to add the paradigms to the Sein and Harindranath framework to complement the ICT use, the ICT views, and its impacts. However, such combination is more than a simple addition. The epistemological axis that distinguishes the paradigms is about the application of ICT depicting a continuum from a neutral view and applicable in a context-free manner to one that is applicable in a situated context. This is conceptually similar to the “ICT view” aspect of the Sein and Harindranath framework. These issues need to be resolved if integration is the alternative chosen. One possible approach is to start with identifying the main actor in the intervention and identifying his/her paradigm.

Enhancing and combining frameworks has other drawbacks. In many e-Government cases, what is observed is that political issues, interdepartmental rivalries, power losses (or perceived loss of power) play a greater role in these failures than any concept from these frameworks. It is tempting to suggest that perhaps these factors should be included in the frameworks. However, this will result in a cumbersome framework with an inordinate number of variables making it practically useless.

The second alternative is to simply use multiple frameworks in evaluating an ICT for development initiative. Examples are frameworks that focus on poverty reduction and meeting millennium development goals. A prominent one is DFID’s Sustainable Livelihood framework (DFID, 1999). A good example of its application is presented by Heeks and Arun (2006). Specific to evaluation of e-Government initiatives, an innovative approach is the use of Amartya Sen’s capabilities view by Madon (2005). This is particularly germane to our analysis because the “what people can do” with capabilities mirrors the “knowledge enabler” view of the Sein and Harindranath model while “what people do with the opportunities” aspect can lead to tertiary effects. It will be a fruitful exercise to evaluate projects such as e-Seva from these perspectives to get a better understanding of such e-Government initiatives.

4.3. Conclusion
As we stressed earlier, our paper is an examination of two conceptual frameworks on ICT for development. That these frameworks were developed by us should not detract from the merits or the conduct of the exercise. Reflecting on and re-examining specific aspects of the literature is an essential activity in the progress of a field. Our paper is such a reflection. It contributes to the literature in two ways. First, by building on existing work, we add to the building of a cumulative tradition in ICT for development research. Such a tradition allows the academic community to compare findings across studies and re-interpret prior findings. Second, while our paper contributes to the building of ‘descriptive’ (explanatory) knowledge, it may also be useful as the basis for developing ‘prescriptive’ (actionable) knowledge. Guidelines can be drawn for action in the field, for example to evaluate specific ICT for

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1 We are indebted to an anonymous reviewer for this insight. The essence of this paragraph is based on the reviewer’s comments.
development initiatives. We are aware that we are far from this desirable outcome. Our invitation to the research community is to continue to reflect, explore and ultimately influence the use of ICT in developing countries.

5. REFERENCES AND CITATIONS


