Local health information systems, e-Governance and ICT policy in Andhra Pradesh, India: Approaches, Challenges and Opportunities

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1. Introduction

In this article, we discuss two ongoing health information system projects going in two rural districts in the same state in India. Local level Information and Communication Technology (ICT) development needs to be taken in the context of the overall situation in the state related to development policy, infrastructure, human capacity, learning, knowledge and experience about IT-usage (Walsham 2001). This broader state level context influences the local level, and experiences at this level can significantly contribute to the reflections and redefinitions of policy at the state level. We therefore present our cases within a framework of the overall policy and practices on ICT-enabled government in Andhra Pradesh (AP).

Andhra Pradesh is a state in southern India with a population of about 75 million people. Driven by the Chief Minister’s political agenda, the state has been in the news for its innovative approach to designing and implementing a ICT-enabled strategy for e-governance. The Chief Minister was recently featured in Time magazine as one of the top-fifty people in Asia. In trying to emphasize that ICT on its own means nothing but needs to be integrated with government services, the state ICT policy document describes e-governance as “one of the vehicles that can be used in reaching the goal of SMART (Simple, Moral, Accountable, Responsible and Transparent) governance.” The government has consciously recognized and committed to an agenda for building “the IT edifice of the government of Andhra Pradesh (is) based on e-governance as one of its founding pillars.” As a part of this broad agenda, a number of initiatives have been implemented over the last five years or so, including:

MPHS: Multi-Purpose Household survey, a name and address based database of the socio-economic data of all citizens of the state. This database is implemented in 1122 local government offices (called Mandals) covering the whole state.

Computerisation of public administration functions at Mandal level, spearheaded by the MPHS project. A number of public service applications are being provided, many of which are integrated with the MPHS database, e.g. CARD.

CARD: A decentralised system for the (scanning and) registration of all land deeds in the state aimed at giving the citizen instant service.

APSWAN: A wide area network (2 Mbps) to connect the Secretariat in Hyderabad with all 23-district offices, and some important cities.
Videoconferencing facilities for enabling discussion of the government with various program officers including on farming, environment and public health.

TWINS: To provide citizens a single window service for integrated citizen services including payment of utility bills, property tax, and obtaining drivers license. This scheme is now being popularised more extensively in Hyderabad and the rest of the state under the title of “e-seva.”

These different ICT enabled initiatives, share the common theme of being aimed “inwards” towards the common citizen, especially the rural poor. This is a noteworthy attempt as it seeks to harness the large pool of manpower resources that India undoubtedly possesses and direct them “inwards” rather than only “outwards” towards the development of export markets. These ICT initiatives are in various stages of implementation, and constitute the broader state strategy of poverty alleviation through the creation of local networks in order to link villages with state, national and even global networks. These thus represent efforts to include groups of people and regions into what Castells (1996) describes with the metaphor of the “network society.”

The AP government is also in the process of establishing a large number of electronic kiosks (similar to the extremely popular “STD” telephone booths in India) in rural areas. The aims are twofold: to serve the information needs of the citizens, and to provide jobs for educated youths and thereby help further develop the human resource and ICT infrastructure. Attempts are underway to integrate the various ‘electronic’ public service initiatives under a State Web Portal so as to enable citizens to access them through the electronic kiosks. These ‘e-seva’ (in Hindi for “electronic service”) activities are being enabled through the efforts of a number of agencies, including public, private, and non-governmental. For example, WorldCorp, a large Seattle-based NGO, is active in one district by supporting ICT-education of unemployed youth of the area, and then providing them with the infrastructure support to establish an information kiosk. It is expected that these information kiosks, in addition to providing income generation potential to the youths, will also encourage government organisations to outsource their information activities like providing citizens information about various schemes, application forms to apply for funding etc.

The State ICT policy emphasises application and use of ICTs, rather than concentrating on artefacts such as computers and networks. The aim is to enable the common citizen to start using the ICT applications in ways that benefit themselves. By providing ‘killer applications’ (that benefit a large population) through electronic kiosks in villages, the state aim is to enable localised technological learning. People learn about ICT by using it, which provides the potential for ICT innovations and local entrepreneurships to develop. Such a policy perspective is well aligned with current theories on economic growth that emphasise people, technological learning and innovation (e.g. UNDP, 1996), as captured in the policy labelled “National Innovation Systems” (Lundvall, 1992, Nelson 1993). Innovation is not seen as ‘products’ or discrete events, uniquely localised in time and space, but as an ubiquitous phenomenon emerging from on-going processes of learning in all parts of a modern economy (Lundvall, 1992). Learning and innovation are seen as
partly emanating from routine activities of citizens that provides the potential to support and develop the prevailing economic structure (Andersen 1992).

Such an approach to fostering innovation and growth can help to address issues of the “digital divide” that is currently a hot topic for debate (for example, Norris 1996). The notion of the digital divide is concerned with the uneven distribution and access of computing and network resources between rich and poor countries, and also between groups of people in the same society, which Castells describes as the “fourth world” (1996). The role of local learning and innovation makes the divide highly ‘analogue’, i.e. not digitised, as it is as much about human learning and development as it is about computers and networking. The UNDP’s Human Development Report, 2001, ‘Making new technologies work for human development’ emphasizes the important role of local adaptation, learning, innovation and appropriate ICT policies:

> Even in the network age, domestic policy still matters. All countries, even the poorest need to implement policies that encourage innovation, access and the development of advanced skills…… the key to a country’s success will be unleashing the creativity of its people….In the network age, every country needs the capacity to understand and adapt global technologies for local needs (UNDP 2001, page 5).

Bridging the digital divide is only possible if those ‘being bridged’ learn how to use and apply ICT to addressing their everyday needs. The needs of the ‘poor’ are not necessarily identical to the needs of the ‘rich’: Availability of Internet banking will not necessarily bridge the digital divide, since first you need something to bank for! It is within this broad framework and environment for change through the state e-governance policy and implementation, that we describe ongoing empirical work relating to a health information systems project (HISP) for improved local control over information at district and sub-district levels in the state. A micro-level analysis of HISP can provide insights on how the broader state-level visions for change and development are being practically realized on the ground. In the following section, we present two complementary approaches to health information in the State, and reflect upon the different learning from these examples to draw some broader conclusions about e-governance.

2. Situation analysis of the existing health information systems

The situation analysis has been developed based on intensive empirical work carried out over the last 18 months. Over this period, the HISP research team consisting of medical doctors, anthropologists and information systems professionals, have interacted intensively with the district and state health authorities through interviews, study of reporting procedures, and the analysis of the existing technological and medical infrastructure. The information flows abstracted as a result of this study is presented in Figure 1 below and then critically analysed:
Overview of health structure

State level:

- Health Programs
  - Commissioner of Family Welfare
  - APVVP (Hospital Structure)
  - District Medical & Health Officer (DM&HO)
  - DCHS - District Hospital Services
  - Maternal Obstetric Delivery Units (PPU)

District level:

- Health programme officers:
  - Malaria
  - Leprosy
  - Tuberculosis
  - Other programs

- Primary Health Centre (PHC)

Health facility & institution level:

- Sub-Centre

All Hospitals including the smaller CHCs

Figure 1: Structure and flow of information in the health system of Andhra Pradesh.

The information flows depicted in Figure one can be discussed under three broad heads:

1. **Flows within the Primary Health Care (PHC) structure.** This structure is primarily to support the mother and child health programs under the Commissioner of Family Welfare. Under this, the health workers in the Sub-centres collect data on various programs and send to the PHCs who then aggregate and send to the district office, who further aggregate across the different PHCs and send to the state.

2. **Flows to support various vertical programs.** Programs like Tuberculosis, Malaria, Leprosy, Family Planning etc, to a large extent, have their independent structures, and the program officers at the district level collect this data directly through the PHCs and report in parallel to the state and district-level programme offices.

3. **Flows under the Andhra Pradesh Vaidya Vidhana Parishat (APVVP) Hospitals.** The APVVP is a separate structure recently established as part of a World Bank project to strengthen the hospital infrastructure. All **district** (200+ beds) and **area** (100 beds) hospitals and community health centres (30 - 50 beds) come under the purview of the APVVP. This involves a parallel and independent management and reporting structure flowing from the hospitals to the District Coordinator of Health Services (and not the District Medical Health Officer as in the first two cases) who in turn send the reports to the Commissioner APVVP (and not the Commissioner for
There are 23 districts in Andhra Pradesh, with a population ranging from 2.4 to 4.9 million people. The district of Chittoor, where our study is currently based, has a population of about 3.75 million spread over an area of about 15152 square KM. The district has 84 Primary Health Centres (PHCs) each theoretically supposed to cater to a population of about 30,000. Each PHC has under it about 4-7 Sub-centres, each of which is again theoretically supposed to cater to a population of about 5000 each. In practice, the PHC population varies from 25-40 thousand and the Sub-centres from 4-8 thousand. The PHC, which is the fundamental building block of the PHC services, has a medical doctor as the head, and they are responsible for providing curative services, maternity, and laboratory services. Other preventative services as antenatal care and immunisation are through the Sub-centres.

The PHC, including its Sub-centres is the origin of all primary health care data and statistics in the health system. In each Sub-centre, there is one female health worker designated MPHA(F) (Multi Purpose Health Worker (Female)), responsible for administering the mother and child welfare program which includes immunisations, antenatal care, and family planning. They typically spend more than half the time going from village to village administering different outreach programs and record data in the various registers (13-20) that they carry with them. Every month end, they collate data from these registers to different data collecting forms, make aggregations, computations and send to the PHCs and then to the district offices. Maintaining and updating the village based household registers that contain details of the entire population, is a central issue in the work of the Sub-centre and forms the basis for all outreach activities. At the district office, one officer is typically responsible for each vertical programme to aggregate all data at the PHC level and submit to the State. This system of aggregating and reporting data relies heavily on the quality of data at the data entry point; the registers and information handling routines at Sub-centre and PHC levels.

As Figure 1 illustrates, there are various structural issues that shape the information flows. Firstly, the fragmented and vertical nature of flows result in data redundancies and poor integration of information at the district level. Secondly, there is a steady aggregation that takes place as the data moves up the hierarchy, which systematically masks the facility level data making it difficult to analyze and use data for local management purposes. For example, the data could be used to compare performances and consumed resources between and across health facilities. Thirdly, the arrows are primarily one-way (top to bottom) underscoring the limited feedback of information to support local management. Fourthly, the strict separation between the hospital and PHC sectors represent an obstacle to unified management of health services at district and sub-district level.

In Table 1, we summarise key problems of information flows in the health care system.
Key Challenges

1. The fragmented information flows are not integrated, analysed or used at the district level
   Despite being the responsible managerial level, the district is not integrating, analysing or using the information emanating from within the district in any systematic way. The district information system is directed towards supporting the State level programme offices, not district level management and decision making.

2. Aggregation of data masks situation at lowest level
   Despite of the Sub-centre being the origin of all primary health care data, data at this level is not kept, maintained or analysed in any systematic way. Data is systematically aggregated at each level, and cannot be traced back to the unit from where it is collected. This seriously impedes data quality and the use of this data for guiding effective action.

3. Poor quality of data collected
   Data collected is poor, incomplete, and often misrepresented. Various reasons contribute to this including lack of use and control at the point of data entry, aggregation of data masking errors and incompleteness, use of forms that are not well understood by health workers, too many forms to fill, inconsistency in forms used, data not available, same data collected multiple times, etc.

4. Lack of feedback of data, and lack of use to support action
   While lots of data is collected and sent upwards, very little data comes back after analysis to support local action. At the maximum, the data is primarily used to ‘reprimand’ local staff for not achieving targets, and not to motivate and support their actions.

5. Primary health care separated from hospitals
   Structurally and functionally, the PHCs and the hospitals are separate units reporting to different authorities at the district and state levels. This prevents developing an integrated and overall profile of the district.

6. Data collection tasks consuming a lot of resources
   A major chunk of the time of the health workers is spent in collecting and reporting data taking them away from their primary task of providing health care. Similarly, district staff spend lot of energy in ensuring data has been collected that they need to transmit to the state level.

3. Addressing the information challenges: Two different approaches

In this section, we describe two ongoing health information projects in the state that seek to address the IS problems outlined in the previous section: the name based record systems in Nelgonda district; the health and management information systems in Chittor.
**Name based record systems in Nelgonda district:** This project focuses on the generation and management of data related to individuals encounters with the health system and the follow-up and management of the individual beneficiaries of the health programs. Improved name based paper registers and a name based record database are the core tools. Emphasis is on ensuring quality of data at the data entry point and on the follow-up of individual cases, for example to help MPHA(F) develop schedules of particular households they need to visit the following week.

Nelgonda is a district in the northern part of the state and the initiative is being implemented there under the name of the “India Health Care Project” with funding from the World Bank through “InfoDev.” The Computer Maintenance Corporation (CMC), is overseeing the implementation of the project, and three PHCs of the district have been covered during August-November 2001. In Nelgonda, the focus is on redesigning and computerising the name based registers and to link this system to the MPHS database, developed as a part of the State e-governance initiative to capture data on each and every citizen of the state.

The Nelgonda project first attempted to streamline the system of register books being used at the Sub-centres, by redesigning12 registers, like e.g.:
- Antenatal Cases Register
- High Risk Antenatal Cases Register
- Birth & Pre-natal Care & Maternal Death register
- Child Immunization & Infant Death Register

During a first phase of implementation, the three PHCs were provided with two PCs each and the staff (the MPHA) was given basic training. Thereafter the name-based database was corrected and updated. Finally the database was populated with the previous years data. Each Sub-centre was responsible for correcting their name register and entering their data. This process took several months and was hampered by frequent power-cuts (power generators were later purchased). In two of the PHCs, each Sub-centre/MPHA(F) was provided with a handheld digital device (PDA) for enabling data capture. In the third PHC, the system is implemented without a PDA. The price of a PDA is today US$ 500, but it is agreed that the price must drop to US$ 50-100 for the PDA option to be viable on a large scale. The PDA component of the project is included as an experiment, paid and required by “InfoDev”.

**Health and management information systems in Chittoor district:** This project focuses on the management, analysis and use of data from multiple sources, including name-based systems, for management of health services and programs. The emphasis is on aggregated, facility level data, rather than individual data, and its use for supporting local analysis and use of information for management. This is enabled through the adaptation of a district database including local health facilities (PHCs and Sub-centres) as the basic building blocks to enable the integration of data on health, health services resources, and population. The database is populated through the implementation of a unified “Minimum Data Set form” representing the least common number of data fields required for the PHCs and Sub-centres. Training and education of health staff at different
levels are key in the attempts to institutionalise procedures for analysing and use of information at sub-district and district levels (e.g. graphs on basic indicators on the walls in all health facilities).

The project work in Chittoor started in December 2000 and during the first year the focus was on standardising the system of data collecting and creating the “Minimum Dataset” that could be used across the health facilities. The initial study had revealed that apart from a few standard formats, multiple forms for data collection were in use. During 2001, a new data set was developed and tested in a few PHCs, and towards the end of the year a first database application prototype was developed based on the District Health Information Systems (DHIS) software. In early 2002 the HISP software was implemented in Kuppam electoral constituency that included nine PHCs, each of which had been provided with one computer. The Commissioner of Family Welfare, Andhra Pradesh, purchased PCs and the Norwegian University Council covers other project expenses.

The focus in Chittoor is to develop capabilities to analyse data and provide information relevant for management on how various targets within the health services are achieved. Furthermore, the aim is to enable managers and health workers at local levels – as close to the ‘production’ of the data as possible – to analyse and use their own data. Thus, various aspects of decentralisation are part of this concept. Information management is based on using aggregated and pre-processed data from multiple sources, including the routine data being collected by the MPHA(F)s. We provide below an example of the kind of analysis that is now being attempted in Kuppam through the use of HISP. The state of AP estimates its % of antenatal cases in 2001 at about 92% while the Chittoor district average was about 74%. For the District Medical and Health Officer to take corrective action on Chittoor’s poor performance, he needs to know how his PHCs are doing. This data to date was not easily available because of the aggregations that take place in the flow of data. The Table and Graph below (from the 9 PHCs in the Kuppam constituency where we are working) indicate the wide spread of the PHC performance (from 39-95%) indicating the facilities requiring maximum attention.

<table>
<thead>
<tr>
<th>PHC</th>
<th>Population</th>
<th>Ante-Natal cases registered (Total)</th>
<th>% of estimated AN Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallanuru</td>
<td>37 174</td>
<td>455</td>
<td>49 %</td>
</tr>
<tr>
<td>Paipalem</td>
<td>66 448</td>
<td>1 223</td>
<td>74 %</td>
</tr>
<tr>
<td>Rallabuduguru</td>
<td>24 507</td>
<td>385</td>
<td>63 %</td>
</tr>
<tr>
<td>Ramakuppam</td>
<td>26 865</td>
<td>368</td>
<td>55 %</td>
</tr>
<tr>
<td>Santhipuram</td>
<td>50 885</td>
<td>502</td>
<td>39 %</td>
</tr>
<tr>
<td>V Kota</td>
<td>74 750</td>
<td>1 421</td>
<td>76 %</td>
</tr>
<tr>
<td>Veernamala</td>
<td>8 714</td>
<td>168</td>
<td>77 %</td>
</tr>
<tr>
<td>Vijalapuram</td>
<td>14 302</td>
<td>340</td>
<td>95 %</td>
</tr>
<tr>
<td>Gudupalle</td>
<td>38 376</td>
<td>774</td>
<td>81 %</td>
</tr>
<tr>
<td></td>
<td>342 021</td>
<td>5 636</td>
<td>66 %</td>
</tr>
</tbody>
</table>
In the next Table and graph, we can also drill down to the level of the Sub-Center to further fine grain the analysis and action.

<table>
<thead>
<tr>
<th>Sub-centre</th>
<th>Population</th>
<th>Ante-Natal cases registered (Total)</th>
<th>% of estimated AN Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheelapalle</td>
<td>7 594</td>
<td>144</td>
<td>76 %</td>
</tr>
<tr>
<td>Cheemanayanapalle</td>
<td>6 816</td>
<td>88</td>
<td>52 %</td>
</tr>
<tr>
<td>Gonuguru</td>
<td>7 217</td>
<td>173</td>
<td>96 %</td>
</tr>
<tr>
<td>Gudlanayanapalle</td>
<td>5 876</td>
<td>124</td>
<td>84 %</td>
</tr>
<tr>
<td>Kamthamuru</td>
<td>7 065</td>
<td>123</td>
<td>70 %</td>
</tr>
<tr>
<td>Kongundi</td>
<td>7 359</td>
<td>136</td>
<td>74 %</td>
</tr>
<tr>
<td>Kuppam East</td>
<td>*8 344</td>
<td>147</td>
<td>70 %</td>
</tr>
<tr>
<td>Kuppam West</td>
<td>*8 850</td>
<td>161</td>
<td>73 %</td>
</tr>
<tr>
<td>Paipalem</td>
<td>7 327</td>
<td>127</td>
<td>69 %</td>
</tr>
<tr>
<td></td>
<td>66 448</td>
<td>1 223</td>
<td>74 %</td>
</tr>
</tbody>
</table>

* Estimated numbers
The above drilling down of data to the lowest level of the Sub-Centre was not possible earlier. In addition to this facility wise drilling down, it is also possible to drill down by the data element. For example, the total ANC registered is the sum of the first, second and third check up. TT-1 and TT-2 should ideally correspond to the 1st and 2nd check-up respectively, and this should be the same as the total deliveries (minus the deaths during pregnancy, or women having the deliveries in different clinics from where they had their earlier checkups). However, when we break up these different “events,” we find that the number of pregnant women increases (by about a 35% average with each check-up). This clearly shows that the data is wrong. On looking at this data more closely, we found that one PHC Paipallem stands out which is about 68% higher. (see graph below)
To explore this problem further, we drilled into the same data of the Sub-Centers within Paipallem. We found two of the nine Sub-Centers causing the aberration (Kuppam West and Cheelapalle), clearly indicating where to direct corrective action (see figure below).

The HISP team is in the process of attempting to institutionalize these tools and see how data analysis can become part of the practice of routine monthly data analysis. In this
paper, we do no focus on the challenges in this institutionalization process, but on the question of how these two seemingly contribute to each other and be integrated to support the broader aim of state e-governance.

4. Name based registers and management information – the challenge of cost-effective scaling of computerisation

It is often assumed that e-governance is about intensive application of new computers. However, this is not the case, and from a similar project in South Africa, it has been demonstrated that MIS need not necessarily be computer intensive (Braa, Hedberg, 2002). More important than the computerisation, is the need to develop ‘discipline’ in data collection routines, which involve the standardisation and simplification of the paper forms for data collection with a focus on the use ‘minimum datasets.’ Furthermore, the procedures for data validation at the point of data entry (manual and/or computer) are crucial. In South Africa, as elsewhere, there will typically be a mixture of health facilities with and without computers. Big health centres and hospitals will typically have one or more computers, whereas the smaller facilities, the majority, will not have computers. In the context of data reporting this mixture is not significant; while the facilities with computers can report data using discs or e-mail, the non-computer facilities report data using paper forms (as is done all over India today). Consequently, the MIS needs to be flexible with regard to whether the individual health facility has a computer or not, as long as the data is captured and managed in a central site. Districts in India are very big (as compared to South Africa), and data capturing and information and database management needs to be devolved to the lowest administrative area of the health system.

Name based registers are computer intensive and one computer per health facility (PHC) would typically be needed. The cost related to computers, maintenance, support and training is therefore much higher than in the case of MIS that are based on aggregated data. The cost-benefit analysis needs to focus on what added value the electronic name based records are providing, since the system is over-dimensioned if the purpose is only to generate and collect aggregated management information. Therefore, as is the case in Nelgonda, the focus needs to be on e.g. the follow-up of risk pregnancies, providing schedules and support for the health workers etc.

In general terms, we argue that a MIS with the minimum required computers is needed in any country, state or district, regardless the state of economic affairs. How else is it possible to get value out of the huge efforts and costs put into the collection, collation and reporting of data? Similarly, it is necessary everywhere to focus on good registers and routines for data production and management at facility, i.e. data production level. Some registers need to be, and will always be, name based: e.g. births, deaths, high risk ANC cases, tuberculosis patients, leprosy patients, chronic diseases needing continuos care and follow-ups, etc. Whether a computerised name based register is needed will then depend on the cost-benefit analysis for the individual facility, or type of facility, as outlined above.

All eight PHCs in our pilot project in Chittoor district were targeted for computerisation and installation of the MIS in the pilot phase. However, it turned out that three of these
nine PHC were not appropriate locations for immediate computer installations due to problems with electricity, buildings, lack of human resources (posts were not filled). Kuppam is the electoral constituency of the Chief Minister and is well resourced as compared with other areas. It is therefore reason to believe that the ‘worst’ 30-40% of the PHCs will be considerably more complicated and costly to computerise than the ‘best’ 60-70%. Full computerisation is thus difficult and expensive to achieve within a short time horizon, since the basic requirements for successful computer installation and use are linked to the more general development of infrastructure.

MIS require full coverage of data for the area of concern. If this area is a district then data systematically reported from all health facilities in the district is needed, and similarly for the state; full data sets from all districts are needed. Name based registers in PHC are different in this respect, as they do not require full coverage in a wider area in order to work according to their intentions. The primary purpose of the computerised name based registers in Nelgonda district is to follow up the individual beneficiary within the local area (i.e. health facility) of concern. As a secondary purpose, the aim of the system is to generate and report quality (aggregated) management information. If this had been the only way to collect and report this management information, full coverage and implementation would have been necessary in all PHCs. However, as the paper-based registers are currently used in the Sub-centres are the basis for the computerised name-based register at PHC level, data for management purposes may easily be aggregated and reported manually, directly from the paper-based registers. Since, as argued above, computerisation of 100% of the PHCs is a complicated and expensive task, a flexible and phased approach may be more appropriate.

There are about 1100 PHCs in Andhra Pradesh. The longer-term plan is to implement the name based database application being piloted in Nelgonda in all these PHCs. We believe that integrating this initiative with the management IS approach being piloted in Chittoor, will put much less strain on the pace of implementation of the Nelgonda project, and provide much greater overall benefits to the management of PHC care in the state. The HISP team has had extensive discussions with the State Government authorities on how can the advantages from the Chittoor and Nelgonda experiences be integrated for the larger aim of supporting health care in the state. These discussions have led to a concrete statement in a Memorandum of Understanding between HISP and the Government on ways forward with the integration strategy. The key aspect of the strategy is that the name based registers would help to provide better quality data than presently being collected, and name based data would be used to monitor services that are individual centred (for example, immunization or tracking TB cases treatment). The data collected through this system would need to be aggregated and taken into the HISP system that could be used to provide the analytical capabilities on the lines of the illustrations provided above. The next step in this process is two pilot studies, one each in Nelgonda and Chittoor, to practically test out this integration issue on the ground.

6. Conclusion
The micro-level analysis of the health projects both reflects and also helps to shape the broader e-governance initiative in Andhra Pradesh. The e-governance vision seeks to
integrate large amounts of fragmented data, and develop citizen-focused services in various sectors including health. The MPHS database has been created with the purpose of supporting integration of public sector initiatives, and ultimately the individual citizens. The efforts to integrate this database with the name based registers maintained at the Sub-centres included in the Nelgonda database is a first and crucial step in linking the micro-level of the health districts with the state. However, the difficulties encountered in this integration process emphasize that full integration in terms of ‘synchronisation’ of all name related activities may be hard to come by and that a more ‘relaxed’ and “incremental” integration strategy may be more appropriate.

Both the cases emphasize the importance of the potential that local learning provides to facilitate larger initiatives of e-governance and ICT policy. While the ICT policies focus on providing ICT-enabled services to the citizenry, their implementation presupposes that individuals have the capacity to engage with the ICTs. But the local learning needs to be facilitated in a number of ways, for example by providing the appropriate infrastructure, training, changing the routines such that the role of information is valued, and providing motivation to the users to engage with the technology. Given these conditions, local learning can flourish, for example we have described the interaction of the health workers with the PDAs, and how this has progressed over time through routine use. Systematically, fostering these processes can firstly enable the more effective uptake of these new technological systems, and secondly can provide the capability to the health workers to use the new data and information for purposes of providing better health care to the public. And after all, this is the ultimate aim of any reform effort in the health sector.

7. References


