Journal of Health Informatics in Developing Countries

www.jhidc.org
Vol. 9 No. 2, 2015

Submitted: June 4, 2015 *Accepted: June 27, 2015*

Understanding the Role of Social Capital in Integrating Health Information Systems

Selamawit Molla MEKONNEN[1], Sundeep SAHAY, John LEWIS
Global Information Infrastructures Group Department of Informatics
University of Oslo, Norway

Abstract.
This paper empirically explores the importance of social capital for the integration of Health Information Systems (HISs) by drawing a case study from Gujarat state of India HIS integration initiative. In light of the main tenets of social capital such as trust, social relation and networking, the paper gives a fresh perspective regarding how the existing fragmented and disparate instantiations of HIS could move towards a coherent whole. Detailing the socio-technical challenges faced during this initiative, we tried to show how the position, background and social status of the implementers contributed in creating trust and networking among the various stakeholders, which in turn led to integration of the HISs.

Keywords. Health information systems; integrations; social capital; trust; social networking.

1. Introduction

The Significance of integrating Health Information Systems (HIS) has been emphasized both in research and practice of health reforms (Chilundo and Aanestad 2005, Smith, Madon et al. 2007, WHO 2008, Sahay, Monteiro et al. 2009). However, the realization of fully standardised and integrated information systems has been fraught by various socio-technical challenges needing a socio-technical understanding to cope with them. In a socio-technical perspective integration of systems refer to the linking of various disparate systems and associated practices. The importance of such linkages is emphasized by the adverse effects of fragmented HIS with respect to data quality, utilization of resources, and the adoption of a coherent and comprehensive health systems approach to health reforms. However, integration may not always be the most efficient approach, as there may be particular problems such as the management of epidemics which may be more suited to a management approach around vertical programs rather than a district based geographical area focused approach as advocated by the primary health care model. This in turn raises questions such as what should be integrated, how and by whom. For example, drawing case material from the Nigerian Health Care Sector Oluwagbemi and Philip (2010) proposed integration of the multiple ISs following a multi-tier application in the health domain. While these issues are relevant, this research focuses on other; perhaps, less addressed nonetheless crucial aspects such as on how trust, social relation and networking framed under the notion of "Social capital" may contribute for integration

[1] Corresponding Author. email address selamawm@ifi.uio.no

efforts.

While, at present research and practice in HIS can be argued to have a fair focus on both the social and technical aspects of integration efforts, the notion of social capital has not yet received the required empirical investigation in IS studies. The technological perspective of integration focuses mainly on how newer and more modern technologies can be applied to address hitherto unaddressed fragmentation challenges. For instance, Enterprise Resource Planning systems, Service Oriented Architectures, Web-based systems, are being tried out as tools for spearheading integration initiatives. On the other hand, researchers who studied the social aspect of integration emphasised the social and political determinants of integration suggesting the need for enrolling and aligning the interests of the various stakeholders. As a result, it is increasingly being recognized that integration of information systems in general and HIS in particular, is as much a technical exercise as it is about addressing the institutional, social and political conditions. In continuing with this line of research, this paper analyses the role of social capital in the integration of HIS in the context of developing countries.

The notion of social capital has its roots in social sciences, and commonly refers to the investments made to build cooperative activities in organizations that have a potential rate of return (Cohen and Prusak 2001). When we invest in infrastructure, we get infrastructure in return, and in the same vein, when we invest on building social networking, we get more of what makes the infrastructure work in practice and also to enable the development of the infrastructure itself. Since integration is very much about creating cooperative activities to enable the building of technical and institutional linkages, it is very appropriate to study it within the framework of social capital. For so doing, we address the following two fold research questions

1) How does social capital shape the realization of ICT based HIS efforts in the context of developing countries?
2) What is the role of ICT in building social capital?

Empirically, the paper draws upon the study of on going efforts of a NGO called HISP India to design, develop and implement integrated HIS in the state of Gujarat in Western India. Specifically, the focus is on understanding the nature and role that social capital plays in the realization of the integration efforts.

The rest of the paper is structured as follows. In the next section, the key concepts around social capital are defined and the manner in which it has been appropriated in the domain of information systems research is discussed, followed by an outline of the research methodology employed and a description of the case study. In the analysis and discussion section that follows, the nature and role of social capital in shaping and being shaped by the integration efforts is analysed. Finally, conclusions are drawn and presented.

2. Social capital and its application in IS research

One of the founders of the concept of social capital, Pierre Bourdieu (1986) defines the term as "the aggregate of the actual or potential recourses which are linked to possess of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition"(pp.248). Huysman and Wulf (2004) provides a more elaborate definition, saying: "*Social capital refers to the network ties of goodwill, mutual support, shared languages, shared norms, social trust, and a sense of mutual obligation that people can derive value from. It is understood as the glue that holds together social aggregates such as networks of personal relationships, communities, regions, or even whole nations*" (pp.1). In short they say that: "*Social capital is the value derived from being a member of a society or community. By being a member, people have access to resources that are not available for non-members*" (ibid.). Social capital can thus be seen as an important ingredient for knowledge development within and between organizations (Cohen and Prusak 2001), with also potential negative effects if there is a condition of high dependency on the central actor (Uzzi 1997). Unlike human and financial capital, social capital does not lend itself to quantitative measures. It is a process of embedded and goal-oriented social interaction that leads to potentially constructive outcomes (Bankston, Carl et al. 2002).

In our research what we found more interesting, and which is not given much emphasis in the social capital discourses, is the value derived from being part of multiple network. We used social capital is because of its central focus on "trust" and "relationship" but not much of authority. However, we argue that this trust gained through being part of multiple networks can be the source of power and authority for the institutional entrepreneur who wants to bring change in a particular organization setting. This, in turn, makes us to be cautious when we apply this concept in practice.

Nahapiet and Ghoshal (1998) identified three analytical dimensions of social capital. These are: structural, relational, and cognitive. The structural dimension refers to the overall pattern of connections among actors, who you reach and how. The presence or absence of network ties among or between actors is a key facet of this dimension. When connection and interaction between members of the network gets stronger, other individuals are more likely to be involved. The relational dimension focuses on the particular relations people have, such as mutual respect and friendship, that influence their behaviour. Trust and trustworthiness are key facets of this dimension. The cognitive dimension refers to those resources that provide shared representations, interpretations and systems of meaning among parties.

In recent times, the concept of social capital is introduced in technology studies and information systems research. For instance, Hatzakis, Lycett et al. (2005) used it to evaluate relational computer based change management initiatives. Syjann and Kuutti (2004), in their study of a technology mediated hunting dog breeding community, describe the role of technology to generate and maintain trust, acceptance and alignment which was necessary for building successful cooperation. The use of information technology was described by the authors to make the actions of the key actors more visible to each other, which in turn facilitated the emergence of trust and social capital. In the same vein, of understanding the role of social capital in civic engagement, (Blanchard 2004) explored how participating in virtual community affects social capital in a face-to-face community. Drawing empirical material from a Multiple Sport News Group virtual community, the authors argued how active participation in the group positively affected face-to-face social capital

and norms of trust amongst members in both the virtual and face-to-face groups. As a result and through time, members become less attached and obligated to the virtual community as compared to the face-to-face one.

Emphasising the role of technology for harnessing social capital,Quan-Haase and Wellman (2004) argue that unlike technological determinists who suggest that technology is diminishing or transforming social capital, the Internet is enhancing it. They argued that those who use the Internet also would continue to communicate by phone and through face- to-face encounters. Information technology also can play an important role in knowledge sharing by enabling communication amongst proactive individuals regardless of time and geographic location (Hoof, Ridder et al. 2004). Social capital, it can thus be inferred, is not only developed by group actions or collective norms but is also enabled through individual characteristics such as the eagerness and tendency to share.

In summary, information systems research, which has drawn upon the concept of social capital, has largely been focused on addressing how technology mediated interactions contribute to the development or not of social capital and its various constituting aspects. However, what has not been given adequate attention is the constituting and constituted relation between technology and social capital. This implies the need to understand how technology itself is a function of the existing social capital, and how the interaction between the two reconfigures both the technology and the social capital. This analytical relation is explored in the context of a HIS integration initiative in India.

3. Research approach

This study adopts an action research methodology, where it is framed within an ongoing research initiative aimed at the design, development and implementation of HIS within a public health setting in India. For a period of two years (2007-2009), direct observation of the activities was conducted on the field involving conversations with field personnel on their day-to-day roles and the challenges they face that resulted from a fragmented HIS operation. For example, we periodically met with the head of the health department to understand the challenges he was experiencing due to the fragmented information channels within the reproductive child health programs, and his vision of developing integrated and cross cutting indicators to allow for more effective monitoring.

Semi-structured interviews were used to collect qualitative data pertaining the perspectives, insights, expectations and visions of key stakeholders. Special emphasis was paid to understand the nature of socio-technical challenges to integration, and how the HISP India implementers and users try address them. The key assumption underlying this inquiry was that integration is a complex phenomenon that is deeply embedded in existing technical, institutional and social conditions. This assumption in turn informs the use of open-ended questions, allowing the respondents to give their views on how they see integration and also the nature of their social networks and interactions around the technology initiative.

Gujarat state, the site for the empirical work, is composed of four hierarchically arranged administrative levels: state, region, district and block. Gujarat has 5 regions,

25 districts, with each having 5-7 blocks. Computers were placed at the block level, where the entire data entry and reporting of all the health facilities in the surrounding catchment area took place. From the block, the aggregated data was sent (either online or manually carried in flash drives) to the district, where further aggregation took place in the online application called District Health Information System (DHIS). The region served as an administrative unit responsible each for 5-6 districts, but where no specific HIS related activities took place. While at the region level, the person responsible for reporting is known as the "regional program coordinator" (RPC), at the district level this role is known as "district program coordinator" (DPC). The M&E (Monitoring and Evaluation) Assistant or the Block Health Officer (BHO) was responsible for data collection and reporting at the block.

A series of focused interviews were carried out with staff from the different levels (see Table below), when we visited each of the regions during the period 4-8, August 2008. During each of these visits, the state level team (including ourselves, researchers as well as implementers), made presentations of the new version of the system to the state directors. There was also a training session for the district and block level. During breaks in these meetings, interviews were conducted with some of the district and block staff. Listening to the overall interactions between the state and district/block teams also served as very useful sources of data.

District/Block	No. of respondents
Ghandinagar region	1 RPC
Ghandinagar district	1 DPC
Ghandinagar block	1 M & E assistant
Mansa Block	1 BHO and 1 M & E assistant
Baruch District	1 DPC and 1 M & E assistant
Jamanagar corporation	1 M & E assistant
Surat District	1 DPC
Dagen District	1 DPC
Navasari District	1 DPC
Vododra District	1 DPC
Panchmhal District	1 DPC
Amerli District	1 DPC
Total Respindents	14

Table 1: Number of District and Block respondents

Other sources of data such as email correspondences between state and district teams were used to better understand the specific issues being raised in these conversations. Emails between the HISP India staff also provided valuable primary source information on how they approached to resolve specific challenges. Practical engagement of one of the authors in some of the technical tasks such as cleaning up the problems in report generation and solving software bugs further helped to gain insights to the technical challenges to integration.

The data analysis was shaped largely within an interpretive framework, where different aspects of the nature and implications of social capital and its interaction with the integration initiative were inductively interpreted. All the authors of this paper carried out their respective interpretation and then collectively tried to understand the variations in the interpretations and why. Subsequently, these interpretations were analysed in the backdrop of the theoretical construct of social capital and integration to understand the specificity of the findings with the research phenomenon studied.

4. Research setting

The case is set in the public health system of the state of Gujarat. There are two key actors involved in this research: HISP India, a NGO that was engaged in the design, development and implementation of an integrated HIS for the state; and, the Health department of the state who was the users of the system and the information being generated by the system. Since HISP India was a node in the larger global R&D network established by the University of Oslo, Norway, around HIS (called Health Information Systems Project – HISP) on-going in about 15 different countries in Africa and Asia, they drew upon the expertise offered by Oslo research and masters students to address particular technical problems (such as for optimizing server performance). HISP India also tried to draw upon "social capital" nationally, especially the personal networks of the President of the organization, for example, in getting friends in local software companies to look at the software code or in getting their advise on establishing software testing protocols.

Gujarat is a state on the west coast of India with an estimated population of about 50 million (as per census India, 2001). The state is in the forefront of economic and infrastructure (including e-infrastructure) development in the country, reflected in the fact that nearly all district and sub district level health facilities have computers, and there is internet connectivity available down to the sub district (called block) level. With respect to the organization of primary health care delivery, the state is divided into six sub-national regions, 26 districts, 250 Blocks, 950 Primary Health Centers (PHCs) and 450 Community Health Centers (CHCs). Each PHC has under it about 5-7 Sub Centers (SCs) that are responsible to provide outreach based services to the community.

Generation of health information starts at the SC, which is the first contact point between the community and the primary health care system. Field level male and female nurses are expected to visit the villages assigned to them (one nurse typically is responsible for a catchment population of 5000) for providing various public health related services such as related to deliveries and immunizations. Data generated through this service delivery is first noted in the field diaries, then posted to various registers (typically about 15 to 20 in a SC relating to Malaria, TB, Family Planning,

Antenatal care, Immunization etc.), and finally taken on a monthly basis into the Form 6 which is then sent to the parent PHC for further processing and upward transmission. The health supervisor at the PHC level compiles this Form 6 data together with Form 7, which includes data from the PHC level service delivery, and prepares Form 7A (an aggregate of all SCs and the PHC services) which is then sent to the Block Health Office (BHO). The CHCs in turn compile their service delivery in Form 8 and also send it to the respective BHOs. At the BHOs, Forms 7A and 8 are aggregated to Form 8A and sent to their respective district offices where an aggregated Form 9 is compiled and transmitted to the State office. The schematic below summarizes this rather complex and fragmented information flow.

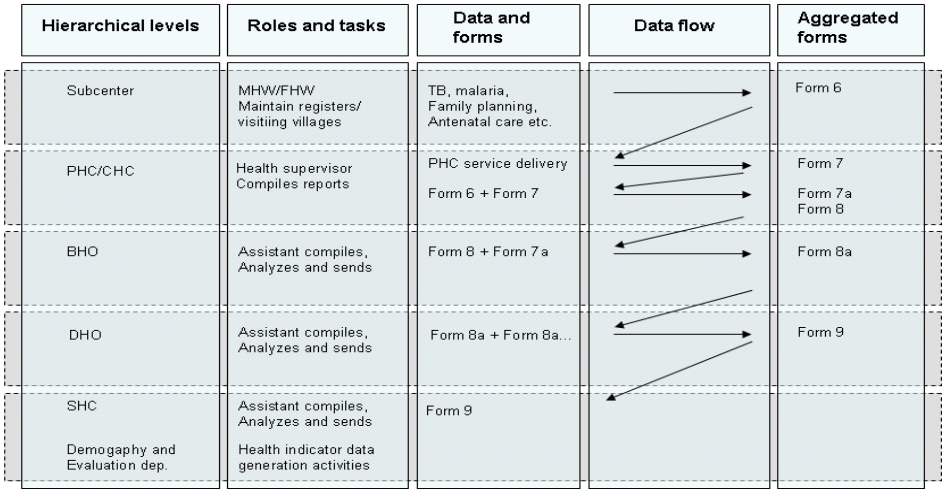

Figure 1: Fragmented information flow in the RCH program

It must be noted that the above schematic is primarily concerned with the RCH program. In the larger picture there are various other programs such as TB, Malaria and Integrated Disease Surveillance Program with their own respective information systems. This was however, not seen as a problem by some, like a district staff who remarked:

> *It is impossible to mix all the programs since they have their own agenda…what is wrong in working separately. They are working fine and it is very easily to monitor a single program than the whole.*

Given this brief contextual background, we now discuss the specific initiative studied.

4.2 Implementation process of the integrated e-HIS

In what can be called as the first phase of the project, in early 2006, HISP India was invited by the State to implement an integrated HIS on a pilot basis at the block level in one district in the state (called Valsad). The notion of integration involved in this phase was taking the data entry forms of the different Reproductive and Child Health (RCH) related activities into one format (Form 6) in order to try and eliminate various

redundancies and duplications. The project involved the deployment of the HIS application –DHIS- at the BHO office computer and training the staff from the different facilities in the block to carry out the basic data entry and reporting activities. Similar processes were also undertaken at the district office. Six months into the process, the project results were evaluated, and happy with the outcome the State Health Commissioner extended the project to four further districts (Rajkot, Surendranagar, Kutch and Baruch). However, in early 2007, for various institutional reasons unknown to HISP, the State terminated the project stating their plan to use another application.

In late 2007, HISP India to Gujarat was recalled by the Health Commissioner as he was unhappy with the application bought in place of the DHIS, especially its weak analysis capabilities such as related to the generation of indicators and their graphical and map-based presentations. In the presentation made when recalled, HISP India emphasized the dashboard facilities of the application, and the value it provided in monitoring both the data quality and health status in the districts. To address the previous unsuccessful implementation of HISP India in the 5 districts, the Commissioner changed the model from a block level deployment to a server based state level deployment arguing that such a "top down" approach would help to develop ownership of the senior state managers who would then be able to provide the impetus for the lower levels of district and block implementation.

In retrospect, this implementation model has in general worked quite well with the district level implementation stabilizing to a large extent within a period of 2-3 months. This involved a server based deployment, which has been the medium for the use of the integrated application. The very fact that all the districts were required to access the same application over the same internet infrastructure required the need to further integrate processes such as related to data entry and technical support. Further, the integrated application placed additional pressure on the performance of the database because of the sheer volume of data that needed to be stored, accessed and processed at one source. The server based application also created the need for developing new kinds of capacities both for the users (who Previously had not worked on an Internet based HIS), and for HISP India for whom it was their first such experience of implementation. Three challenges to integration related to server, database and capacity are now discussed.

4.2.1. Server performance

The DHIS application was deployed on a Windows based server that was rented from a private provider based in North America. The server had a 2 GB RAM, which with time as data started to be entered for a few months became paralyzing slow. The slowness was further magnified by the local Wide Area Network in use in the State, which had an extremely limited bandwidth. These technical constraints coupled with the institutional practice of the monthly data being entered by all the users in the last week of the month, meant that the server was significantly overloaded during this period and also during with the peak working time in the day (10am to 8pm). For example, we tested that importing a file during this peak period and this took nearly 10 to 20 minutes, while outside this period (in the night) the same file could be downloaded in less than a minute. In the interviews and email correspondence conducted, the respondents expressed their disappointment regarding server performance, both while entering data and also in using the export-import

functionality. The following email extract from a District staff to his state in-charge reflects this problem:

> *Respected Sir,*
> *This is to bring to your kind notice that most District Blocks have completed of Data Entry in Offline DHIS2.0 for April-May-08 Sir. They export the Data by Data Set Wise as advised by HISP India Sir. But when they try to import the same Data to the online application, they are facing problem Sir… We are getting several calls from the Blocks everyday regarding the above problem Sir. Could you please request HISP India to find a solution to the above problem at the earliest Sir.*

A DPC from another district summarized his server related problems in an email:

> *Subject: Problem in DHIS*
> *Respected Sir,*
> *As per your instruction to finish the DHIS entry, we have completed, 40% of entire, but we are facing a lot of problems.*
>
> 1. *Server is very slow.*
> 2. *Data is not getting saved.*
> 3. *Software is not accepting zeros.*
> 4. *Software is getting closed automatically.*
> 5. *It is taking ½ hrs to save one entry and for the cursor to move to next column.*
>
> *Kindly help us in the above mentioned regards so that we can this the entry as soon as possible.*

In addition to the earlier problems of server performance, the 3rd problem related to "not saving zeros" was because HISP India in trying to find a solution of the ever expanding database analyzed the database to identify that nearly 70% of the data included was systematically being reported as "zero" or "blank."

This was pointed to the state HIS in charge, and it was suggested that we do not store the zero and blank values in the database. While he was not agreeable to this suggestion completely, we were forced to do that to prevent the almost complete paralysis of the server application. Further, it was found that the same user name and password were being shared by multiple users, which magnified the load on the application. To try and work around the slowness of the Internet, some of the users tried to use the Internet from a cybercafé with nearly the same results. The following email reflects this attempt and the outcome from the same:

> *On Mon, Jun 23, 2008 at 11:28 AM Hello*
> *As discussed on Saturday since there is some problem with the importing process at my end, I tried to do it from cybercafé on Saturday, but it did not happen because the server was too slow. Then I went there yesterday early in the morning and I tried the same procedure again. But the same problem is still there. Now I did it from our computer for two other centers, it is giving the same message like 57% or 100% import process completed. But in the data entry screen, no such data is seen. Please again look in to the matter seriously. May be there is some problem of importing with my username/password.*

Since dealing with server related problems was new experience for the HISP India, they tried to draw upon the "social capital" available through the Oslo network of PhD and masters students. Suggestions were made to enhance the server RAM, which was done first from 2 to 4 GB and then to 8 GB. Another suggestion was made to shift the server from a US based provider to one which was local to address the problem of data transfer speed. This was also done to an Indian based provider, whose server was however based in the United Kingdom. While all these measures have greatly helped in enhancing performance, the rapidly expanding database size and number of users continue to prove as challenges to performance. Further measures were worked on including the optimization of the DHIS application, splitting the database and the application part of the DHIS into separate servers, and further moving the server to Gujarat.

4.2.2 Database Size

With time, as first all districts and then block level users started to use the application, the size of the database started to grow exponentially including data for about 8000 organization units. The HISP India team made a systematic analysis of the database, and wrote the following email to the State in charge:

> *Date: Thursday, August 28, 2008, 4:44 PM*
> *At the end of every month we have **1,15,30,220** records in the database, of which 78% of data belongs to the Sub Centre (the lowest level of data collection). This 78% of sub- centre data decreases the performance of the application to a great extent. To increase the performance and optimization of the application; we suggest that we maintain 3 to 4 level of data in the online system. But if and when State official want to drill down to PHC or Sub Centre level, data can be made available on request. To do this we need to build a new functionality in the DHIS2 called "Aggregated Export" which aggregates the data to higher level from the field and then exports the data. By keeping the PHC and Sub Centre data at the district or block level, we will be reducing 94% of data load on the server. As and when required by the state official, specific PHC or Sub centre data can be made available for further clarification or scrutiny. This could be achieved by exporting the data in normal (Current) mode. At state office we suggest to maintain one high-end computer (which can act as local server or backup server) where all the data can be stored to easy access and retrieval.*

The above email highlights a policy issue of what level of data should be maintained in the online database. While HISP India were of the firm view that data from the lowest levels (Sub Centre and PHC) should not be kept in the online database (but in a local server) which would reduce the load by more than 90%, the state insisted that they wanted an "integrated database" including all available data. Even the suggestion made by HISP India on not saving zero values was not acceptable, as reflected in the following comment by a district staff:

> *If we are worried about zeros at this stage in three months, what about the performance of the system in the long run.*

The option of using a commercial database like Oracle was also explored by HISP India instead of the existing free MySql, but the costs and licensing considerations quickly made the state to discard this option. The problem of the database remains still not fully resolved, but temporarily the situation was made under control with the 8 GB RAM servers being able to handle the database load. But as the database size continues to grow, the problem is bound to resurface.

At this stage, the main actor, in HISP India NGO joined National Health System Resource Center (NHSRC-a government of India think thank on technical issues to the Ministry of Health) as a consultant for the HMIS. This enabled the actor to make suggestions on how to improve the existing HIS. One of the core suggestions were on setting essential data sets which serves as standard by bridging the fragmented program owned information flows. Specialists from the public health domain were invited by the consultant to get input in the process. A national level reform process followed in which NHSRC was centrally involved, leading to a dramatic reduction in the number of data elements collected and a simultaneous increase in focus on the generation of indicators.

4.2.3 Capacity limitations

There were capacity issues for both HISP India and the users. For HISP India, both the server and database related issues required a kind of expertise, which did not exist in the current team. To solve them, they drew heavily upon the expertise of the Oslo doctoral students. Further, personal contacts of the HISP India in charge involving friends working in the sever business in private firms in both India and Oslo also helped to diagnose the problem and consider alternative solutions.

From the perspective of the users, many of the issues concerning the online system or the import and export of data were also new. A user from a district commented on their lack of experience in working with an integrated HIS:

In the current situation, we have specialists to manage each program. And I hope they are effective. If we move towards an integrated HIS, then we need to have multi-skilled professionals. That should be the priority focus

Contractual arrangements were set so that HISP India was seen to be responsible only for the development while the State was to take care of the capacity building processes. As a result, no HISP India staff was physically based at the state level. The problem with this arrangement was that the state staff who were responsible for capacity building did not themselves have the expertise to further do the job. To address this problem, HISP India suggested to the state to hire three technical staff for the areas of server, database and programming. But however, due to the prolonged procedures inherent in state recruitment, this suggestion could not be implemented.

In the absence of these physical support mechanisms, HISP India has relied extensively on electronic mail communication, telephone support and periodic visits by their members to the state. The positive aspect of this arrangement was that many of the users were forced to developed skills to be able to work effectively with the application. For example, detailed emails were written by the HISP technical person in Delhi to the state, district and block level staff providing instructions on how to upload a new WAR file containing the upgraded state application.

In summary, we have discussed issues of server performance, database size and capacity needs to serve as key challenges in the implementation of an integrated HIS, which at the present mode is only including the information systems to support the

Reproductive and Child Health program. At the national level, there were on-going attempts to integrate other vertical programs such as related to TB, Malaria, Blindness Control etc. into the HIS. As these reforms are operationalized and transmitted to the state, there will be increasing pressures, technical and institutional, on the integrated HIS.

We now analyse and discuss the case material drawing primarily on the theoretical notion of social capital.

5. Analysis and discussions

Three dimensions of social capital are identified by (Nahapiet and Ghoshal 1998)and presented in section 2 serves as an analytical framework to examine the role of social capital in the implementation of an integrated e-HIS.

Structural: This refers to the overall pattern of connections between the actors involved and the nature of the network ties that exist.

With respect to the case discussed, two aspects of the structural dimension are relevant. One concerns with the top-down implementation model adopted by the Commissioner, which first helped to create visibility of the initiative at the state level, and then the senior state staff themselves took ownership and cultivated the virtues of an integrated system to the lower levels of the district and block. This kind of local ownership, often lacking in HIS implementation projects, helped to create a network of institutionalized relationships and understanding of mutual benefits between the different administrative levels of the health department. The state level saw the benefits with respect to the richer analysis capabilities that an integrated HIS provided, but also realized this required they needed the district level staff to take up the system in an effective manner. This mutual relationship was enabled through the structural top down model of implementation adopted, where the authority carried by the state level was crucial in initiating the process, and then the on-going support and handholding provided to the users helped to cement the mutually beneficial network of ties. This provided the basis for the creation of positive social capital that helped the implementation of the integrated e-HIS.

The second aspect of the structural dimension concerns the relation HISP India has with the health organization. This relation was mediated by the focal actor who was part of three significantly influencing organizations: University of Oslo, HISP NGO and NHSRC. From these organizations, the actor extensively draw upon advices, human and financial resources that helped gain trust from the health sector about the initial implementation in Gujarat and the expansion of the system functionally (e.g. incorporating more health programs in the system other than RH) and geographically (including others states) which contribute the basis for the design of the integrated national HMIS. In general, this ability of the main actor to participate in different networks helped to create mutual trust between HISP India and the health department, with the latter learning to value the expertise, positive intention and objectivity and willingness to support HISP India. Moreover, HISP India is part of a larger "network of actions" (Braa, Monterio et al. 2004) from which it drew upon competency for tackling technical and institutional challenges the company faced

during the integration effort. This kind of partnership and collaboration for learning and experience sharing is suggested by the recent article of (Alsadan, Elmetawlly et al. 2015) as a way forward for increasing the adoption of IT in developing country context.

Relational: This focuses on the particular relations people have, including feelings of respect and friendship that influence their behaviour. Right at the outset, the Commissioner valued and respected the expertise that HISP India introduced into the initiative. These feelings were enabled by the fact that the President of HISP India was also a university professor with extensive global experience in field level implementation of HIS projects. Similarly, HISP India held the Commissioner in the highest regard, and valued deeply his vision and focuses of an integrated HIS to support his and the State analysis needs. Gujarat undoubtedly is on the forefront of HIS use in India, and the personal status and visibility of the Commissioner nationally also helped to also provide HISP India with useful mileage in being accepted also by other states.

Outside the state networks, HISP India had strong personal relationships with friends who were working in technical positions in software firms both in India and Oslo. Whenever faced with a difficult technical problem such as optimizing server performance or using alternative databases, the HISP India President would call on his network of friends for advise, problem diagnosis and suggestions of alternative solutions. This very valuable advice was always made available without cost to HISP India who could then implement cost effective solutions without additional financial burden to the state.

Cognitive: This refers to those resources providing shared representations, interpretations and systems of meaning among parties. A key resource in this regard was the use of technology, which while serving as the object of shared representations, also served as a medium to circulate these interpretations. Starting with the server-based application, the medium of deployment for the integrated HIS, helped to focus the attention of hundreds of users to the same application in the "same physical location." Frequent discussions on problems related to the server performance had the positive effect of creating a common understanding of the issues influencing the integrated HIS implementation state-wide. Common forums (such as of training programs) helped users to discuss similar problems, and also to create user groups who could help each other to find solutions. The use of internet also proved to be very useful for users to directly be able to communicate with the HISP India technical team on the problems they were experiencing and be able to receive advise on how to address them. This direct line of communication was empowering for the users who could now subvert the traditionally existing hierarchical and centralized forms of communication.

6. Conclusion

As argued in this paper, social capital played an important role in the implementation of integrated HIS. As the case study demonstrates, the public sector domain of Gujarat state had a lot to benefit from harnessing the various facets of social capital The existing

social capital helped the implementation at many levels from enabling the introduction of the initiative to being able to start including other vertical programs and the stabilization of existing systems. On the other hand, the deployment of the integrated application and the use of the Internet helped the creation of additional social capital, such as personal relationships between the district users and the HISP India technical team based on mutual trust and confidence. This helped us to draw two key theoretical inferences. The first concerns the point that social capital is not something given and static, but is a process that grows over time both shaping and being shaped by the processes of implementation. The second concerns the point that ICTs including Internet and the e-HIS itself plays a key role in further building social capital that is helpful to integrate the fragmented HIS. The integrated application provided a common focus and site for people to come together and discuss similar problems and jointly seek and identify solutions. Further, the use of the Internet helped to take these common resources and circulate it across a larger social group enabling the creation of a broader base of social capital.

While, in this paper, we contributed in expanding our understanding of the role of social capital by drawing empirical material, we also contend that it should be taken into consideration in future ICTs implementation in developing counties. As we know, developing countries are suffering from human and financial resources. The most educated part of such nations is not retained in the country, but distributed all over the world. Therefore, the use of an ICT mediated social capital approach shifts our focus to capitalise on the social relation, trust and networking of knowledge people despite their location. Moreover, in this kind of approach, the role of the main leader of such projects becomes more of facilitating and cultivating the trust, which glues together the participants to make the network functional and sustainable. Future research in this area could be identifying the various mechanisms on how to cultivate social relation in ICT projects.

References

Alsadan, M., A. Elmetawlly, A. Ali, J. A., M. Khalifa and M. Househ (2015). "Health IInformation Technology (HIT) in Arab countries: a systematic review study on HIT progress." *Journal of Health Informatics in Developing Countries* **9**.

Bankston, Carl, Zhou and Min (2002). "Social Capital as process: The meanings and problems of a theoretical Metaphore." *Sociological Inqury* **72**(2).

Blanchard, A. (2004). The effects of dispresed virtual communities on face-to-face social capital. *Social capital and Information technology*. M.Huysman and V.Wulf.

Bourdieu, P. (1986). The forms of capital. *Handbook of Theory and Research for the Sociology of Education*. J. Richardson. New York, Greenwood**:** 241-258.

Braa, J., E. Monterio and S. Sahay (2004). "Networks of action: sustainable health information systems across developing countries. ." *MIS quarterly* **28**: 337-362.

Chilundo, B. and M. Aanestad (2005). "Negotiating Multiple Rationality in the Process of Integrating the Infomation Systems of Disease Specific Health Programs." **20**.

Cohen, D. and L. Prusak (2001). *In good company: How social capital makes organizations work*. Boston, Harvard Business School Press.

Hatzakis, T., M. Lycett, R. Marcedie and V. Martine (2005). "Towards the development of a social capital approach to evaluating change managment intervations " *European Journal of Information Systems* **14**: 60-74.

Hoof, B., J. Ridder and E. Aukeme (2004). Exploring the eagerness to share knowledge: the role of social capital and ICT in knowledge sharing *Social capital and information technology*. M. Huysman and V.Wulf.

Huysman, M. and V. Wulf (2004). Social capital and Information Technology: current debates and research. *Social capital and information technology*, Massachusetts Institute of Technology.

Nahapiet, J. and S. Ghoshal (1998). Social capital and information technology: current debates and research *Social capital and Information technology*. M. Huysman and V.Wulf.

Oluwagbemi, B. and A. Philip (2010). "Lack of Integration in Software Systems for Health Practioners in Nigeria: The Way Forward." *Journal of Health Informatics in Developing Countries* **4**(1): 47-51.

Quan-Haase, A. and B. Wellman (2004). How does the internet affect social capital?. *Social capital and information technology*. M.Huysman and V.Wulf.

Sahay, S., E. Monteiro and M. Aanestad (2009). "Toward a Political Perspective of Integration in Information Systems Research: The Case of Health Information Systems in India." *Information Technology for Development* **15**(2): 83-94.

Smith, M., S. Madon, A. Anifalaje, M. Lazarro-Malecela and E. Michael (2007). "Integerated Health Information Systems in Tanzania: Experience and Challenges." *The Electronic Journal of Information Systems in Developing Countries* **33**(1): 1-21.

Syjann, A. and K. Kuutti (2004). Trust, acceptance, and alignment. *Social capital and information technology*. M.Huysman and V.Wulf.

Uzzi, B. (1997). "Social structure and competition in interim networks: the paradox of embeddedness." *Administrative science quarterly* **42**: 35-67.

WHO (2008). "Framework and sSandards for Country Health Information Systems. Health Metrics Network. Geneva.".