Implementing Electronic Health Information Systems in Local Community Settings: examining Individual and Organisational change experiences in the Philippines

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Abstract: In this paper, we examine the implementation of an electronic health information system called the Community Health Information Tracking System (CHITS) in health centres in the Philippines. CHITS was created in 2005 to respond to a gap in population health decision-making that developed when the Philippines government underwent health sector reforms in the 1990s, shifting resources and decision-making authority from the national Department of Health to local governmental units at the municipal, provincial and regional levels. Two models - Prochaska and Velicer's Transtheoretical Model for Health Behaviour Change and Greenwood and Hining's Organisational Change Management Model - were used to examine the transition from a paper to electronic environment and to assess processes and outcomes at the individual and organisational levels. Final results show both models adequately described the change management processes that occurred for health centre workers and health centres during implementation. However, neither model was developed to focus well on system and government level action and inaction. Our use of these frameworks was therefore unable to fully encapsulate the multiple organisational and political layers of change required in a highly decentralised environment; the health centre as an organisational entity was, and remains, highly dependent on decisions made by local governmental units – decision and policy-makers at this level must undergo their own change management processes in order for the adoption of CHITS to proceed. We therefore see a series of processes required to proceed both concurrently and sequentially in order for change to occur and be sustained individually, organisationally and systemically. In particular, the role and power of government policy and decision-making requires more deliberate attention when building our models and conducting our empirical enquiries.

Keywords*:* health information systems, evaluation, individual and organisational change management, e-health, decentralisation

1. Introduction

At the 1978 conference held at Alma-Ata, the World Health Organisation (WHO) encouraged health care reform in the developing world through decentralisation. WHO (1978) argued that decentralisation would enable greater distribution of decision-making authority to district health systems. As a result, since the mid-80s, decentralisation has been widely implemented across the developing world, usually as part of a greater process of political, economic and technical reform (Litvack in Bossert and Beauvais, 2002: 14). In the Philippines, it was introduced in two waves, in 1991 and again in 1998. By decentralising the health sector, the Philippines hoped to transfer as many resources as possible from central to peripheral authorities, to extend decision-making authority to lower level managers and to enhance the efficiency and effectiveness of health services management (Grundy et al, 2003: 3-4). Unfortunately, during the decentralisation process, the existing paper-based data collection system, called the Field Health Services Information System (FHSIS), was not reformed. It therefore currently does not accommodate evidence-based population health decision-making at the community level. Due to the existence of vertical health programs, data collection is geared towards a centralised system in which data are collected locally and submitted sequentially to higher levels (Figure 1). Required health policies are then developed by the national Department of Health (DOH) and filtered back down. This setup is unsuited for the present reality in the Philippines.

Reference this paper as: Shainur P, Casebeer A and Scott R "Implementing Electronic Health Information Systems in Local Community Settings: examining Individual and Organisational change experiences in the Philippines" *The Electronic Journal Information Systems Evaluation* Volume 15 Issue 2 2012, (pp186-197), available online at www.ejise.com

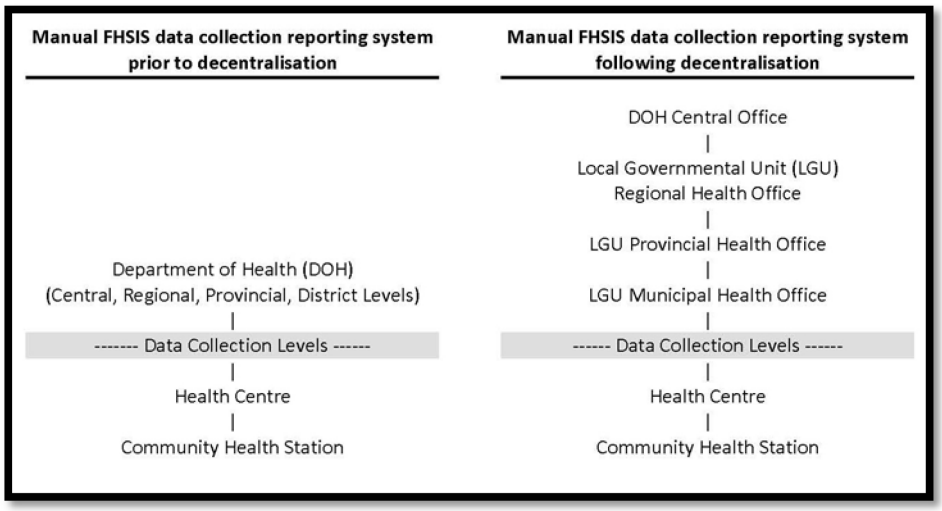

Figure 1: Data collection reporting before and after decentralisation

In 2004, a research team from the Medical Informatics Unit at the University of the Philippines, Manila attempted to address data collection issues by creating an electronic health information system (HIS) that would provide local decision-makers with the tools they required to make relevant, timely and evidence-based decisions. This system, called the Community Health Information Tracking System (CHITS), combines the characteristics of an electronic health record and a clinic appointment system, while also integrating modules for each existing national vertical health program (Tolentino et al, 2005: 312). CHITS were designed to follow the existing FHSIS program structure while supporting informational requirements for local health centres. It was immediately piloted at two local health centres and has since expanded to 36 health centres across the country (UP Manila - National Telehealth Center, 2010).

Despite its popularity, as of 2008, a formal evaluation of CHITS had yet to take place (Premji, 2010: 19). For a country such as the Philippines, which is characterised by high population growth combined with high poverty rates and limited financial resources (Shelzig, 2005), it was imperative that an evaluation take place to ensure that CHITS was worth ongoing investment. In 2008, a study was undertaken by a graduate student at the University of Calgary, Canada, to assess the processes and outcomes of CHITS. Two models were used to help understand the change processes that occurred during system implementation: Prochaska and Velicer's (1997) Transtheoretical Model for Health Behaviour Change and Greenwood and Hinings' (1996) Organisational Change Management Model. The following paper will present these models, use them to describe the transition from a paper to electronic environment and to assess the implementation of CHITS at the individual and health centre levels.

2. Literature Review

Electronic HIS encourage the optimal use of resources while making workplace tasks and the management of health information more efficient (Rahimi and Vimarlund, 2007: 397). Despite a high demand, however, there is a lack of knowledge concerning how to effectively deploy an HIS so that it meets the needs of a variety of users (Kaufman et al, 2006: S37). As a result, only 15% of HIS projects are considered successful, while the remaining 85% are considered either partial or full failures (Heeks in Ferrer, 2009: 167). Further, nearly 45% of information systems fail because of user resistance, even if the system is technologically sound (Dowling in Lising and Kennedy, 2005: 28). Assessing individual and organisational impacts is therefore crucial, as the success of an HIS depends not only on the quality of the technology but also on the people and organisations involved (Ammenwerth et al, 2004: 480). Unfortunately, it is quite common for researchers to underestimate the complexity of clinical and organisational change management processes when evaluating HIS (Cibulskis, Posonai and Karel in Tomasi, Facchini and Santos Maia, 2004: 872).

Studies that have evaluated the individual and organisational impacts of HIS in the developing world have highlighted several lessons to be learnt before these applications can become sustainable for

individual users and organisations as a whole. Lessons include encouraging a 'bottom up' approach to development, building the capacity of local human resources to develop, implement and operate systems, supporting joint partnerships between various local stakeholder groups and promoting the routine integration, or institutionalisation, of an HIS into the daily activities of an organisation (Cibulskis and Hiawalyer, 2002: 752, 756; Gordon and Hinson, 2007: 535-6, 538; Kimaro and Nhampossa, 2004: 3-4; Rodrigues and Risk, 2003; Walsham in Kimaro and Nhampossa, 2004: 2-3). As Gladwin, Dixon and Wilson (2002; 2003) found through their work, the success of an HIS is determined by how well it is received by end-users, as well as how supportive organisational cultures are to its long-term sustainability. Further, not accounting for organisational effects during HIS implementation and use could ultimately lead to failure as users reject the system.

3. Methodology

Ethics approval was received from the University of Calgary's Conjoint Health Research Ethics Board and the appropriate municipal and provincial health administrators in the Philippines.

A descriptive case study approach was used to examine CHITS within its real-life context (Yin, 1994: 13). This approach encouraged the use of multiple sources of data to aid in triangulation (Yin, 1994: 90-92), with the main objective being to gain a greater understanding of CHITS.

Data collection took place from March to July 2008 in the Philippines. During this time, various qualitative tools were used to gather data. Literature and document reviews were used to provide important background and contextual information. Participant observations involved spending time in the health centre environment, unobtrusively examining interactions, behaviours and processes. Focus group sessions were held with health centre workers in the local dialect, while key informant interviews took place with members of the original CHITS implementing team as well as decision and policy-makers at the LGU level. These sessions were used to examine the individual and organisational effects of implementing and operating CHITS. Finally, field notes and journaling techniques were used as reflective tools for the researcher to record her data collection and cultural research experiences.

Whilst in the field, an opportunity arose to accompany the implementing team to a feedback and training session for CHITS and later to attend a national CHITS convention. At these sessions, users were asked for feedback on their experiences with the system and their opinions on what improvements could be made. This feedback was noted and used as another source of data.

Once transcripts from the participant interview and focus group sessions were translated and verified, QSR NVivo 8 software was used to organise the information collected. Thematic coding was performed in three stages: open, axial and selective. During the open coding stage, the data were conceptualised so that relationships were identified and patterns and themes were noted (Liamputtong and Ezzy, 2005: 268). Memos were made about developing themes and ideas, and specific encounters and experiences with CHITS were noted down and compared. In axial coding, the codes that had already been developed were scrutinised more closely and broken down into further categories and reformed in new ways to explore possible relationships between each category and its sub-categories (Strauss and Corbin in Laimputtong and Ezzy, 2005: 269). Finally, selective coding involved unifying all the identified categories around core categories using a higher level of generality (Corbin and Strauss in Liamputtong and Ezzy, 2005: 269). Additional information from the field notes and journal were used to supplement the transcripts and inform the setting and context of the study.

Focus group sessions were held at two CHITS and one non-CHITS health centre, the latter selected to be socially, culturally and economically comparable. Data gathered from these sessions were used to compare 'before' and 'after' effects of CHITS. These data, combined with key informant interview session data, were used to better understand the organisational impacts of the system at the individual and health centre levels and were used to populate the models below.

4. Change Models

Following a literature review of various models (see Premji, 2010: 56-71), two change models were identified from the literature and used to determine areas of inquiry for the focus group and key informant interview questions. These models were chosen based on their suitability for this study, with

one (the Transtheoretical Model for Health Behaviour Change) focussing on individual motivations and outcomes for change, and the other (Organisational Change Management Model) addressing external factors that lead to internal organisational change.

The Transtheoretical Model for Health Behaviour Change (Prochaska and Velicer, 1997) describes six steps that determine whether an individual is successful towards achieving a purposeful behaviour change. These steps, or stages, include:

- Pre-contemplation, where an individual is unmotivated to change their behaviour;
- Contemplation, where the individual openly states their desire and intent to change;
- Preparation, where active steps are taken to make the change within a given time frame;
- Action, where open modifications are made;
- Maintenance, where the individual is less vulnerable to frequent relapses; and
- Termination, where the former problem behaviour is no longer desirable.

For successful implementation, health centre workers must be willing to undergo the transition from the old paper-based system to the new electronic-based HIS. Once they achieve termination and CHITS becomes routine, then, according to Prochaska and Velicer (1997: 39), the change is successful.

The Organisational Change Management Model (Greenwood and Hinings, 1996; Hinings in Casebeer and MacKean, 2004: 42-45) outlines three factors that influence change in an organisational setting: precipitating, directing and enabling factors.[1] Precipitating factors involve a change in the external environment that directly affects how an organisation operates. Directing factors, influenced by individual and organisational values and interests, involve the organisation addressing this external pressure by changing from within. Finally, enabling factors examine whether the organisation has the ability to enable the change from a capability and power standpoint.

5. Results - Individual Behaviour Changes

Using the Transtheoretical Model for Health Behaviour Change (Prochaska and Velicer, 1997), the following behavioural changes and impacts were noted among health centre workers.

Precontemplation – Individual is unmotivated to change their behaviour
According to study findings, health centre workers wished to continue operating under the manual, paper-based system because they had been using the system for years, were accustomed to it and did not find it difficult to use. The FHSIS has been in place for over two decades (Robey and Lee, 1990: 37); any change that involved adopting a new way of collecting information was therefore scary, especially for those who had been working in their positions for over 10 or 20 years. Further, health centre workers had a fear of computers, having never accessed or operated a computer before. For a majority of these workers, computers were a new, intimidating phenomenon. One health centre worker described:

> *I have a computer at home but I really don't turn it on because it might explode.*

This fear deterred potential users from wanting to change.

5.1 Contemplation – Individual openly states their desire and intention to change

Despite being accustomed to the paper-based system, several health centre workers found it burdensome, complaining that the amount of paperwork and reporting they had to complete was overwhelming. With multiple vertical health programs in place, each with their own set of reporting requirements, workers constantly felt pressured to complete reports, leading them to sacrifice service quality in the process. One health centre worker exclaimed:

> *Our hands are getting tired of writing, even our ears!*

During Level 0 Training for CHITS (which is essentially an information session that takes place before any commitments to adopt the system), workers were made aware of existing data collection issues

[1] Precipitating, Directing and Enabling Factors are defined here according to Hinings' work as noted in Casebeer and MacKean, 2004: 42-45.

under the FHSIS and were introduced to CHITS and its role in improving these issues. This is when they first began contemplating the idea of change. Several factors pushed workers to consider moving to the electronic system. Through the training, flaws in the FHSIS were highlighted, such as its inability to support evidence-based decision-making at the local level. Health centre workers were also made aware that CHITS made daily health centre tasks easier, such as eliminating the need to enter redundant information. They expected this would ultimately lead to a savings in time and ease the reporting burden, which tempted them to make the transition to an electronic environment. As CHITS popularity continues to grow across the Philippines, more and more health centre workers and decision and policy-makers are requesting Level 0 Training so they may learn more about the system.

In one participating health centre, a policy was enforced whereby health centre workers and students were given the option to work in a non-CHITS health centre if they did not desire to learn the system.

5.2 Preparation – Active steps are taken to make the change within a given time frame

During the preparation stage, the CHITS implementing team worked alongside health centre workers and LGU decision-makers to begin implementing the system. Computers were installed at the health centre 3-4 weeks before training and workers were taught how to gain control of the mouse (and begin overcoming their fears) by playing computer games.

Level 1 Training took place after a commitment was made from decision-makers at the LGU to adopt CHITS. Funding was secured, either internally or externally, and the software was installed at the health centre. Level 1 Training was implemented for four specific target groups: i) CHITS end-users, or health centre workers, for whom training introduced the basic features of CHITS, including how to navigate through the system, encode data and print daily service and special module reports; ii) CHITS administrators, including health centre physicians and nurses, for whom training provided an introduction to the administrative functions of CHITS; iii) CHITS technical support personnel, if any were assigned at the LGU level, for whom training outlined troubleshooting and network-related issues; and iv) local chief executives, including senior officials at the LGU, for whom training introduced CHITS and how it can be used to collect accurate, reliable and verifiable data for local evidence-based decision-making.

5.3 Maintenance – The individual is less vulnerable to frequent relapse

During this stage, health centre workers spent time practicing and growing accustomed to operating CHITS on a daily basis. This involved a steep learning curve. Health centres typically spent the first few months following implementation operating dual paper and electronic systems. In the morning, when health centres were busiest, workers continued using the paper-based system for daily operations. In the afternoons when patients were few, workers entered information from the morning onto CHITS. After some time, the majority of workers overcame their fear, although some continued to struggle. Most users began to type faster, did not look at the keyboard and found it easier to operate CHITS. They also gained confidence in their abilities. One study participant went so far as to say:

> *I consider myself a techie; I can now use the computer!*

Health centre workers underwent Level 2 Training six months to a year after CHITS was installed. In this training, workers learnt how to run queries so that specific information could be easily retrieved from the system.

Unfortunately, health centre workers ran into issues when it came time to provide technical support for CHITS. Even though there was Level 1 Training for local technical support, at the time of this study LGUs were still identifying local technical support personnel to go through this training (in one jurisdiction, technical support people were already identified but were awaiting training). When a computer was not working or there was a need for technical support, the CHITS implementing team was called in to resolve the issue, either in person or remotely through the telephone. In one instance where a CHITS computer had not been working for months, health centre workers had to resort back to the paper-based system and wait to enter data into alternate CHITS computers on a weekly basis.

5.4 Termination – The former problem behaviour is no longer desirable

Participating health centres typically moved from dual paper and electronic systems to solely using CHITS within a few months, once health centre workers felt ready to make the change. Several outcomes were achieved that helped workers permanently change their behaviour. First, CHITS empowered health centre workers by giving them the competency to manage their own information system. Workers also gained a greater appreciation for the value of data collection and were more conscious of the importance of entering accurate and complete information:

> *I became more alert. We had a meeting about CHITS and I knew then what my mistakes were. I'm well adjusted now; I am alert and attentive that before I let the patient go [home], all the facts are complete.*

CHITS instilled a sense of pride among workers for the skills they gained, for overcoming their fears and for being part of a select few to implement an electronic system:

> *We feel like we are rich and high-tech… especially if we attend meetings or seminars with other local governmental units, we are proud to say that [we are] using a computerised system.*

Perhaps the most notable change for individuals was the ease in reporting burden that resulted from the electronic system. CHITS enabled printing of the daily service report at the end of the day, when in the former system workers would manually create the report by filling in each patient's information. Once printed, workers used this report as the basis for all other FHSIS reporting forms. The savings in time enabled workers to focus on services provided to patients:

> *[CHITS] allows us to be more patient centered rather than [focused on] the records because the program makes our work easy for us. There are many work or needed outputs that we do not attend to anymore. Then we realised that there is more work that we [can] accomplish with the computerised system compared to the traditional one.*

For those that continued to struggle with CHITS but who still wished to learn the system, ongoing support was provided by the head nurse at each participating health centre, who answered questions and taught users how to carry out certain functions, such as editing patient information.

6. Results - Organisational Change Management

Using the Organisational Change Management Model (Greenwood and Hinings, 1996; Hinings in Casebeer and MacKean, 2004: 42-45) as a conceptual lens, the following factors enabled change at the health centre level.

6.1 Precipitating Factors – Changes in the external environment that affect how an organisation operates

In the external environment, one immediate event raised the need for a new data collection system. When the Philippines decentralised the national health sector during the 1990s, a gap developed between conventional data collection methods and innovative local decision-making processes. As a result traditional, centralised methods of data collection had to be modified to better support population health decision-making at the local health centre level.

6.2 Directing Factors – Addressing external pressures by changing from within the organisation

Once the data collection gap was recognised, the biggest question for health centres was 'what can we do to better accommodate population health decision-making at our level?' For a long time there were no answers as options were limited. Given that the existing FHSIS was created and managed by the DOH at the national level, challenging the status quo involved engaging in a system-wide change, which was difficult for health centres to achieve under decentralisation; in order for change to take place, health centres would have to convince the LGUs they reported to at the municipal, provincial and regional levels, as well as the LGUs that operated independently in alternate jurisdictions across the Philippines (refer to Figure 2). Eventually the DOH would also have to be convinced to change so that a new program could be implemented. This was not an easy task to achieve beginning from the health centre level.

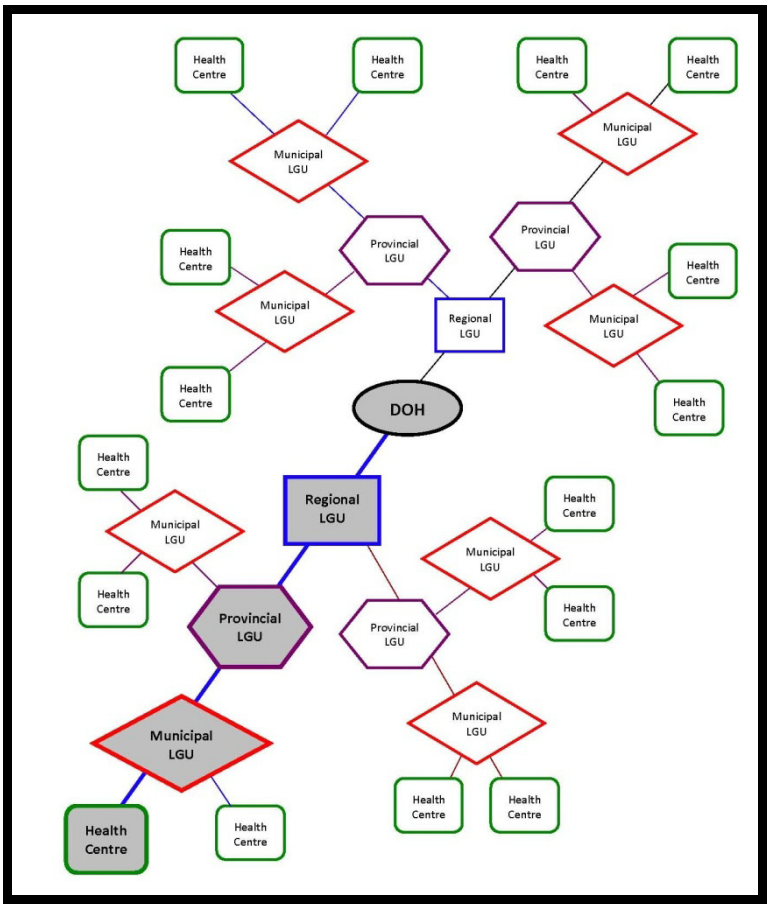

Figure 2: Theoretical depiction of the Philippines health system under decentralisation, showing various levels of independent authority.

In this figure, the shaded area represents the chain of command that a health centre must go through to implement change within their own jurisdiction. Each LGU represented in this figure (municipal, provincial and regional) has independent authority from the other; therefore any change adapted by one LGU does not guarantee that the change will be adapted by another. System-wide change is difficult to achieve using a bottom-up approach.

In 2005, a team from the University of the Philippines, based on feedback from health centre workers, developed CHITS, which follows the FHSIS approach *while* supporting local decision-making requirements at the health centre level (Tolentino, 2004: 10). By creating CHITS, the implementing team was able to provide a simple alternate solution for data collection. Following from Greenwood and Hinings (1996: 1035), CHITS existence encouraged other health centre workers (that previously did not) to recognise their dissatisfaction with traditional data collection methods and seek change. By using a participatory approach to development, CHITS was created, piloted and marketed to health centres and LGUs. The implementing team then waited for an invitation from either a health centre or LGU to conduct Level 0 Training.

If a health centre took the lead in organising the Level 0 Training, the implementing team provided support to help bring the local health office (which operates at the LGU level) on board. On the other hand, if the local health office took the lead in organising the Level 0 Training, decision-makers, once they decided to install CHITS, underwent a process to determine which health centre(s) within their jurisdiction would be the first to adopt the system. In practice, this was achieved by using the head physician's age as a proxy to determine whether they would be open and willing to learn CHITS and encourage other health centre workers to learn and operate the system.

For change to occur successfully, health centre workers had to envision a new way of performing their daily tasks. Traditional values that workers and decision-makers were committed to had to be

addressed. Level 0 Training introduced workers to an informational approach to decision-making. This approach emphasised the value of using accurate, verifiable and complete information to make evidence-based population health decisions. Given that workers previously admitted to openly fabricating data in order to meet reporting deadlines (Tolentino, Marcelo and Maramba, 2004: 8), the informational approach directly challenged the paper-based method of data collection and empowered workers to take an active role in improving how data collection was traditionally performed.

Health centre workers also had to be excited about the change, believing that CHITS would work in their best interests. Workers were already dissatisfied with the burden of paper-based reporting and deadlines. As far as they knew, CHITS would potentially take away this burden, making their work easier. Through Prochaska and Velicer's (1997) health behaviour change model presented above, it is clear that workers' readiness to change acted as a critical enabler for successful organisational change.

6.3 Enabling Factors – Factors that enabled organisational change

At this stage, the health centre had to determine whether it had the ability to transition to CHITS. Two types of enabling factors, capability and power, are examined.

Technical capability involves specifying what the health centre hoped to achieve by adopting CHITS (Hinings in Casebeer and MacKean, 2004: 44). Through Level 0 Training health centre workers were made aware of existing data collection issues. They therefore expected that CHITS would address these issues and would provide the necessary tools to help workers make evidence-based population health decisions at the community level. One health centre worker anticipated:

> *It would be easy for us to plan in the community what we would do [for a certain] health situation, because the data gathered [through CHITS] would already reflect the situation. For example, if we have 10 diarrhoea cases admitted from one [community], we could immediately take action. In the [traditional] system, the [resulting policy] action would come really late.*

Other changes that were expected included simplifying health centre processes by learning to better rely on CHITS for reporting needs and removing the need to enter redundant information, making it easier to organise and recall patient information and track patients that failed to come in for follow up appointments. One participant described:

> *[Current CHITS users have] told us that [CHITS] is easier and faster. They showed us that they just have to click buttons, while [in the paper-based system] we have to find our data from stacks or piles [of charts].*

To achieve these outcomes, health centre workers needed to gain the technical ability to operate CHITS, which would be provided by the implementing team through various levels of training.

Social / behavioural capability involves managing the change while emphasising collective and devolved leadership throughout the organisation (Hinings in Casebeer and MacKean, 2004: 44). Given that the organisation in this case is the health centre, which operates with very few employees (as compared to a large scale organisation), leadership was not devolved to the same extent at the health centre level; the head nurse and the head physician took on a leadership role at each participating health centre. They were generally also consulted about CHITS from the LGU level and acted as representatives for their health centre at CHITS meetings. At the health centre itself, the head nurse provided additional support to workers that struggled using the system and acted as the system head when the physician was away.

At one participating health centre, a hierarchical relationship was perceived between the head physician, head nurse and the rest of the health centre workers, while an open and equal relationship was detected at another centre. Through observation, it was evident that organisational culture influenced how comfortable workers were in learning and operating CHITS.

Pfeffer (in Casebeer and MacKean, 2004: 45) defines power as 'the capacity to bring about certain intended consequences in the behaviour of others'. To this end, the head physician and head nurse were again relied on (by the LGU and implementing team) to support health centre workers in making the change from a paper to electronic environment. In one rural health centre, CHITS ultimately failed

because the leadership team did not support its use and therefore did not encourage health centre workers to use the system.

6.4 Outcomes at the Health Centre Level

As health centre workers had expected, the system helped simplify regular clinic activities by better organising administrative tasks. Daily activities were more efficient, such as storing and retrieving patient charts, completing reports and retrieving information required for community outreach programs. Further, health centres experienced a faster patient turnover, as each step in the consultation process was timelier. One participant described:

> *In the manual, paper-based system it [took] 10 minutes to find a patient record but now it takes seconds to find.*

With CHITS in place workers did not rely on the manual system except to complete their reports, which still had to be submitted on approved FHSIS reporting forms. However, even this task became easier, as all the required information was available from the system and were perceived to be more accurate. Reporting forms were thus completed and submitted to the LGU in less time.

Health centre workers were also able to better monitor outbreaks. Data were not only available immediately through the system, but workers had more faith in the information and therefore trusted resulting health policies. If a rise in disease incidence was noticed, workers proactively notified the head physician that certain medications would be required in the coming weeks. They also spent time in the community or at the health centre educating patients on preventative measures that could be taken.

7. Discussion

Study findings indicate that CHITS implementation has had a positive impact on both health centre workers and health centres. This success is due to the nature of how the system was designed and implemented and how health centre workers were trained. At the organisational level, the implementing team waited to be invited by health centres or LGUs to conduct Level 0 Training; CHITS adoption was not forced and, in one health centre at least, health centre workers were given the choice to move to a non-CHITS health centre if they were uncomfortable learning the system. According to the literature, this 'bottom up' approach to development is critical for CHITS sustainability, as individual users are more likely to accept the application when given the appropriate support (Cibulskis and Hiawalyer in Gordon and Hinson, 2007: 535; Walsham in Kimaro and Nhampossa, 2004: 2-3). Further, the implementation approach encouraged local partnerships between stakeholder groups, including health centre workers, administrative leadership and decision and policy-makers at the LGU level. Through these partnerships, stakeholders become more invested in the system, sharing an increased sense of ownership of CHITS which will give them more motivation in the future to do whatever it takes to sustain the system once implementation support is withdrawn (Gordon and Hinson, 2007: 541; Rodrigues and Risk, 2003).

The Transtheoretical Model for Health Behaviour Change effectively described the series of changes health centre workers underwent to adopt CHITS. This model highlighted the importance of requiring workers' support to learn CHITS before a permanent behavioural change could take place as they transitioned from a paper to electronic environment. Through this model, it was also evident that before workers could reach the termination stage, CHITS had to become a part of their everyday mindset and they had to believe the system benefited them. Through this form of institutionalisation, CHITS also has a greater likelihood of becoming sustainable (Gordon and Hinson, 2007: 538-40).

The Organisational Change Management Model was also effective in that it adequately captured change management factors at the health centre level. This model examined relationships between workers as well as overall technical and capability factors that influenced whether the health centre would be able to effectively adopt CHITS. Through this model it was evident that organisational readiness and culture play an important role in determining whether CHITS adoption will be successful and sustainable.

While both models provided an in depth view of change management factors at the individual and health centre levels, neither model was developed to focus on broader system and government

influences. Data suggests that broader system changes need to be considered. Under decentralisation, health centres do not act independently. Rather, broader level influences help determine and shape their decisions. Figure 3 helps conceptualise relationships between different stakeholder groups that sum up the organisational field surrounding CHITS. This model delineates the further context within which CHITS was implemented and is presented for further validation by the academic community.

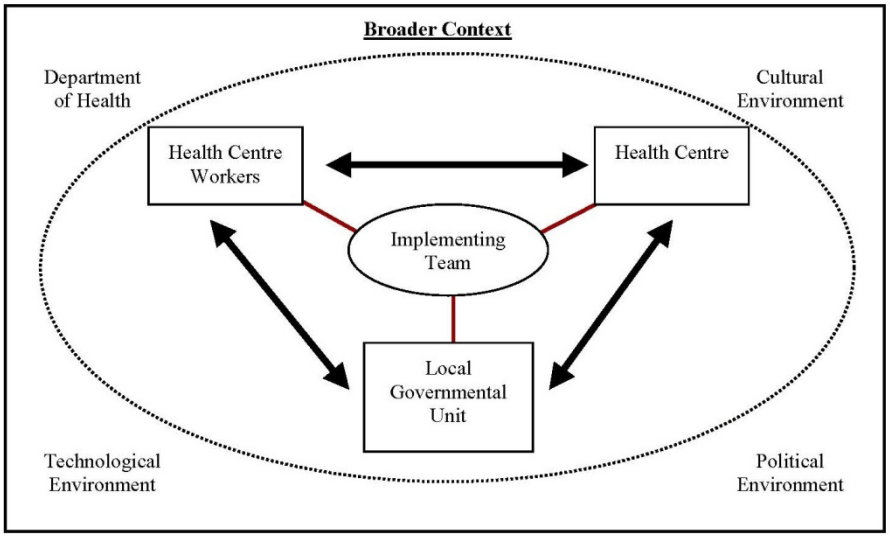

Figure 3: Organisational Field Surrounding CHITS

The primary circle depicts the immediate organisational influences within and between stakeholder groups. The implementing team has the expertise to help implement CHITS and transition relevant stakeholders from a paper to electronic environment. They train health centre workers, health centre administrators and LGU decision-makers on how to learn and operate the system. Similarly, a mutual relationship exists between the stakeholders, as each group influences the other in terms of organisational decision-making and readiness to adapt.

In the broader context, the DOH, although not directly involved in supporting CHITS use, still influences organisational decision-making because ultimately they manage vertical health programming and the report submission process. The wider political, technological and cultural environments also significantly impact the capacity for change and sustainability of the system over the long-term. Politically, it will be difficult to garner long-term commitment for CHITS if there are ongoing tensions at the LGU level. If governments are overthrown, corrupt or face a high level of scrutiny, system sustainability will be threatened. Technologically, it is likely that following significant investments in equipment and training for CHITS, a more innovative and cost-effective technology will emerge that influences system sustainability. Culturally, CHITS sustainability is, and will continue to be, heavily influenced by the attitudes, willingness and adaptability of its users.

As CHITS exists in a multi-stakeholder environment, implementation involves a concurrent shift in the mindset of health policy and decision-makers at higher levels towards adopting the electronic system. The health centre is highly dependent on decisions made by, and support provided from, those at the LGU level. Without their support, the health centre would be unable to proceed with CHITS adoption. Future work should endeavour to broaden attention to wider factors and actors at the system and government levels. It is further suggested that while enablers are important, an explicit examination of 'disablers' at the broader system level is key to better understanding blockages to fundamental change.

8. Conclusion

Several countries in the developing world have undergone decentralisation processes over the last three decades and find themselves facing a similar data collection reality as the Philippines. By implementing an electronic HIS such as CHITS, which supports the traditional data collection environment while meeting current information needs of local decision-makers, these countries can reconcile past differences in data collection methods and begin moving forward using innovative

technologies and solutions. However, while an electronic HIS is an exciting prospect because of the potential it holds, implementers can learn from past research experiences and more explicitly recognise and consider the value of attending to systemic change management processes when implementing and evaluating their own applications. Supplementary evaluative research should extend conceptual lenses to include system-wide analyses of the concurrent and sequential change processes required for successful and sustained implementations. In particular, the role and power of government policy and decision-making requires more deliberate attention when building models and conducting empirical inquiries.

References

Ammenwerth, E., Brender, J., Nykanen, P., Prokosch, H.U., Rigby, M. and Talmon, J. (2004) 'Visions and strategies to improve evaluation of health information systems: Reflections and lessons based on the HIS-EVAL workshop in Innsbruck', *Int J Med Inform*, vol. 73, pp. 479-91.

Bossert, T.J. and Beauvais, J.C. (2002) 'Decentralization of health systems in Ghana, Zambia, Uganda and the Philippines: a comparative analysis of decision space', *Health Policy Planning*, vol. 17, no.1, pp. 14-31.

Casebeer, A.L. and MacKean, G.L. (2004) 'Putting Skills Into Practice: Factors Influencing Individual and Organizational Readiness for Change: A background for paper for Health Canada's "Skills Enhancement for Health Surveillance Program". *Department of Community Health Sciences, Centre for Health and Policy Studies (CHAPS),* University of Calgary.

Cibulskis, R.E. and Hiawalyer, G. (2002) 'Information systems for health sector monitoring in Papua New Guinea', *Bulletin of the World Health Organization*, vol. 80, no. 9, pp. 752-758.

Ferrer, E. (2009) 'ICT Policy and perspectives of Human Development in Latin America: the Peruvian Experience', *Journal of Technology Management & Innovation*, vol. 4, no. 4, pp. 161-170.

Gladwin, J., Dixon R.A. and Wilson, T.D. (2002) 'Rejection of an innovation: health information management training materials in east Africa', *Health Policy and Planning*, vol. 17, no. 4, pp. 354-361.

Gladwin, J., Dixon, R.A. and Wilson, T.D. (2003) 'Implementing a new health management information system in Uganda', *Health Policy and Planning*, vol. 18, no. 2, pp. 214-224.

Gordon, A.N. and Hinson, R.E. (2007) 'Towards a sustainable framework for computer based health information systems (CHIS) for least developed countries (LDCs)', *International Journal of Health Care Quality Assurance*, vol. 20, no. 6, pp. 532-544.

Greenwood, R. and Hinings, C.R. (1996) 'Understanding Radical Organizational Change: Bringing together the Old and the New Institutionalism', *Academy of Management Review*, vol. 21, pp. 1022-1054.

Grundy, J., Healy, V., Gorgolon, L. and Sandig, E. (2003) 'Overview of devolution of health services in the Philippines', *The International Electronic Journal of Rural and Remote Health Research, Education, Practice and Policy* [Electronic], vol.3, pp. 1-10, Available: Pubmed/ 15877513, [23 Jan 2008].

Kaufman, D., Roberts, W.D., Merrill, J., Lai, T.Y. and Bakken, S. (2006) 'Applying an Evaluation Framework for Health Information System Design, Development and Implementation', *Nursing Research*, vol. 55, no. 2S, pp. S37-S42.

Kimaro, H.C. and Nhampossa, J.L. (2004) 'The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania', *Journal of Health Informatics in Developing Countries* [Electronic], vol. 1, no. 1, pp. 1-10, Available: DOAJ [13 Jan 2008].

Liamputtong, P. and Ezzy, D. (2005) *Qualitative Research Methods, 2nd edition,* New York: Oxford University Press.

Lising, M. and Kennedy, C. (2005) 'A Multimethod Approach to Evaluating Critical Care Information Systems', *CIN: Computers, Informatics, Nursing*, vol. 23, no. 1, pp. 27-37.

Premji, S. (2010) 'The Development of a Framework to Evaluate the Organisational and Policy Impacts of the Community Health Information Tracking System (CHITS) in the Philippines' *Master of Science Dissertation*, University of Calgary, Canada [Electronic], Available: ProQuest: Dissertation & Theses/ MR62097 [22 July 2010].

Prochaska, J.O. and Velicer, W.F. (1997) 'The Transtheoretical Model of Health Behavior Change', *American Journal of Health Promotion*, vol. 12, no. 1, pp. 38-48.

Rahimi, B. and Vimarlund, V. (2007) 'Methods to Evaluate Health Information Systems in Healthcare Settings: A Literature Review', *Journal of Medical Systems*, vol. 31, pp. 397-432.

Robey, J.M. and Lee, S.H. (1990) 'Information system development in support of national health programme monitoring and evaluation: the case of the Philippines', *World Health Statistics Quarterly*, vol. 43, no. 1, pp. 37-46.

Rodrigues, R.J. and Risk, A. (2003) 'eHealth in Latin America and the Caribbean: Development and Policy Issues', *Journal of Medical Internet Research* [Electronic], vol. 5, no. 1, e4, Available: Pubmed/ 12746209 [18 Jan 2008].

Schelzig, K. (2005) *Poverty in the Philippines: Income, Assets and Access*, Asian Development Bank, [Online], Available: http://www.adb.org/Documents/Books/Poverty-in-the-Philippines/Poverty-in-the-Philippines.pdf [5 Oct 2007].

Tolentino, H.D., Marcelo, A.B. and Maramba, I.D.C. (2004) *Final Technical Report: Community Based Child Injury Surveillance System – Rapid Data Collection Using Short Messaging Services,* Medical Informatics Unit, University of the Philippines Manila, [Online], Available: http://www.idrc.ca/uploads/user-S/11472716661Child_Injury_Surveillance_Final_Report.pdf [12 Nov 2006].

Tolentino, H., Marcelo, A., Marcelo, P. and Maramba, I. (2005) *Linking Primary Care Information Systems and Public Health Vertical Programs in the Philippines: An Open-source Experience*, American Medical Informatics Association (AMIA) Annual Symposium Proceedings Archive [Electronic], Available: Pubmed/ PMC1560490, [17 April 2008].

Tomasi, E., Facchini, L.A. and Santos Maia, M.F. (2004) 'Health information technology in primary health care in developing countries: a literature review', *Bulletin of the World Health Organization,* vol. 82, no. 11, November, pp. 867-875.

UP Manila - National Telehealth Center (2010) *CHITS makes public-private partnerships possible*, [Online], Available: http://plone.telehealth.ph/news/chits-makes-public-private-partnerships-possible [22 July 2010].

World Health Organization (1978) *Primary Health Care: Report of the International Conference on Primary Health Care, Alma Ata, USSR*, Geneva.

Yin, R.K. (1994) *Case Study Research: Design and Methods,* 2nd edition, Thousand Oaks: Sage.