A Socio-Technical Approach for Mobile Health Informatics together with Organisational Change: Case Studies in Community Healthcare Service Centres in China

By

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Abstract

This thesis addresses the theory of Socio-Technical Systems (STS) within the context of Information Systems (IS), a complicated field combining Information Technology and social shaping impacts. IS have been changing our society for some decades. From Office Automation (OA) to E-Commerce and E-government, IS are creating a new era of Mobilisation. Different industries have all been adopting Information Technology to enhance their business, from enterprises to public sectors. All these changes bring dramatic impacts for organisational behaviour and people's living, which need to be studied.

According to academic literature, health informatics, being one of the important and complex fields in IS, started to employ mobile technical systems to improve healthcare service delivery for citizens at the start of the new Millennium. Comparing with other theoretical models in IS, the author argues that the Socio-Technical approach can explain comprehensively the new changes to organisations and society. Following the theories of STS, these case studies were decided by the researchers as field work in Chinese Community Healthcare Service Centres, where there are various mobile services for the citizens.

Through multiple case studies, the author found that Leader Emphasis is one new social element in the field of the IS, while Participation, as another social element is essential to the context of this research project. These two social shaping elements, combining together within a model of STS, provide new decision making process, which is vital to a successful development of Mobile Health Information Systems (MHIS). The model has affected organisational

behaviour, organisational structure, culture and society, following the usage of Mobile IS.

Based on the result of the field work and the relevant literature of E-government, this research also concludes that M-government can be the transformation of E-government, as public service can be delivered efficiently by Mobile IS. A developing model is presented in this thesis.

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Abbreviations

3G	3rd Generation communication technology
API	Application Programming Interface
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CCP	Content, Context and Process
CNNIC	China Internet Network Information Centre
D&M Model	DeLone and McLean Model
E-government	Electronic Government
E2C	E-government to Citizen
EMIS	Emergency Management Information Systems
ETHICS	Effective Technical and Human Implementation of Computer-based Systems
G2B	Government-to-Business
G2C	Government-to-Citizens
G2G	Government-to-Government
GDP	Gross Domestic Product
GP	General Practitioners
GPRS	General Packet Radio Service
GSM	Global System of Mobile communication
HIS	Health Information Systems
HR	Human Resources
ICT	Information and Community Technology
IDT	Innovation Diffusion Theory
ITPOSMO	Information, Technology, Processes, Objectives and values, Staffing and skills, Management systems and structures, and Other resource
IT	Information Technology

ITU	International Telecommunication Union
IS	Information Systems
M-Government	Mobile Government
MAS	Mobile Agent Server
MHIS	Mobile Health Information Systems
MIS	Management Information Systems
MMS	Multimedia Messaging Service
OA	Office Automation
OS	Operating Systems
PC	Personal Computers
PDA	Personal Digital Assistant
SARS	Severe Acute Respiratory Syndrome
SMS	Short Messages Service
SSL	Secure Sockets Layer
STS	Socio-Technical Systems
TAM	Technology Acceptance Model
VPN	Virtual Private Network
WAP	Wireless Application Protocol

CHAPTER 1

Introduction

Mobile phone technology, as one of the symbolic representatives in the wireless era based on Information and Communication Technology (ICT), has been spreading across the world since 1973. At the end of 2009, statistical data indicates that approximately 4.6 billion people have cell phones. That means two thirds of populations of the world using cell phones.

In recent years, ICT has been increasingly adopted for public service delivery. Healthcare information service delivery, as one of the important areas of public service delivery, is currently facing challenges such as IT projects failures, society resource shortages and pandemic control, etc. Mobile Information Systems (IS) may be a solution for these problems.

In public sectors or governmental authorities, how to integrate ICT for better service delivery has been discussed in many academic articles. In order to develop this IS theory, scholars proposed concepts of E-government to Citizen (E2C) model for this delivery issue at the end of the last century. However, an abstract of E2C model needs to be implemented and empowered by a specific technology. What is more, ICT is being constantly developed, since the invention of computers and mobile facilities.

1.1 Research Domain and Problem

Service delivery from public sectors to citizen requires that the target group of population is large, and the cost should be estimated carefully. In this case of this phenomenon, it is better to choose some technologies, which should be

ubiquitous, affordable, stable and mature. Text messaging, a very basic function as important as mobile voice talk, is always embedded in every mobile. It became stable for a decade of development, and it could be affordable for other public sectors and users. Community Healthcare Service Centres in China sum up the predominance of mobile text messages. They determined to adopt mobile text message as an essential tool for information service delivery.

In the Pearl River Delta Region of China, north of Hong Kong, Community Health Service Centres are adopting mobile technology as an improved form of public information service delivery. The cases of mobile IS in these Centres provide research value in the manner of evaluation on IS. It is worth learning how the mobile IS became success in these cases. Case study is an appropriate research strategy, rather than others in this study. The health IS in China are different from those in West. Power is mainly from the top, but employees have more right to say no. Health welfare systems currently only offers free "Basic health service and Basic medicine", defined by the central health authority for its citizens. People have to pay the health service for medication, which is beyond the "Basic" scope. The healthcare provided by Chinese Health Service Centre is free of charge, and it is a part of current developing countries' welfare systems. It is crucial to study how to adopt an existing simple technology, enhancing the quality of complex health service information delivery.

Mobile informatics in Community health service centres offers a novel mix of healthcare information and policy instruments, managerial concepts and ICT applications. This is a new area, largely unexplored in studies of technology and organisation, but such programmes are interesting and vital, not least because of their projected ability to promote social and economic

development and protect people's health. The case study of Community Health Service Centres in China presented here is of research interest, because of China's health national reform in 2009 aiming to provide basic health and medical care for 1.3 billion people (Watts, 2009), including the launch of health informatics programmes for the creation of the information society in urban areas initiated in 2003 (Liang and Xue, 2004). China is also a typical developing country in the Asian East, accompanied by the development in E-government, with radical implications for citizens (Li, 2009a). E-government projects in China are trying to deploy powerful coordination using ICT in its state and public administration covering financial industry, revenue administration and public health management, etc. (Cai, 2006). This research thus offers a unique perspective on the role played by the transfer of the technology of E-government and health in community healthcare in an urban area in China.

Interesting questions are naturally worth asking: does mobile IS have the same challenges as the tradition IS faces in public administration? If so, what are the characteristics of mobile IS, compared with other IS? Can we use the same model or patterns to evaluate mobile IS? How does a mobile IS dramatically enhance public health service delivery? What are the key elements for mobile IS success in public health service? It would be beneficial to solve these problems, from a point of views of IS knowledge and practice.

1.2 Research Aim and Plan

IS requires researchers to view it within a broad category, with technology itself just one component of this subject matter (Galliers and Frank, 1987). Thus, IS is concerned with technology, and relations with the organisation and the people they serve. Under this definition, IS is interdisciplinary, spanning social science, business and technology, etc. Besides, in the world of health

informatics, this would be a typical kind of a problem, because they fill roles in policy, science, and technology, and can bring organisational changes affecting all these things. Therefore, it is complex.

In the domain of IS, it is conventionally suggested by scholars that it should include social aspects, as well as technical issues. There is a fundamental basis for this study, namely, Socio-Technical approach. The Socio-Technical approach, applying in IS, implies that an integrated IS does not only contain technologies, but also consists of organisation and people. As we can see, the Socio-Technical approach describes an entire IS, including interdisciplinary fields.

This PhD research aims at exploring a Socio-Technical model for evaluation of mobile IS, alongside with understanding the Public service delivery affecting organisational changes such as organisational re-structure, etc. One issue about IS failure is not newly attracting attention from scholars, but it still keeps happening. Fallacy often occurs such as technology-determinism or believing only in technology, which is the master key to solve all of challenges people have at present (Ennals, 1995 and Brennan, 2005). Many scholars emphasise that the IT developers and the relevant stakeholders have to focus on social shaping elements, together with the technical elements, when they design or evaluate an IS (Williams and Edge, 1996; Mumford, 2003; Brown, 2001; and Kling, 2007). How can we balance account of social and technical impacts in a IS? Socio-Technical can provide a comprehensive solution for this.

Human elements are often omitted from consideration. Ignorance of people ware would mislead the IS into technology determinism, which asserts that advanced and flashy technologies are able to solve all the problems faced by

IS development strategy. Referring to the Socio-Technical principle, it would be necessary to explore and identify whether other managerial elements significantly impact on validation of IS Success.

Case study research was selected to explore Mobile Health Information Systems (MHIS). The theoretical concept of this research adopts Socio-Technical System (STS), which is a tradition strongly in EU in last 50 years found by Tavistock Institute in London (Mumford, 2006 and Luna-Reyes et al, 2005). It can describe E-government and health in terms of people and technology from an organisational perspective. The research conducting in this thesis is on E-government and health, and how the new technology of mobile health develops with Chinese government. The research is looking at what can be learned from a Chinese perspective.

The philosophy in this research employs interpretivism. The qualitative data was composed of primary data and secondary data. There are, in total, 53 semi-structured interviews. After a pilot study, preliminary analysis was pursued. If new points arose from an interview, they were also analysed sequentially. Secondary data covers official reports, media reports and other documents, which helps to justify the results.

As to deep understanding of this complex IS phenomenon, using qualitative data has its own advantages for this case study. The field work of qualitative data was collected in eight centres, which were operating mobile IS very well. After the analysis, research data indicates that leadership and participation are the two essential elements for the mobile IS success model. Consequently, multi-cases study would underpin this finding.

The Socio-Technical approach is the core of theoretical concept for this study,

applying it to research problems based on mobile IS within Community Health Service Centres in China.

1.3 Thesis Outline

Seven Chapters in this thesis are to demonstrate how the researchers addressed problems brought by new mobile technology for public service delivery. The following chapter is a Literature Review, providing a brief introduction of E-government theory, and the current situation of mobile health informatics, and discussions on various new challenges. Moreover, theoretical models and framework have been compared and argued from perspectives of IS and management. Research questions will be asked at the end of Chapter Two.

Chapter Three discusses how to seek a best solution to answer the research questions. With inquiries that cross-cut disciplines and subject matters, qualitative research is suitable, and therefore adopted (Yin, 2009). This method relies on investigating why and how of organisation impacts, not just what, where and when. Archival documentation and interview data were collected, including official reports and direct observations, etc.

Chapter Four includes description of cases at Chinese urban Community Healthcare Centres and 53 interviews data analysis, where the basis is the findings of qualitative method. It draws two new elements for a thematic model of STS, and a valuable decision making processes to ensure a successful development of MHIS within the field work settings. Eventually, a thematic network of STS is concluded.

The fifth chapter discusses insights into the research findings, and provides detailed answers for the research questions, reflecting on the theories of STS.

The sixth chapter discusses the limitations of this study, the implications from M-government development model, and the future research avenues. The last chapter clarifies the contributions of this study, and reaches a conclusion.

CHAPTER 2

Literature Review

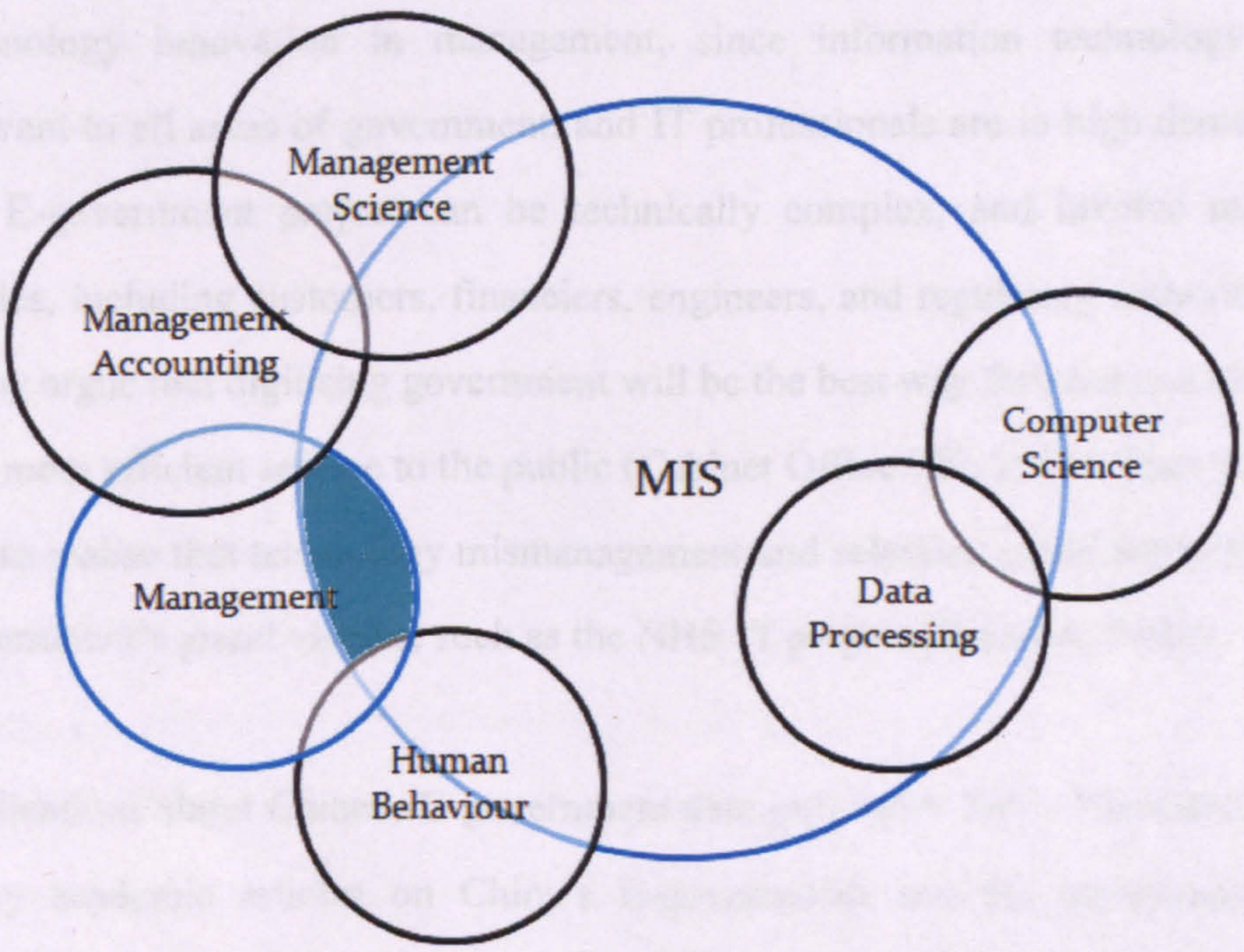
This literature review aims to identify knowledge gaps between mobile IS success and health service delivery, in terms of IS evaluation from the perspective of social impact. Mobile applications have developed, in recent years, a new and mature emerging information technology (IT), which is supposed to delivery more efficient public services to citizens (Ahluwalia and Varshney, 2009; Song and Cornford, 2006 and Rodrigues et al, 2005), particularly in healthcare (Istepanian et al., 2004; Krishna et al, 2009; Koshy et al, 2008 and Costa et al., 2010). Mobile IS are treated as an advanced solution for health service information delivery, and therefore, it is necessary to explore how to empower users to operate properly, as system designers and users expect.

Literature review in the field of information technology management is an essential part of a research project, as in any other academic subject (Webster and Watson, 2002; Levy and Ellis, 2006 and Cornford and Smithson, 2006). Bryman and Bell (2003) state that critical reviews are to explore the field, and its critical abilities of commentary and contributions. In this chapter, the research scopes of IS, E-government, Health Informatics and their relevant works will be discussed. Then, a theoretical framework, based on literatures intended to provide explanation of IS success social elements will be developed, and ultimately research objectives and questions can be presented.

The subject of IS, sometimes called Management Information Systems (MIS), was established in academia, when many international prestigious journals were founded during 1970's to 1990's, such as Management Information

Systems Quarterly, European Journal of Information Systems, Information Systems Journal, Scandinavian Journal of Information Systems, International Journal of Information Management and Artificial Intelligence and Society (AI & Society), etc. IS has been defined as a subject, with multidisciplinary intervention between social science and ICT (Liebenau and Smithson, 1991. and Backhouse et al, 1991). Vogel and Wetherbe (1984, p4) demonstrate major MIS Influences in Figure 2.1. It argued that IS are not the same as "pure technology": not - Computer Science, but related to it. The IS interacts with Management Science, Management Accounting, Data Processing, etc. Thereby, IS development is not only concerned about technology. Technology determination solutions are not able to tackle social or organisational problems without considering social effects. This research focuses on the interposition between IS and Management, which is highlighted in Figure 2.1.

Figure 2.1: Major Management Information Systems Influences (Vogel and Wetherbe, 1984, p4)



While the theory of IS applies in organisations, it varies. Different organisations, groups or societies have miscellaneous concerns and contexts. The diversities of IS theory have evolved for business entities, manufacturers and governments, and so on. IS in public sectors or government have a common objective of providing better service for their citizens in non-profit making activities. A new concept: E-government, based on the frame of IS and public management, consequently has emerged (Carter and Belanger, 2005; Layne and Lee, 2001 and West, 2004). As theory of IS may alter under certain circumstance, the background of E-government, within the cases in China, has to be introduced for better understanding of this research.

China is undergoing rapid economic and political change, accompanied by developments in E-government, with radical implications for citizens. The review considers the modernisation of government organisation, and the

challenges of technology management. E-government provides information and services from governments to citizens, using a range of information and communication technologies (Burn and Robins, 2003). It is based on technology innovation in management, since information technology is relevant to all areas of government, and IT professionals are in high demand. An E-government project can be technically complex, and involve many parties, including customers, financiers, engineers, and regulatory authorities. Many argue that digitising government will be the best way forward to a better and more efficient service to the public (Cabinet Office UK, 2005). They often fail to realise that technology mismanagement and selection could hamper the government's grand visions, such as the NHS IT project (Brennan, 2005).

Publications about Chinese E-government date only from 2003. There are not many academic articles on China's E-government and the organisational structure of Chinese governments. Wu (2003) was the first scholar to discuss this issue. Chinese E-government Projects are advised by the State Council Informatisation Office (SCITO, http://www.acsi.gov.cn/en/), set up in August, 2001. E-government projects for local governments are designed and developed by local government informatisation offices.

Accordingly, E-government is intended to enhance communication between the government and citizens, business partners, employees and other agencies, and information distribution from the authorities, three primary delivery models have widely agreed: Government-to-Citizens (G2C), Government-to-Business (G2B) and Government-to-Government (G2G) (Christopher, 2004). For example, http://www.bis.gov.uk/ is a governmental website for E-business, G2B. Another case is the 'Golden Tax' project in China, which is a G2C model (Chinese People's Daily, 2001). Having focused on healthcare information delivery to citizens, this research should be seen as

a G2C study.

The Chinese government have been exploiting and developing E-government based on the country's circumstance, such as the economy after attending the World Trade Organisation (WTO) in 2002 (Cai, 2006). E-government became one of the most important aspects of transformational governments and public sectors. It can improve public service delivery faster by ICT, helping national economic growth. Many national governments have employed applications of E-government in public administration fields (Eifert and Puschel, 2004), seeking more effective service delivery to customers including healthcare service. There are different regional characters. Local governments and public sectors are setting their E-government applications as principal projects for implementing Government Informatisation. The Chinese government is moving, from development, towards a shared services culture in information and in infrastructure; based on E-government, the strategies of transformational government improve better policy outcomes and efficiency, by reducing duplication and routine processing, and leveraging delivery capacities (Ye, 2007). E-government in Chinese governments and public agencies has lower capabilities of service delivery compared with developed countries (Yao and Lin, 2005). In China, the entire country is divided into provinces, autonomous regions and municipalities directly under the central government, and the provinces and autonomous regions are divided into autonomous prefectures, counties, autonomous counties and cities (China.org.cn, 2007), and at local city level every city in China has their own access web portals and IS. Their degrees of informatisation are different. Some online portals just provide a brief and simple introduction about the city or the sector itself. These are big gaps, and long term projects to fundamentally change people's daily lives (Meng and Yi, 2006).

2.1 E-government in Organisations

This section pursues the research at an organisational level. In the light of organisational theory, it is worth considering how E-government affects Chinese government and public sectors; and the further development of E-government to modernise government.

Organisational structural change is constant, and it is impacted more and more by ICT projects. The organisational structure of Chinese government traditionally is bureaucracy, adopted by most big organisations and governments around the world (Liu and Li, 2006). However it tends to change while IS works in the public sector. The theory of organisational structure has been influenced by Mintzberg (1983). He stated five basic organisational structures: simple structures, machine bureaucracy, professional bureaucracy, the divisionalised form and adhocracy. The Chinese conventional structure relies on standardised processes for co-ordination and control, and is mechanistic (Robbins, 2005). Robbins (2005) argues for the organic model, which uses cross-hierarchical and cross-functional teams, and involves high participation in decision making referred in Table 2.1.

Table 2.1: Mechanistic versus organic models (Robbins, 2005)

The mechanistic model	The organic Model
High specialisation	Cross-functional teams
Rigid departmentalisation	Cross-hierarchical teams
Clear chain of command	Free flow of information
Narrow spans of control	Wide spans of control
Centralisation	Decentralisation
High formalisation	Low formalisation

A mechanistic structure is designed to induce people to behave in a

predictable way. Conversely, an organic structure promotes more flexibility and encourages organisational change. Zhang and Wang (2007) believe that mechanistic structure companies work better than organic companies, and the organic model can be employed by Chinese governments for public management transformation. E-government reduces the cost of public management and service transactions, and can make organisational structure change more efficient (Argyres, 1999).

2.1.1 Chinese E-government

In China, the E-government development is divided into three stages followed by Office Automation, "Golden Zi Projects" implementation and E-government project.

In 1980s, there were new challenges and opportunities created by the information revolution. Governmental organisations started to utilise ICT to aid basic official routines such as documentation inputting and data storage, etc., namely, Office Automation (OA) (Han, 2007). In this stage of E-government, the fundamentals of OA were usage of computers aided technology to replace some hand paper writing works, enhancing the efficiency of file processing. The implementation of OA focused on improving hand writing work efficiency (Song, 2004). Until the late 1980s, many local governments had · built their own Information Technology Centres to co-ordinate internal OA systems (Han, 2007). OA constructions provided the technology supporting foundations for further E-government development. Due to expensive IT equipment and instabilities of software, the adopting of OA could not be introduced to every local government and public sector or agency quickly and easily (Han, 2007). Even now in some certain rural areas in China, "OA" is still seen as "E-government" (Song, 2004). Although OA implementations succeeded, that is nothing to do with the government

structure changing, because changes were only in some functions for a local department. They did not use cross-functional teams. OA is a low-grade governmental informatisation.

On December 1993, the national joint conference on economy informatisation was launched, and then three "Golden Zi Projects" were launched, to achieve informatisation for government public administration. There were the "Golden Bridge Project", the "Golden Custom Project" and the "Golden Card Project" [China Internet Network Information Centre (CNNIC), 2007]. The "Golden Bridge Project" was relevant to the physical network of infrastructure. It was based on the traditional communication network and intranet of government. On September 1996, the "Golden Bridge Project" opened a lease line connected to the Internet Network of the United States; it also launched the Internet access service for the industrial and academic users via dedicated line network, with individual users via telephone line network (China Internet Network Information Centre, 2007). Internet web browsing and the information sharing era had arrived in China. The "Golden Custom Project" was set up to promote the business of customs declarations via ICT. It helps the Customs cut cost and save time. Electronic ports have been established by the central Customs based on the Custom intranet, which widely promotes informatisation of Chinese international trading (Wang et al, 2002). The "Golden Card Project" is for the purpose of developing of China's electronic currency: a financial informatisation project to implement electronic currency circulation based on Banking ICT as hardware infrastructures. The initial functions were implemented in 1993 (Wang et al. 2002). It realised financial modernisation in China, and promotes the banking service for people. These three "Golden Projects" are the fundamentals of Chinese E-government modernisation. In recent years, Chinese central government have launched several new "Golden Zi projects" such as the "Golden Tax Project" and the

"Golden Health Project", etc (Cai, 2006). These projects have made great progress for national informatisation and enhance economic development (Li, 2003). ICT in public sectors can now deal with information and public transactions, with cross-functional teams and cross-hierarchical teams from different departments, from local governments or public agencies to central governments. The organisational structure was still mainly mechanistic, with no fundamental change in public sectors. Cui and Zhang (2003) deem that effects on public service were improved by informatisation, and explored how it can bring more for the organisation, not only for system users.

On January 1999, China Telecom and the Economic Information Centre of the State Economic and Trade Commission, with over 40 relevant governmental departments, hosted the Conference for Launching the E-government Project together in Beijing. http://www.gov.cn is the primary website of the project, which initiated its trial operation (China Internet Network Information Centre, 2007). According to data from China Internet Network Information Centre, up to 2007, 28,575 American Standard Code for Information Interchange (ASCII) names were registered in .gov.cn used for portals of Chinese public sectors including local governments and ministries. 70% percent of government websites have been built up: public service transaction processing, for instance, the driving license application register. Meanwhile, government announcements, legislation and regulations can be published through the Internet, such as transport live information and so on. These approaches enable a transitional government structure to become more modern as a public service organisation. E-government development in China is approaching the level of developed countries (Yao and Lin, 2005), but there is no ICT infrastructure in some rural poor areas (Qu and Wang, 2007). Challenges lie ahead for Chinese authorities to leverage state informatisation.

While most E-government projects are connected by the Internet, dramatically improving the service of free flow of information and wide spans of control, Chinese governments start to concentrate on development for transformational public service, after conducting technical implementations in China (Wang, 2007). Wang (2007), who promotes the theory and practice of China's transformational governments from SCITO, argues that E-government needs to be based on an orientation of service delivery. Thereby, converting a concept of technology-oriented to service-oriented is emerging in E-government. Service delivery can be enabled by IS in E-government.

2.1.2 Public Service Delivery Enabled by E-government

E-government was expected to enhance the working efficiency of public service thoroughly, and deal governmental transactions transparently by policy decision makers (Li, 2003). Nevertheless, the outcome of E-government was not as good as anticipated, following enormous expense and manpower on building IS for E-government (Zhou, 2007). Decision makers and leaders realised that the essential problem is not about technology (Cai, 2006), but how to use a proper technology to change the processing of governmental transactions, and strengthen service delivery. These issues are close to the range of social shaping (Williams and Edge, 1996; and Kling, 2007).

E-government was initially treated as the application of ICT by civil servants and citizens. The IT managers reckoned that solutions can be provided by technicians only. E-government meant setting up intranets, installing software for computers, and communicating via emails or E-bulletin board systems, etc. (Zhang, 2003). The IS were designed to keep the transitional flows of processing. The output merely provides alternative way of recording tools from pen and paper into keyboards. IS in public sectors were using new technology to fit the old political or bureaucratic systems. IS made people

disappointed. Zhou (2007) argues E-government further development tendency is to make governmental and public service transactions online and wireless available to enhance interactions between public sectors and citizens, and to implement digital public management with setting up standards. More efficient public service delivery can be enhanced by Mobile IS, within the organisation, supporting change from decentralisation and low formalisation. According to the argument of Zhou (2007), wireless settings for mobilisation IS are able to be achieved by mobile phones or Personal Digital Assistant (PDA). Smart phones, in recent years, brought diversified software applications (Katz, 1994 and Pernici, 2006). In this sense, governmental and public sectors are commencing the employment of mobile applications into their current IS, as the capabilities of mobile IS come along with more potential benefits for both their civil servants and citizens (Istepanian et al, 2006 and Kushchu and Kuscu, 2003). It has been named Mobile Government (M-government) (Rodrigues et al., 2005).

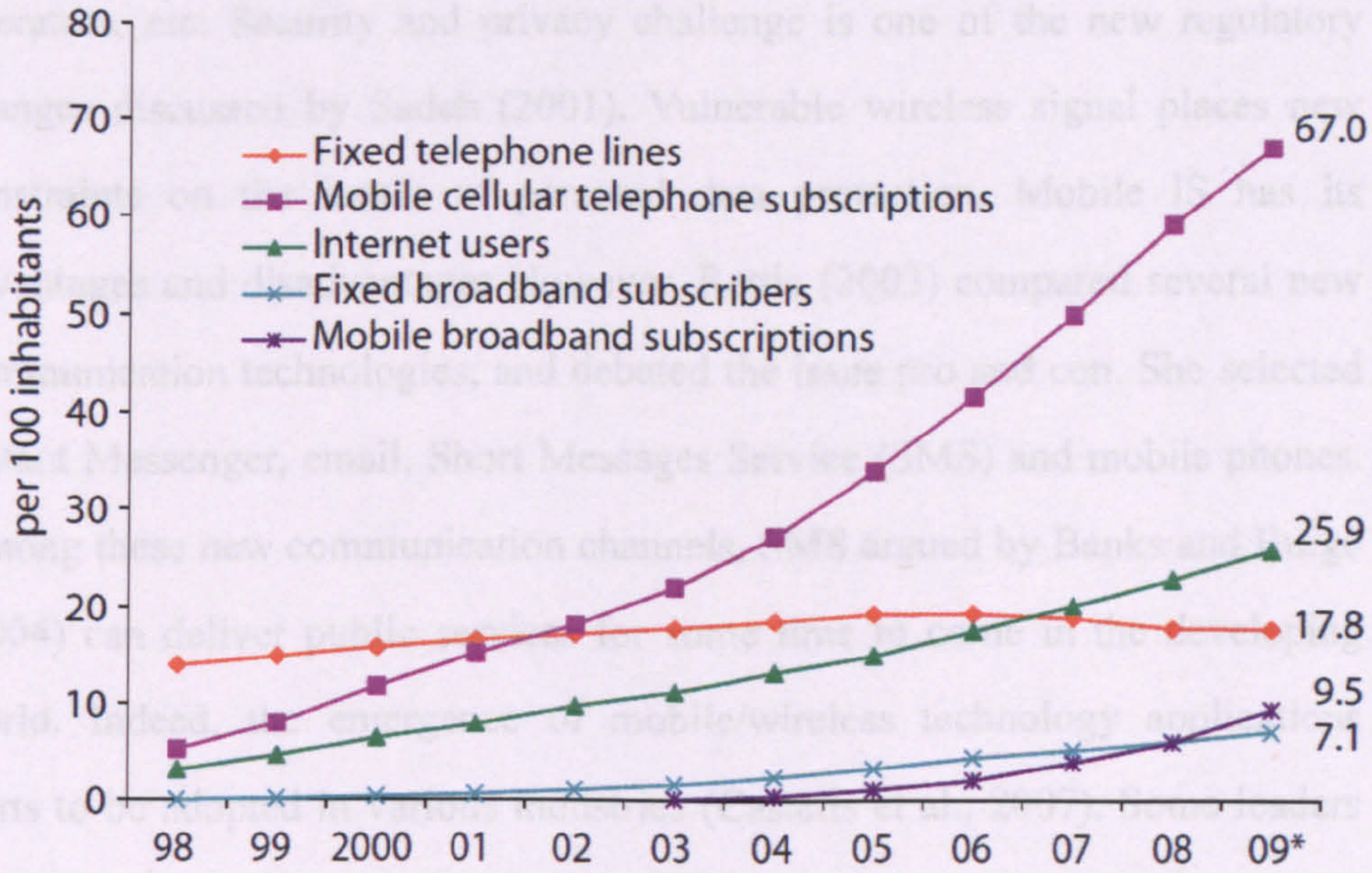
Plenty of cases of mobile usage currently cross the world (Ennals, 2009). In the Bay of Bengal, weather warnings are sent to fishermen by mobile phone. In Crete, farmers are getting advice about their crops via mobile phone. In many African countries, mobile phones are used to handle financial transactions. In Iran, reports of unrest were passed on by mobile phones and Twitter. In Sri Lanka, reports of human rights atrocities have been supported by mobile phone pictures. In the UK, the Mobile Information and Network Technologies (MINT) Centre in Kingston University has developed self-testing systems for diabetes, using mobile phones (Ennals, 2009). The core of this study is that Health service delivery, enabled by wireless instruments, is one of essential public services for its citizens in China. However, It is important to discuss the theory of mobile IS, which is the foundations of health informatics in a new mobilisation era. Based on the

frustrations that have been experienced, the next generation of public information management scheme will be from technology-oriented to service-oriented, and from cable to wireless mobile (Cai, 2006).

2.2 Mobile Information Systems

The usage of mobile phones began to increase dramatically year by year from 1990's, and now it is the most popular ICT device at present (Figure 2.2). Mobile phone subscriptions ascendancy can be predicted, with growth in future. The International Telecommunication Union (ITU), the leading United Nations agency for ICT issues, claims that economic development can be strengthened by ICT technology, including wireless and internet access (ITU, 2010). Wireless ICT has already built up a mobility society, with impacts in people's everyday life, such as mobile commerce, mobile government and mobile learning (May, 2001; Nyiri, 2003 and Kushchu and Kuscu, 2003). Castells et al. (2007) conceded that mobile ICT should extend public service mobilisation, but the public sector usually has not sufficiently utilised mobile phones, even though some progress has been made. Although public service potential of mobile IS may have a good future, there is a long way to go before it is fully realised.

Figure 2.2: Global ICT Development (Source from ITU, 2010)



Wireless ICT, producing ubiquitous mobile or cell phones, is a major tendency that has more and more impacts on the our society, despite geographical locations, cultural-diversities, economic differences, ages, among others. The growth of mobile technologies has been a global phenomenon, and it is necessary to investigate the reasons behind this successful growth, and the impact on societies and organisations.

Therefore, due to the new emerging ICT, mobilisation represents a new IS era. Does the mobile IS have the same main characters as the conventional IS? Or does mobile IS have its own new characters different from other types of IS? Sadeh (2001) considers that mobile technology that applied in commerce is not just only another information distribution channels with its own technologies, but also introduces mobile usage scenarios, business models and regulatory challenges. Due to the limitation of usability of mobile handsets, such as limited size of control panel, battery power and network assessment, well-targeted and concise content is suitable for ultimate users. Mobile IS

involves more new entrants: likely software developers, new technology platforms, equipment vendors, handset manufacturers, mobile telecom operators, etc. Security and privacy challenge is one of the new regulatory changes discussed by Sadeh (2001). Vulnerable wireless signal places new constraints on the issues of personal data protection. Mobile IS has its advantages and disadvantages However, Rettie (2003) compared several new communication technologies, and debated the issue pro and con. She selected Instant Messenger, email, Short Messages Service (SMS) and mobile phones. Among these new communication channels, SMS argued by Banks and Burge (2004) can deliver public services for some time to come in the developing world. Indeed, the emergence of mobile/wireless technology applications starts to be adopted in various industries (Castells et al., 2007). Some leaders are developing mobile IS e.g. healthcare service, education, emergency response, which are to consist of M-government (Kushchu and Kuscu, 2003). The healthcare sectors became early birds adopting mobile IS (Wu et al., 2007; Istepanian et al, 2004; Chatterjee et al, 2009; and Krishna et al, 2009). Therefore, to some extent MHIS, which improve quality of healthcare service delivery (Varshney, 2003), need to be explored.

2.2.1 Mobile Health Informatics

The rapid development of Mobile ICT has improved healthcare, which is considered to provide benefits to organisations and care for patients (Sheng et al., 2005 and Siau, 2003). Istepanian et al., (2006, p xxiii) define the usage of Mobile ICT Health, namely M-Health, as "emerging mobile communications and network technologies for healthcare". Varshney (2003) and Lu et al. (2005) report that research work on mobile health informatics has been introduced on understanding the impact of wireless technology on "providing effective and efficient healthcare service to patients, which reducing the costs of doing so." (Chatterjee et al., 2009, p 620). Due to the prevalent mobile phone technology,

Patrick et al. (2008) suggest MHIS can meet the need for the delivery of healthcare and population health.

Not only does MHIS enhance the healthcare service delivery in well developed countries, but also in developing countries or regions. Dr. Selanikio, a physician working in Africa, built up an organisation datadyne.org to "deliver more effective public health services" using the explosion in common mobile phones, Voice of America reported. "Instead of collecting data today to plan for a campaign next year, changing from that to collecting data today to plan for what we do tomorrow," Selanikio explained. "That is a pretty radical change." (VOA News, 2010)

Krishna et al. (2009, p 231) systematically reviewed 25 papers published between 2004 and 2008 about MHIS. Krishna searched Medline (1950-May 2008) for the relevant empirical articles of MHIS. The selected studies "included 38,060 participants...cover 12 clinical areas and took place in 13 countries." The authors conclude that mobile phones and SMS are able to improve processes and outcomes of healthcare. 60% out of 101 processes and outcomes were confirmed with successful positive results. The technology used in MHIS usually includes SMS, phone calls, voice messages, E-mail, Internet and PDA (Brendryen and Kraft, 2008; Benhamou et al, 2007; and Lu et al., 2005).

Among these technologies, SMS is the most ubiquitous technology, embedded in every common mobile phone, and a very popular unobtrusive communication channel between provider and user; when the service information has been delivered, it does not require the service provider and user have to interact with each other simultaneously, which is better than phone calls. Moreover, SMS messages can be saved for a rather long time.

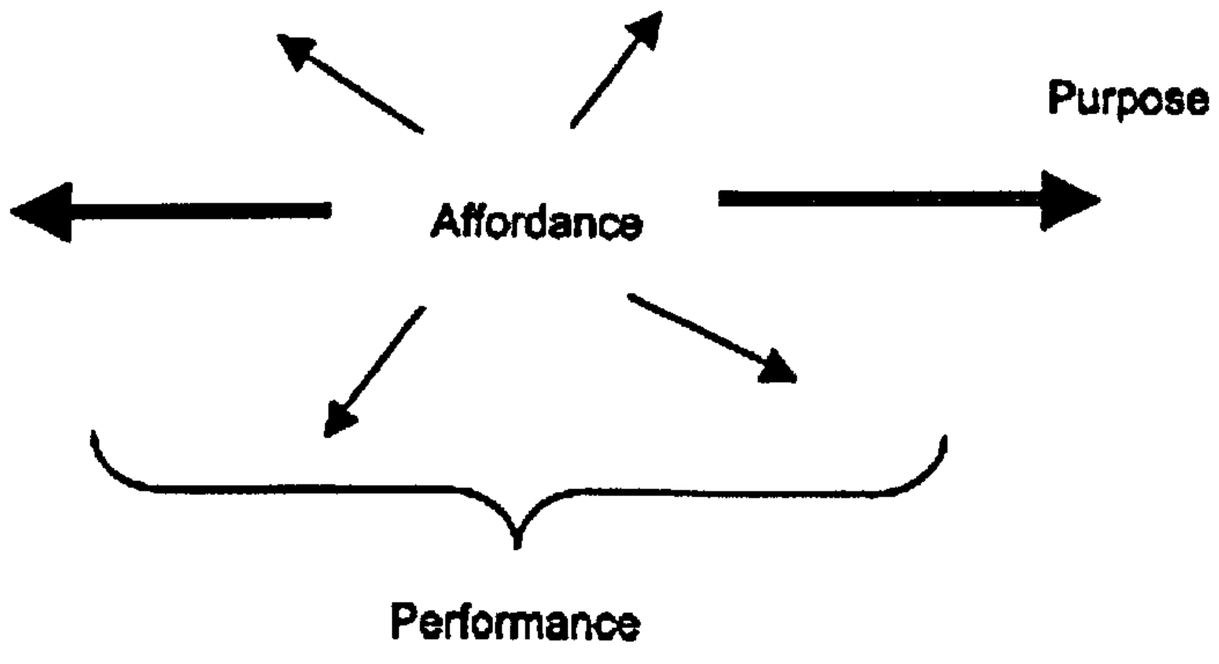
The charge for SMS and voice messages are cheaper than phone calls, but voice messages only can be active when users dial a certain service number, and that may cause the healthcare messages mix up with other personal messages. Users can often not immediately recognise some healthcare services to them, and also, because of complex medical terminology, it would be better to send by text "word by word" format rather than voice. E-mail and the Internet Access both appeal for Internet service, which has to be paid extra by the smart mobile phone users only. Given service delivery by special facilities like PDA for healthcare professionals and users, it requests that the health sector should have enough resource to support these functions such as economic conditions, user training teachers and equipment maintenance technicians, etc. Furthermore, users or patients may not like bringing the particular facilities themselves; all the same that may delay the service delivery or miss healthcare information (Harris et al., 2010).

From aspects of the content of healthcare information, SMS could only convey simple text messages, but as long as the operation systems in servers are able to receive customers' feedback, the function of communicating is practical. The strength of SMS lies in that, as one of the most fundamental functions of a mobile phone, it could benefit all mobile phone users. Secondly, text is the data transfer format of SMS, and the data it carries about is much less than that of smart mobile phones visiting websites. In that way some communication ports are saved. Dynamic web pages often contain database reading and pictures. If its transferring speed is too low, or transmission quantity is too large, then the transferring process will be delayed. The text of SMS is basically the smallest transferring unit of favourite applied communications. Thirdly, because of the formation of content, SMS is cheaper than phone calls, and the majority of mobile phone users could afford it. As a result, currently many medical mobile IS begin their application with the SMS

systems; and a number of mobile medical IS have been put into practice in the form of SMS during the last decade (Person et al., 2011; Fjeldsoe et al., 2009; Costa et al., 2010; Joo and Kim, 2007; Lu et al., 2005 and Krishna et al., 2009). It is likely that simple technologies very often do a great job as long as they fit into a social system.

Arnold (2003) points out that, even though new mobile technology can provide people a new sense, it has to be carefully considered with regard to its adverse reactions. A metaphor "Janus-faces" is used in the study. He argues that IS performance cannot be analysed from one direction only, but multi-dimensions (Figure 2.3). Adams and Fitch (2005), following the "Janus-faces" analysis, conclude that mobile healthcare has some opposed pairs of performance such as Standards: homogeneity versus heterogeneity; Increase in collaboration: interruption versus engagement, and increased efficiency versus increased workload. Standards imply that national standards may be imposed, top down by an inflexible route, while local practice will actually "emerge more rapidly as the imperative of local needs" Adams and Fitch (2005, p 346). Increase in collaboration means that real time interactions interrupt healthcare professionals more often; on the contrary, MHIS "offer better co-ordination of schedules". Increased efficiency versus increased workload indicates that more sophisticated equipment requires extra devices to implement tasks (Adams and Fitch, 2005). These issues highlight the fact that MHIS has its challenges, as other Health Information Systems (HIS) have (Berg, 2001 and Heeks, 2006).

Figure 2.3: Contrary Performances (Source from Arnold, 2003, p 235)



Notwithstanding the fact that MHIS offer lots of potential benefit for healthcare service delivery, with the result of the systematic review of MHIS (Krishna et al., 2009) that points out 80% success outcomes of the studies, there are still 20% of studies, which cannot be confirmed as "being successful". There may be failure or partial failure to meet the requirements as the stakeholder originally expected (Heeks, 2006). As a consequence, MHIS inevitably face new challenges.

2.2.2 Challenges to Mobile Health Information Systems

According to three generic case studies of community healthcare, Fitch and Adams (2006) argue that a "one size fits all" solution for mobile provision is inappropriate, due to the services adopting diverse technologies and working to various protocols. Yet, they sum up a list of challenges for all groups of healthcare staff in all the study cases (Table 2.2).

Table 2.2: Challenges to Mobile Provision for Community Healthcare Support (Fitch and Adams, 2006, pp 307-308)

Heading	Specific Explanation
1. Organisational issues	Understanding how groups of people work and interaction with the new technology introduced.

2. Focus on job function	Increased deployment of technology should not lead to a deskilling, or change patient-centred to the care supporting device.
3. Availability of equipment	All three services suffer from a lack of equipment support.
4. Appropriateness of equipment	Whatever the equipment is provided, technical and maintenance support needs to be in the right place to support the service delivery.
5. Availability and integration of notes and records	The need for Information integration and mobilisation.
6. Security and confidentiality	Data security and confidentiality as well as mobile device. This has to involve increasing processes and activities.
7. Working practices and protocols	New protocols and practices need to be agreed and accepted by professional groups.
8. Integration Standards	Standards for the integration of patient records and incorporation of mobile technology involving technical, organisational and political challenges.
9. National and Local difference	The perception of what is important between the policy makers at centre and the care providers in the community is different.
10. Access control processes and	Control and access policy has to be

procedures	well established as well as user identifications "human factors".

As Table 2.2 indicated above, the challenges are more than at a level of technical system re-engineering, but require MHIS to broaden the scope of considerations with different stakeholder groups to get involved, so that the issues can be dealt with, including the challenges (Fitch and Adams, 2006; and Gillies and Whetton, 2005).

Although we have discussed MHIS based on wireless ICT, the assumption of health IS success has been questioned in the field of IS (Heeks, 2006; Ammenworth et al., 2000; Varshney, 2005 and Varshney, 2007). Berg (1999 and 2001) concedes that successfully implementing health IS appears to be difficult. Hence, as MHIS itself has newly emerged from IS, seeking solutions to conquer these current challenges, and problems caused by MHIS should be based on the conventional theory of IS.

2.3 Theoretical Models for Mobile Healthcare Information Systems

The challenges of IS are not just limited in healthcare. Government or public sector IS encounters failures as well as in the commercial field (Ennals, 1995; Ainger et al., 1995 and DeLone and McLean, 2003). Therefore, in order to increase the successful rate of IS, many IS scholars have been investigating IS trying to find out the causes of failure (Bostrom and Heinen, 1977a), solutions or approaches to deal with it (Mumford, 1983 and 2006; Bostrom and Heinen, 1977b; and Land,. 2010), theoretical models or frameworks (Ein-Dor and Segev, 1978; DeLone and McLean, 1992 and 2003; Checkland, 1998 and 1999; and Pettet et al., 2008), etc, which are relevant to this issue, since the IS

discipline is already defined.

During the implementation process of field of government or public sector informatics, it is vital to understand the context in which government or sector works (Stamoulis et al, 2001). Stamoulis (2001) argues that E-government is not simply a matter of technology, but it is vital to understand the context in which government works.

Many IS fail to meet initial social requirements, rather than not working at all. Smith (1997) stated IS can be described "as being used effectively for the uses for which it was commissioned" in terms of a successful IS. He believes that the degree of acceptance or rejection by users and their organisation is normally important, even though many other factors may inhibit IS from meeting their strategic objectives. Scientific American (Gibbs, 1994) published a report that 3/4 of all large systems were 'operating failures', which meant IS do not function as intended (Table 2.3).

Table 2.3: Systems Success Rates (Smith, 1997)

	Success (%)	Marginal gain (%)	Failure/ rejection (%)
USA 1976	20	40	40
UK Office Automation Survey 1986	37	30	33
UK Small Medium Enterprises 1986	40	20	40

As discussed above, an appropriate technology can enlarge the capability of public sector organisations to meet the requirement of modern governance. Modern public management is calling for innovative change re-engineered by ICT (Andersen, 2006). Yet, choosing or making a decision is difficult, as people need to understand how the organisations and users of IS interact with

the technology, and then how technologies affect people and organisations. Without doubt, the interaction causes changes in organisations (Coiera, 2004; and Aarts et al, 2010).

Markus and Benjamin (1997) describe technology determinism, a philosophy of assuming technology can solve all the problems on its own, with human-related issues included, as a "magic bullet". When people trigger a gun, the bullet will hit the box by itself and cause damages. This is a rather naive way of managing a IS project.

Whatever technology is used, advanced or not advanced, it must be introduced in a suitable place to fit into organisations, and interact with users in a suitable way. Sometimes a simple technology may perform better than a complicated technology in organisations, as is shown in two similar studies by Harris et al. (2010) and Person et al. (2011). Harris et al. (2010, p 1024) found the special pager-based text messaging system "did not actively engage all participants over the course of the trial" group, due to the relatively low response rate 42.8%, and dropped significantly over the study period. In comparison, Person et al. (2011) found that 56% percent of subjects would accept mobile phone SMS. Cocosila et al. (2008, p 234) found the significant improved adherence after the trial: "by 246% for the intervention group and by 131% for the control group."

However, there is still a historical and current tendency to rely on complex technology systems, dealing with problems which are not understandable, either by managers or users. "Connecting for Health", as demonstrated in England, is part of a high technology approach, but did not involve users at the design stage, and has little chance of success, as it does not link to current ways of working (Brennan, 2005). This NHS IT system is "complex,

expensive, top-down, and lacks credibility among professions and the media" (Li, 2007, p 9). Therefore, in the English NHS, with widespread deficits and disillusion with new technology, ICTs have been seen as part of the problem, at least as much as part of the solution (Li, 2007).

Meanwhile, "Informing Health Care", in Wales, demonstrates an alternative approach that empowers healthcare professionals supported by the IT department (Li, 2007), which satisfies the users and promotes the performance of healthcare delivery. This NHS IT is simpler, cheaper and bottom-up, with a basis of human experience and expertise, and is seen as supporting local decision making (Li, 2007).

The exact same technologies may be in essence given different meanings within different contexts. Fjeldsoe et al. (2009) review the adoption of mobile SMS for delivering healthcare behaviour change interventions. Given the same SMS service, the delivery services vary, such as smoking cessation, diabetes self-management, hypertension medication compliance and asthma self-management, etc. These cases demonstrate that the meaning of the technology is seen in its use.

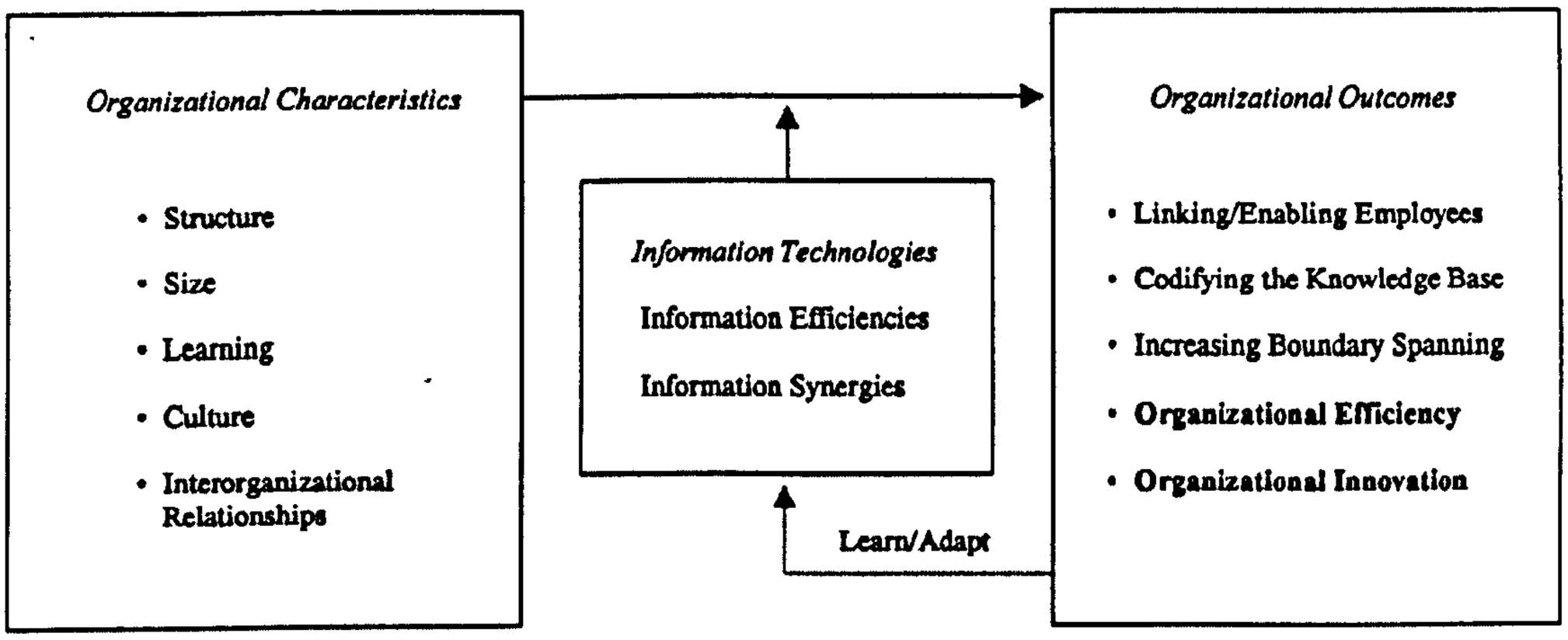
Technology itself is best seen as tools, rather than a complete and consistent system. It should be considering people, technology and organisation as a whole IS. Those who do not understand this, and assume that technology works in isolation, are dangerous, and in a position of putting IS at a risk of failure.

Thomas (1995) points out that ICT development does not rely on the technical factors about how the advances of technology are used. It is determined by social factors, which shape the implementation of ICT development. Social

factors are shaping ICT, and the ideologies and motivations which underlie it. These social and organisational elements are often critical in determining whether or not IS successfully meets its objectives (Sommerville, 2007).

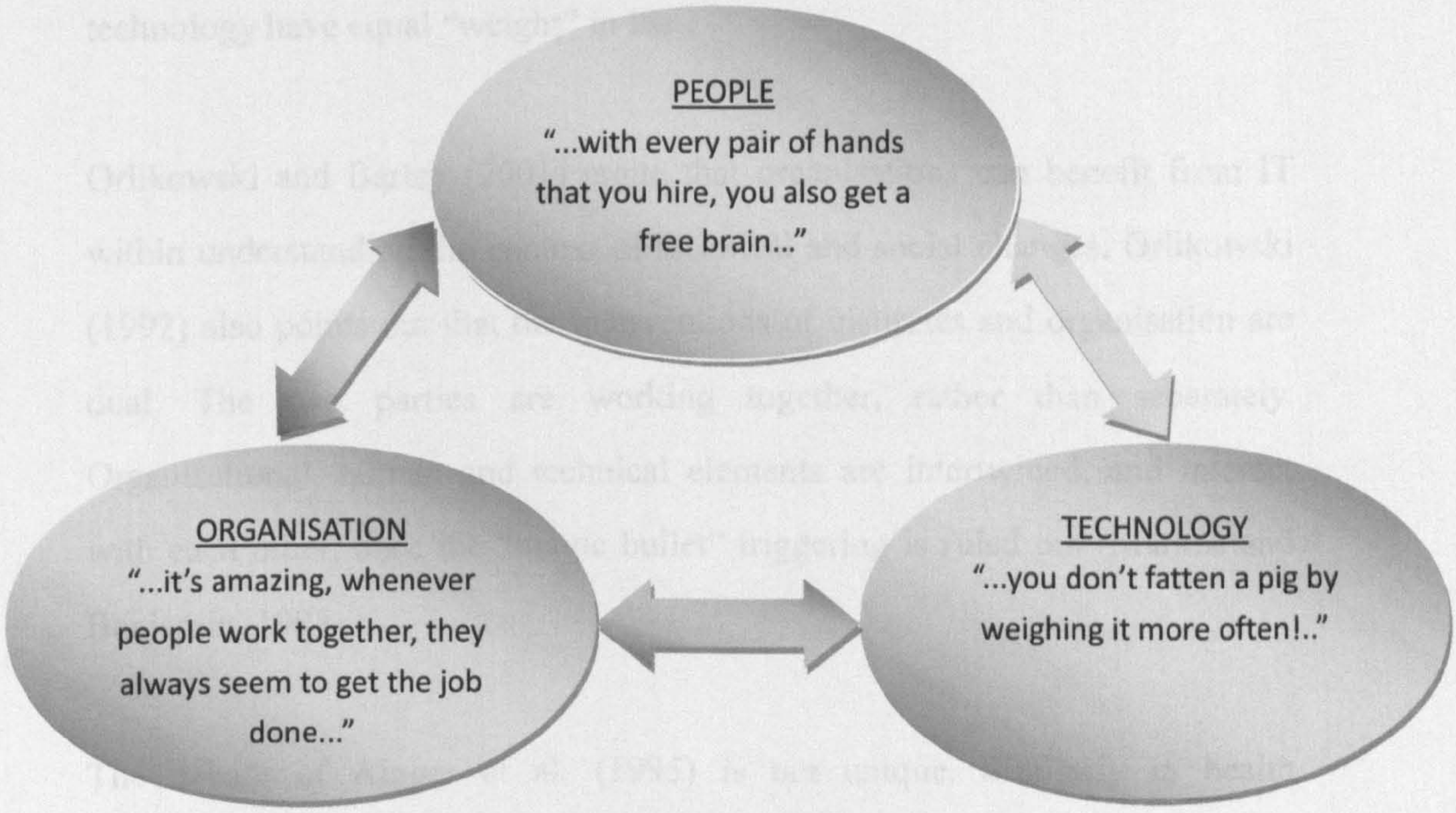
Dewett and Jones (2001) explain the role of IT in the organisation, that it is most likely the moderator element between organisational characteristics and outcomes. Iterative processes between organisational outcomes module and IT module are illustrated in Figure 2.4.

Figure 2.4: The Role of IT in the Organisation (Dewett and Jones, 2001, p 314)



Ainger et al. (1995) argue that an IS system is a human-centred system, which includes People, Organisation and Technology. A more comprehensive picture describing the relations among technical systems and human systems is presented (Figure 2.5). The authors (Ainger et al, 1995) claim that they do not advocate technology per se, but promote the appropriate use of technology and organisations. . Human-centred attention in IS is intended to meet the requirement and idealistic criteria, so that the IS can deliver improved overall organisational performance.

Figure 2.5: Human-Centred Systems – A Balanced Approach [Source from: Human Centred Systems Ltd 1993 (Ainger et al., 1995, p 18)]



"A human-centred system will not damage the worker's health, nor impair their well-being. It will correspond to the needs for the worker. It will give the worker the opportunity of influencing work decisions, and it will contribute to their personal development. Thus it deals not only with technology, but also with the fundamental principles and practices of organisations. Human-centred systems seek to accept the present skill of the user, and allow it to develop, rather than incorporating the skill into the machine, and thus deskilling the human. They allow a greater degree of freedom for users to shape their own working behaviour and objectives...encourage formal and informal social communications between users, and generally provide a healthy, safe and efficient work environment." (Ainger et al., 1995, p 17)

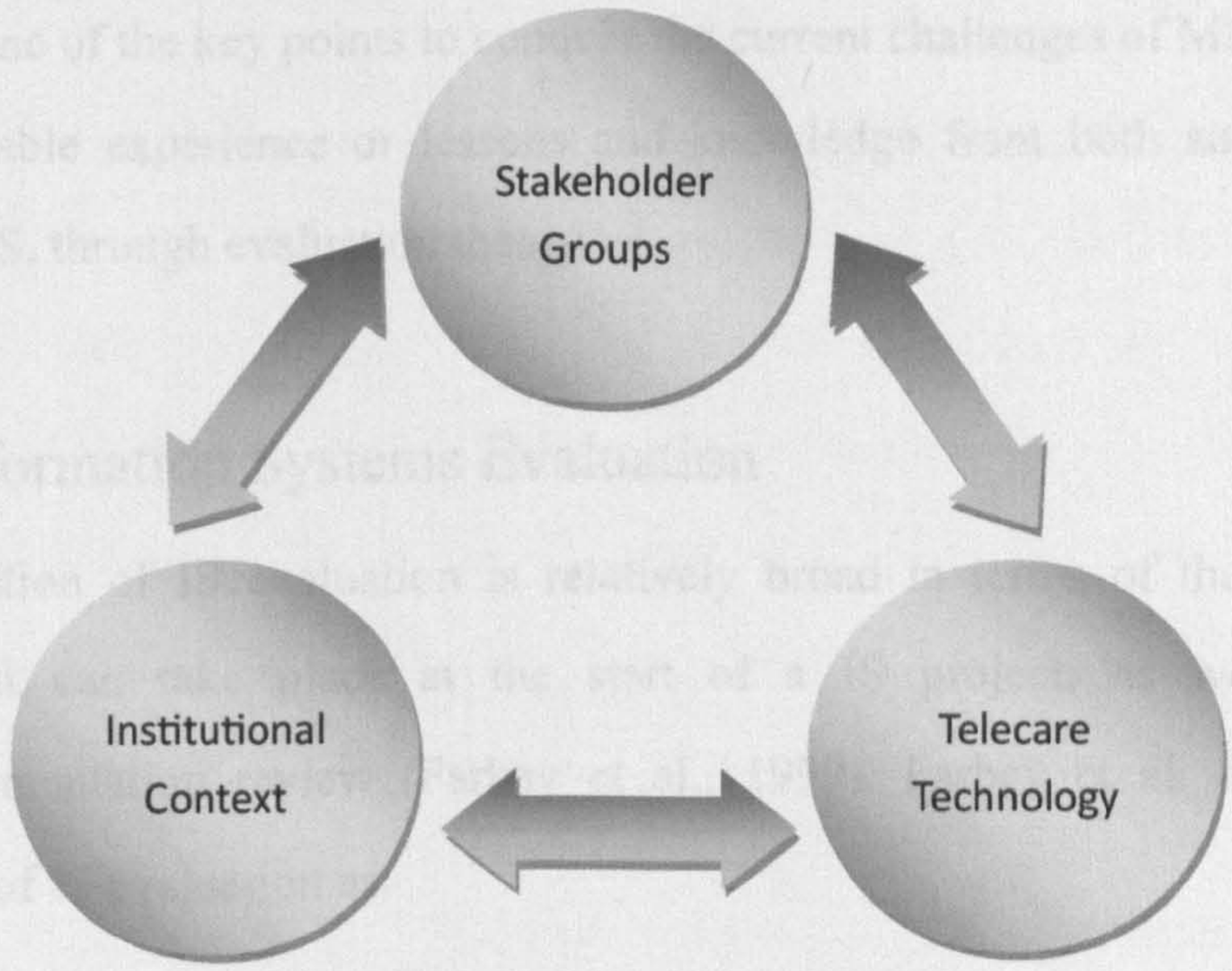
Human-centred philosophy in IS criticises Taylorism, which is an old system, with dangers of limiting the human capability to shape work and technology.

Human-centred systems aim to combine unique human capabilities and skills with the adoption of the technology rather than ignoring technology completely (Ainger et al., 1995). To some extent, human factors and technology have equal "weight" in IS.

Orlikowski and Barley (2001) argue that organisations can benefit from IT within understanding the context of technical and social changes. Orlikowski (1992) also points out that the interventions of institutes and organisation are dual. The two parties are working together, rather than separately. Organisational, human and technical elements are intertwined, and interact with each other, once the "magic bullet" triggering is ruled out (Markus and Benjamin, 1997).

The debate of Ainger et al. (1995) is not unique. Similarly in health informatics, Boonstra and Offenbeek (2010) developed a mode towards emerging e-health. successful implementation. Figure 2.6 illustrates that stakeholder groups are relative to people in IS; institutional context implies organisational context; and telecare technology is about technology.

Figure 2.6: Emerging E-health Implementation Mode (Boonstra and Offenbeek, 2010, p 5)



However, defining IS success or failure is a complex issue. If IS cannot completely implement all the initial requirements, or resolve the problems users originally expected, the IS would be defined as a failure. Nevertheless, this is not the case. Heeks (2002 and 2006) argues that IS may have partial failure or success and complete failure or success, which relies upon evaluations.

The reason why it is so hard to define IS success or failure is addressed by Heeks (2002 and 2006, p 126) as well, disputing that the first difficulty is "the subjectivity of evaluation: viewed from different perspectives, one person's failure may be another's success" (Lyytinen and Hirschheim, 1987; Sauer, 1993 and Jones, 2003). Smithson and Hirschheim (1998, p 161) emphasise "the subjectivity" underlying the IS evaluation such as "the subjective judgements concerned in answering the questions of 'what', 'how' and 'when' to evaluate tend to determine the final result of any evaluation study." The

second difficulty is the timing of evaluation: today's success may become tomorrow's failure (Heeks, 2002 and 2006).

Thereby, one of the key points to conquer the current challenges of MHIS is to learn valuable experience or lessons and knowledge from both success or failure in IS, through evaluation theory.

2.3.1 Information Systems Evaluation

The definition of IS evaluation is relatively broad in terms of theory and practice. It can take place at the start of a IS project, as well as a post-implementation review (Farbey et al., 1999). Farbey et al. deliver a definition of IS evaluation as:

"A process, or group of parallel processes, which take place at different points in time or continuously, for searching and for making explicit, quantitatively or qualitatively, all the impacts of an IT project and the programme and strategy of which it is a part." (Farbey et al., 1999, p 190)

That implies that the evaluation is a dynamic process, which is at the very centre in the study of IS through design, development and assessment. It concerns whether new or old technologies reshape the organisations, and create the way of people work together, while technology has been introduced. Klecun and Cornford (2005) suggest evaluation is to address and understand the reasons for the IS failure. Heeks (2006) argues a good model can be treated as a post hoc evaluative tool, and as a pre hoc risk assessment and mitigation tool. Therefore, there have been many arguments advocating different methods and approaches for conducting effective evaluation (Stockdale and Standing, 2006). The following context, from the literature perspective, studies several popular IS evaluation methods in an order of

occurrence. This section investigates advantages and disadvantages of the listed models, and discusses which theoretical concepts or evaluating models are desirable for this PhD research.

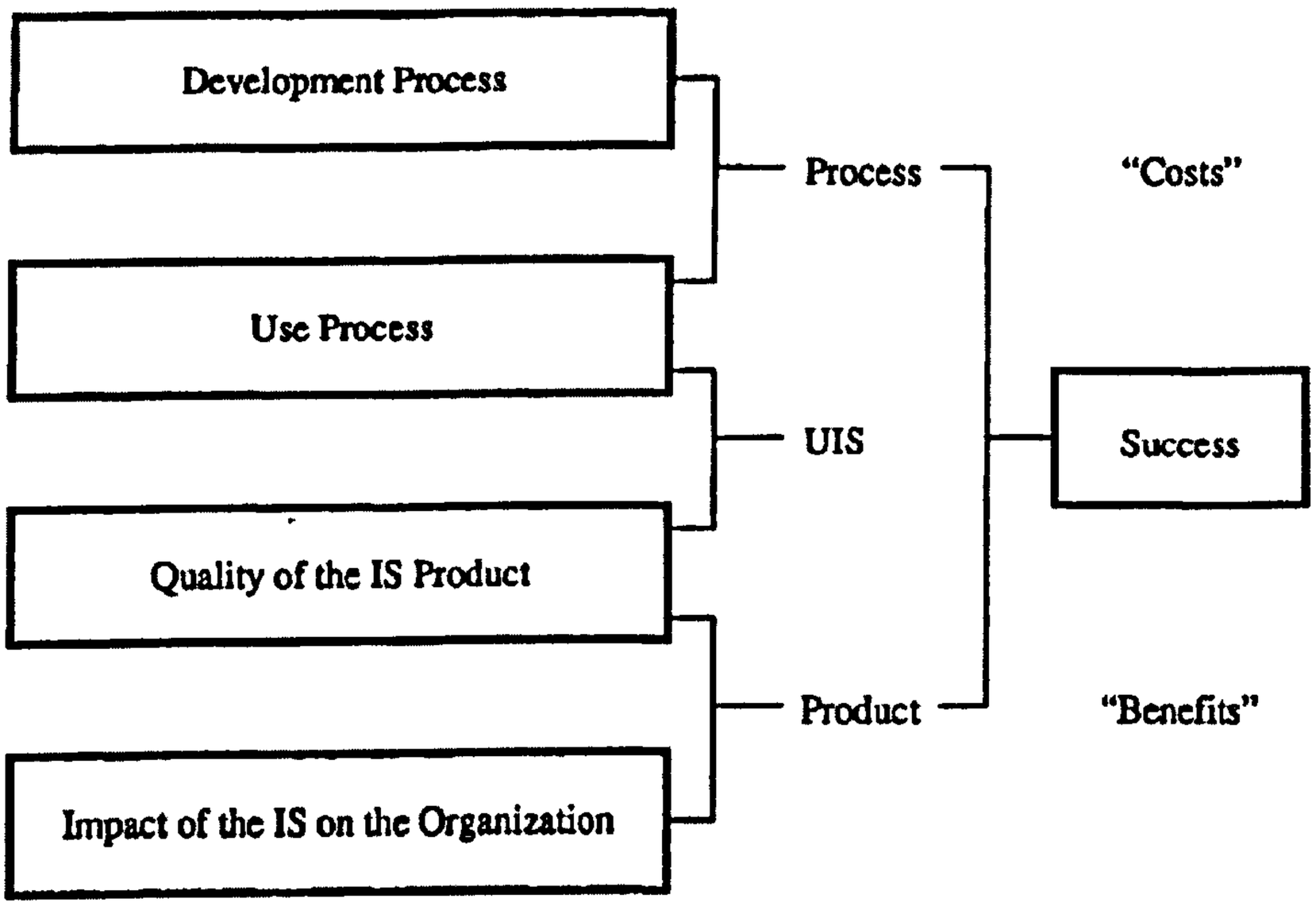
A matrix framework for evaluation of health IS, provided by Cornford et al. (1994), contains structure, process and outcome on one side, and system functions, human perspectives and organisational context on the other side Figure 2.7. The matrix lists details in every grid. However, the process or causal procedure cannot be indicated, such as how system functions affect the organisational context.

Figure 2.7: Cornford et al.'s Evaluation Framework (1994, p 499)

	System Functions	Human Perspectives	Organizational Context
Structure	Technical detail	Work conditions and implied requirements	Sustainability, opportunity costs, management needs, skill requirements
Process	Information processing; correct and valid	Human participation in tasks; social interaction	Altered delivery and practice
Outcome	Relevant, applicable, reliable	Quality of service, and outcomes	Effects in the wider world

Saarinen (1996) argues that main dimensions of evaluating IS success ought to include development process, use process, quality of the IS product and impact of the IS on the organisation in Figure 2.8. Three mediators between the constructs and success are process, user information satisfaction and product. "Costs" and "Benefits" are the two results of success. In reality, the results of IS success "Benefit" should influence both the technical systems and users (Checkland, 1999; Fitzgerald, 1998; DeLone and McLean, 1992 and 2003).

Figure 2.8: Saarinen's dimensions of IS success (Saarinen, 1996, p 106)

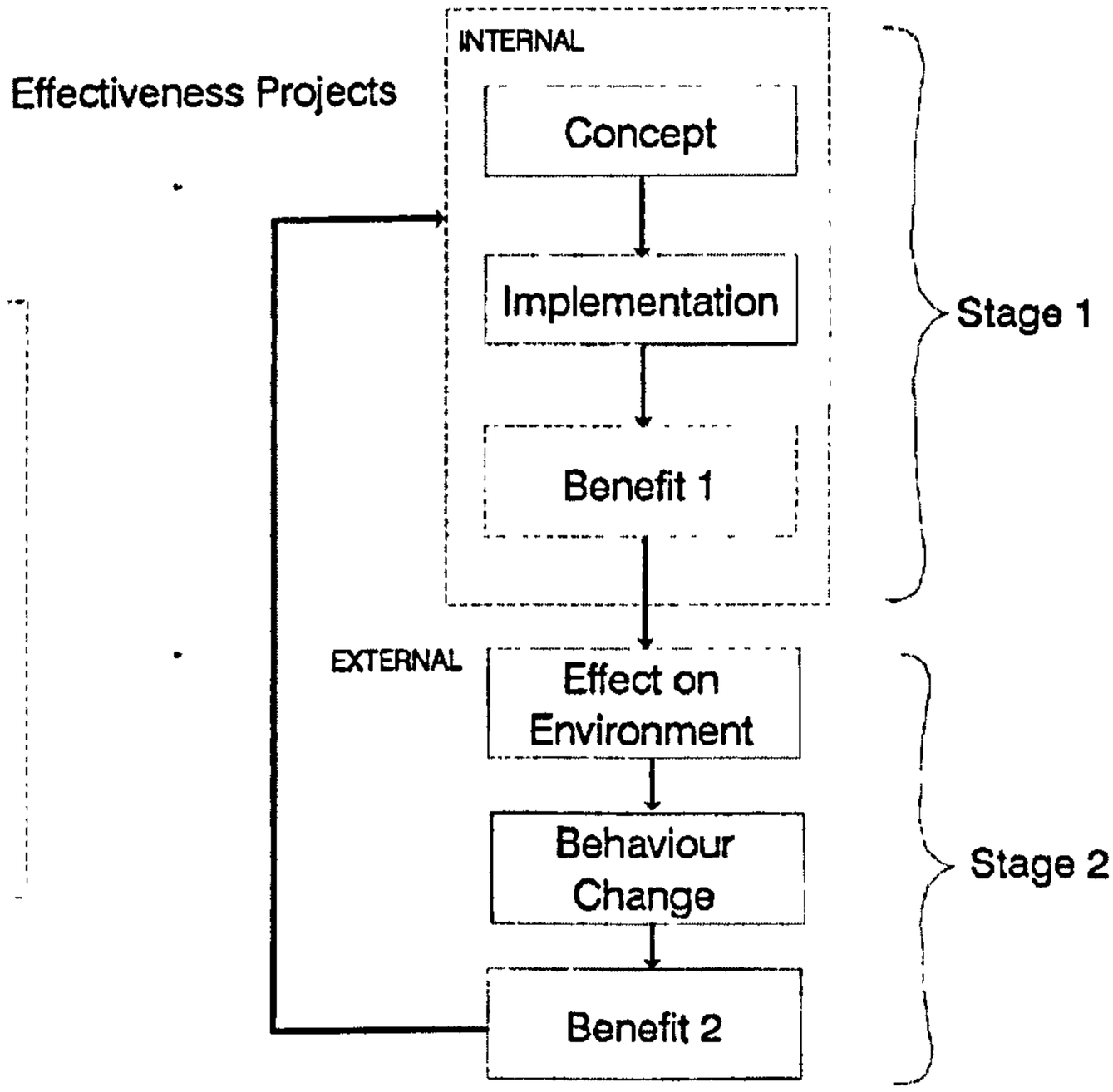


Checkland (1998 and 1999) argues, in his soft systems methodology, that characters of IS cannot be attributed to any specific part, as these properties can be derived directly from other components. However, IS result in similar outcomes from the similar background and technology, and lessons can be learned for each. Then, IS development has to make assumptions according to experience about other comparable systems and on common sense. Yet the soft systems methodology lacks adequate treatments of conditions, conspiring against elicitation of stakeholders' views, and undermines the true consensus, due to the messy connections among each element we study in IS (Klecun, 2002).

Fitzgerald (1998) demonstrates an effectiveness approach to projects in Figure 2.9. In this model, the process is linear, from internal IS to external environment. As discussed earlier, the human factor is an important aspect of IS, absent in Figure 2.9. Moreover, the interactions among human, organisation and technology are complicated as illustrated in Figure 2.5 rather

than straight away from the internal technical system to the external social system.

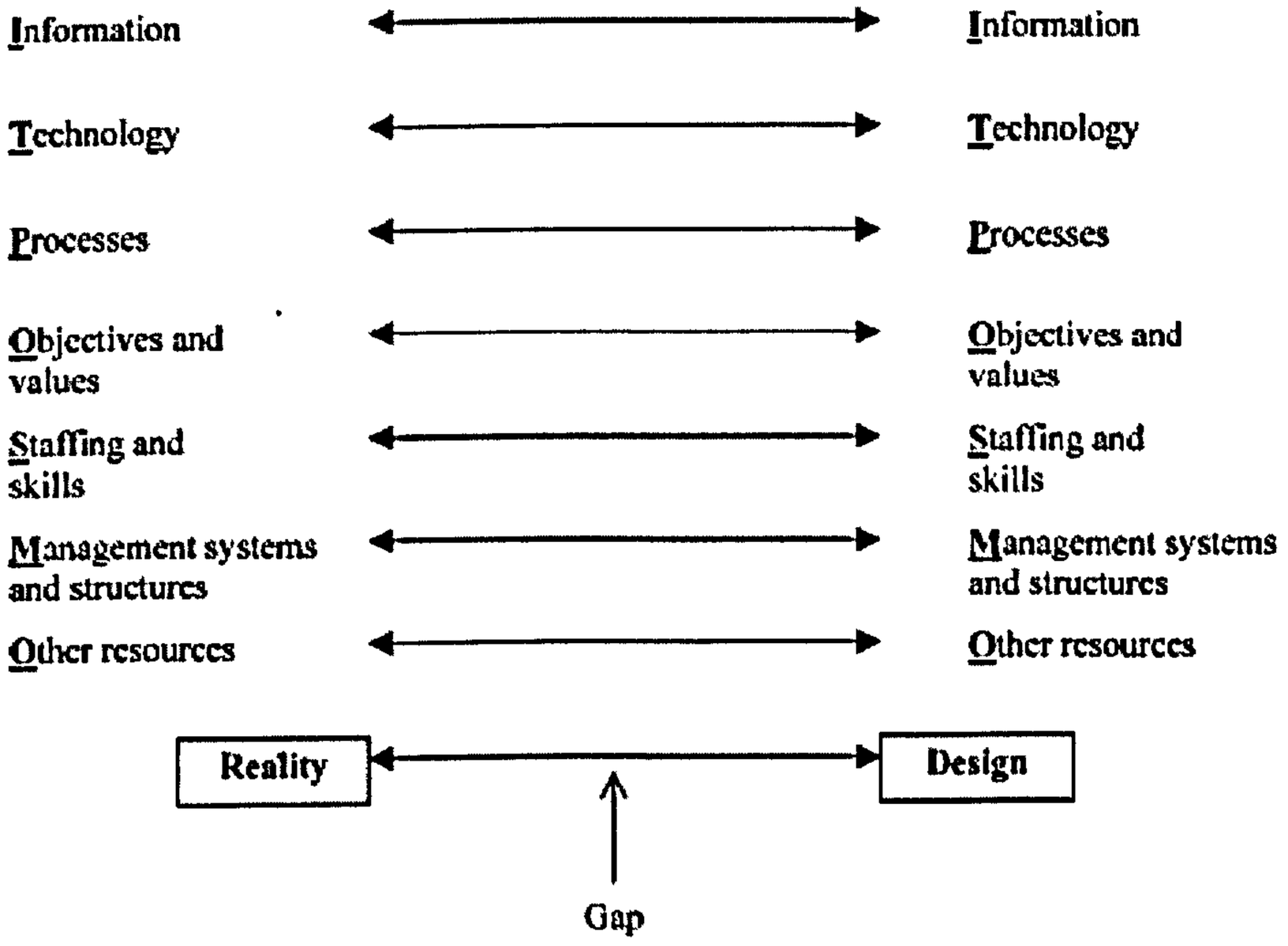
Figure 2.9: The Benefits Realisation Process (Fitzgerald, 1998, p 18)



Heeks (2006) points out that defining a Health IS failure and success is complicated, but is significant to IS development. He mentioned a "design-reality gap" conceptual model, which demonstrates seven elements for health IS design, including Information, Technology, Processes, Objectives and values, Staffing and skills, Management systems and structures, and Other resource (ITPOSMO) in Figure 2.10. In his model, associations between "Old" elements and "New" elements built up by seven links, which are isolating. The problem about "design-reality gap" concerns the IS elements being scattered, rather than an integration IS with an organisation. There is not any correlation between 7 elements that may cause evaluation more complex.

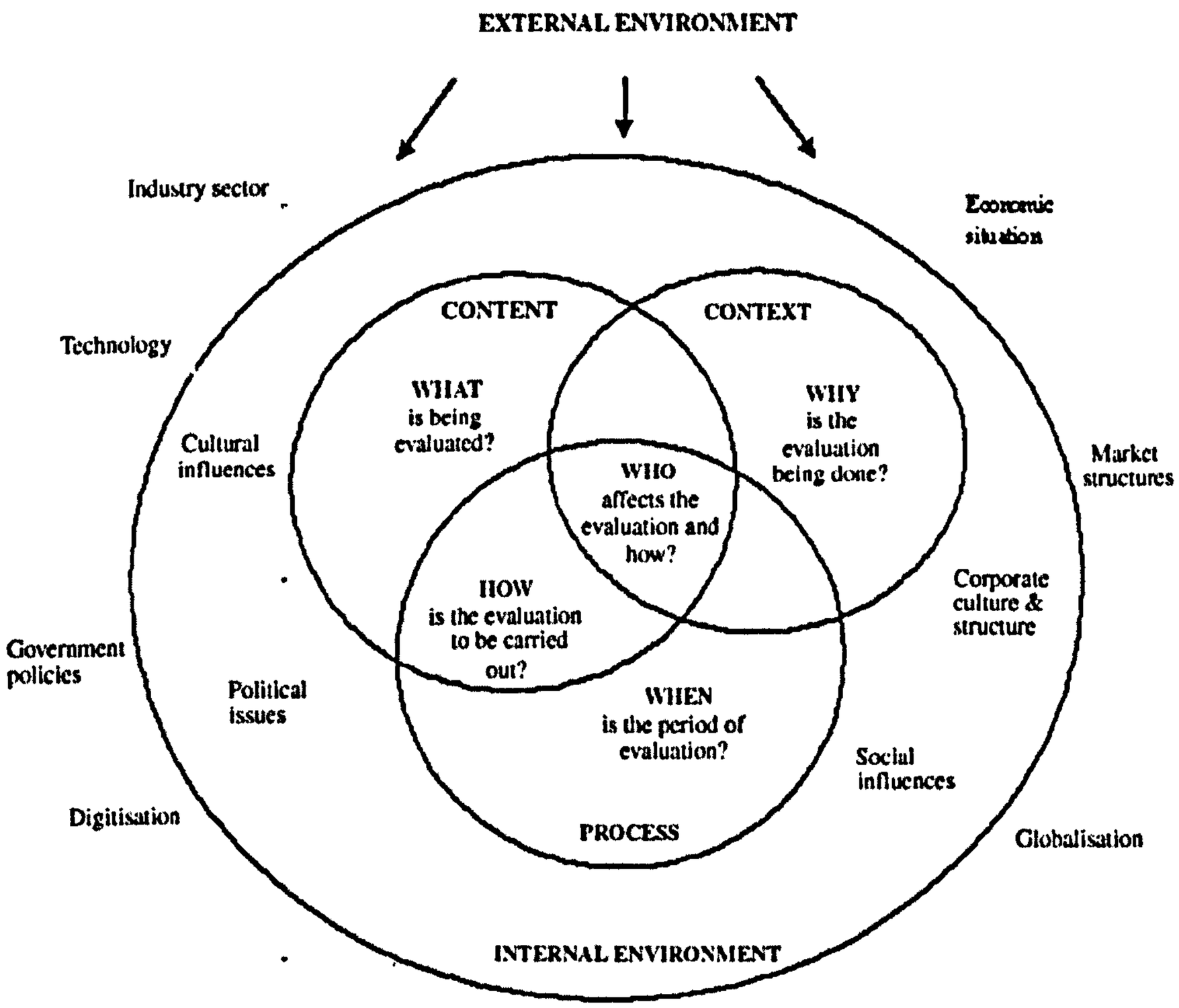
Figure 2.10: The ITPOSMO Dimensions of Health IS Design–reality Gaps

(Heeks, 2006, p 129)



The Content, Context and Process (CCP) is developed by Stockdale and Standing (2006), updating the original CCP created by Symons (1991). Stockdale and Standing introduce five Why, What, How, When, and Who questions to guide the people in pursuing the evaluation within 11 elements embedded inside and outside the environment in Figure 2.11. The CCP is trying to cover the needs for more holistic processes for evaluation (Stockdale and Standing, 2006). However, a main defect of the CCP is to over emphasise the social system, rather than the combination of technology and social elements, which less concern the technical aspect. Plus, the framework lacks empirical data support at this stage.

Figure 2.11: The Content, Context and Process Framework (Stockdale and Standing, 2006, p 1097)



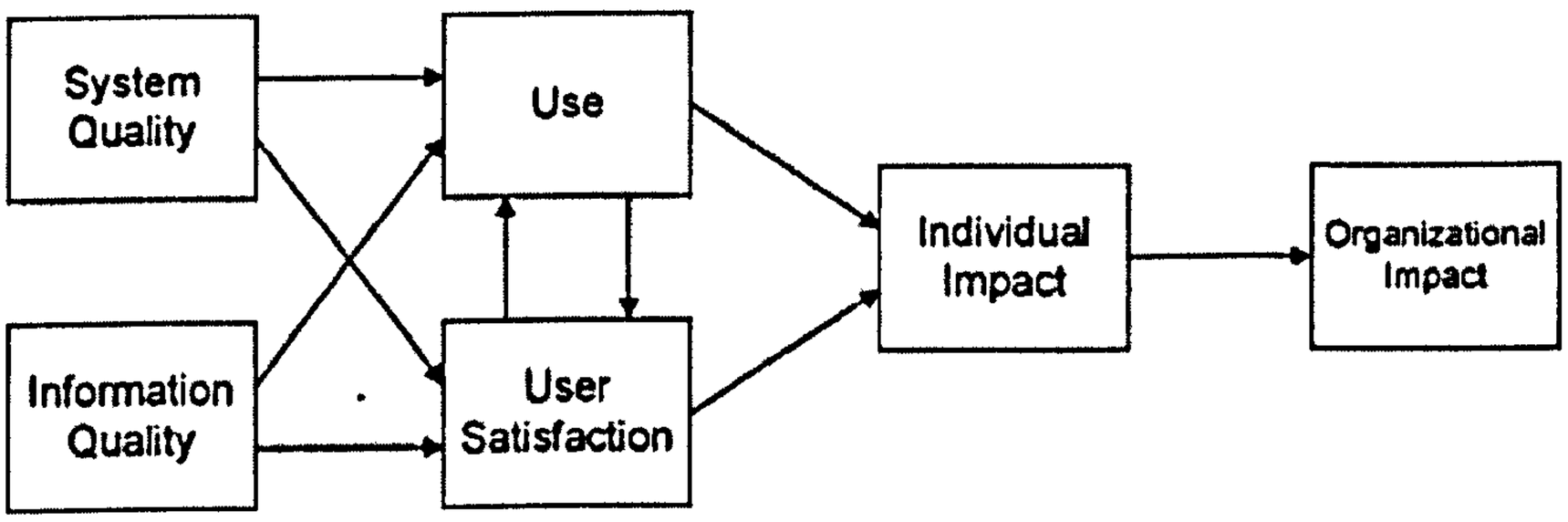
Wu et al. (2007) develop a model of mobile healthcare systems based on the Technology Acceptance Model (TAM) developed by Davis et al. (1989), and the Innovation Diffusion Theory (IDT) developed by Rogers (2003), in order to examine the evaluation of technology acceptance by healthcare professionals. User-related issues have been paid lots of attention by scholars (Sabherwal et al., 2006; Henfridsson and Lindgren, 2010 and Venkatesh et al., 2003). Even though the users' acceptance of technology is one of the important dimensions in IS success (Gagnon et al., 2003), TAM cannot deliver the full scale of the evaluation (Petter et al., 2008).

Even now, theorists are still continuing grappling with the question of the evaluation of IS success or effectiveness alongside models, framework and

theory (Wang and Liao, 2008). DeLone and McLean (1992 and 2003) twice comprehensively reviewed the literature of IS success theory, then proposed and updated a six-factor model as a taxonomy and framework for evaluate IS success, which is the widest IS theory accepted during the last twenty years.

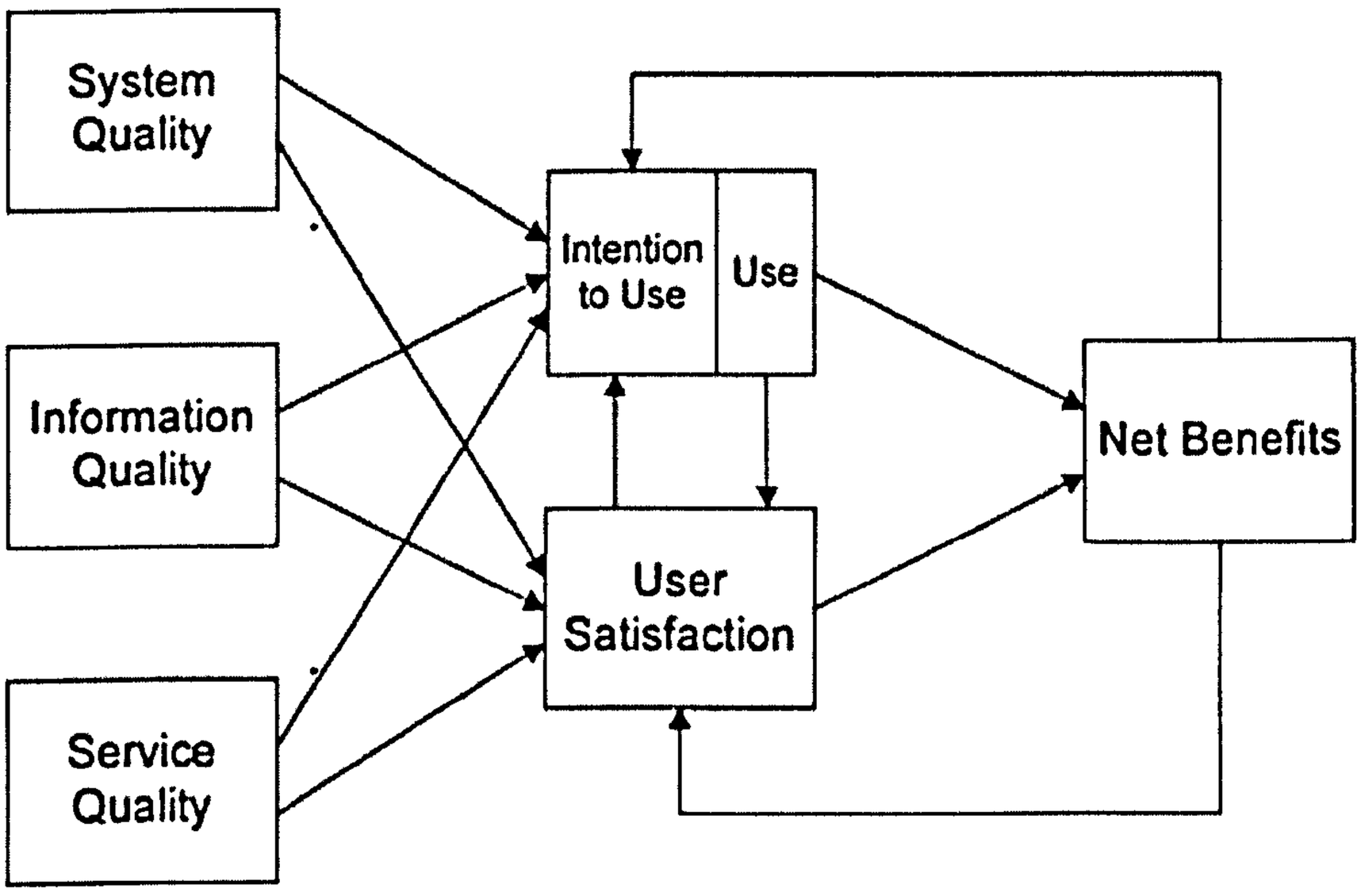
In 1992, DeLone and McLean (D&M) reviewed the literature published in 1981-1987 in 7 quality IS journals to develop a taxonomy of IS success, using the six dimensions System Quality, Information Quality, Use, User Satisfaction, Individual Impact and Organisational Impact (Figure 2.12). The model demonstrates that the success of IS can be represented by the technical system quality, the quality of the output information, the use of the output, the users' attitude, the effect of the IS on the behaviour of the users, and the effect of the IS on organisational impact (DeLone and Mclean, 1992; and Wu and Wang, 2006).

Figure 2.12: DeLone and McLean Original IS Success Model (1992, p 87)



In 2003, DeLone and McLean (2003) updated their D&M model. They added service quality into the model, and combined the individual and organizational impact as Net Benefit. The interrelations between the factors are based on previous research, but the authors point out that Net Benefit can affect usage of the technical system and user satisfaction (Figure 2.13).

Figure 2.13: DeLone and McLean Updated IS Success Model (2003, p 24)



The framework is an abstraction from reality, intended to point out which elements are most significant impact on a IS success. Their values are drawn from the complex situation of IS development. It provides essential aspects for shareholders to consider how to construct a good IS. The D&M framework makes a diagrammatic link between social and technical dimensions of a system. Although D&M is a multi-dimensional approach, rather than a linear model alongside the most cited success model, the social environment that faces the same technical computer systems varies, and that is one of the fundamental reasons for the disagreement over a simple framework, which can depict all the IS success situation.

During recent decades, the rate of IS failure is still high. The simplistic models have been criticised, so that leaders in the IS field become discredited, together with IS evaluation. The issue for people, technology and organisation is never simple, which cannot be holistic, demonstrated by some simplistic models.

In order to have critical and comprehensive conceptual thinking about how technology changes society, the Socio-Technical approach has been studied by some scholars from the Tavistock Institute since the 1960s. Socio-Technical theory argues that technical systems cannot be treated in isolation from the social systems which involved with it (Emery and Trist, 1960).

2.3.2 Socio-Technical Approach

Therefore, what is the context driving the emergence of the Socio-Technical approach, and the definition? Hatch and Cunliffe (2006, pp 40-41) states:

"In the 1960s, renewed concern for the human dimensions of work led to the development of Socio-Technical Systems (STS) theory. The Tavistock Institute of Human Relations in the United Kingdom proposed the idea that human behaviour and technology are inter-related, and that any changes in technology will affect social relationships, attitudes and feelings about work which in turn affect the output of the technology. According to Tavistock researchers, managers therefore need to identify the best fit between technical and social systems, and maintain a balance between them that may mean compromising the optimality of one or both subsystems."

The Socio-Technical approach applied in the field of IS has been introduced as a concept of integration natures of IT and social needing within an organisation as a whole system, namely STS since the 1970s (Bostrom and Heinen, 1997a and 1997b; Land, 1982; Trist and Murray, 1993; Kling and Lamb, 2000 and Mumford, 2003).

The idea of Socio-Technical approaches brings together people, organisations and systems. It has been strong at the Tavistock Institute in London. Research work on Socio-Technical approaches continued to develop in Scandinavia

(Bansler, 1989), whereas in the UK Thatcherism emphasised the individual, rather than society. Ainger et al (1995) argue Socio-Technical approaches can be developed from Human-Centred systems in Europe, which were an alternative to Taylorist scientific management and a technocentric approach. Brodner (1990) argues that technology development has to focus on the human aspect, rather than technology perspective. Numerous articles, published in AI & Society, take forward human-centred systems in Europe and India. In terms of types of anthropocentric systems, there are individual and collectivist systems. Individualism is strong in West developed countries, while in regions of the Far East, there is a collectivist tradition such as in China and Korea. In turn this means that the same physical ICT can have different meanings.

Nevertheless, we cannot deny the importance of the technology itself. Appropriate ICT applications are one of the keys to ensure an IS success. One of the advantages of using Socio-Technical thinking is that it offers a fresh way of making sense of different ways of doing things.

Klecun and Cornford (2005) deliver a table comparing the different perspectives of the IS evaluation (Table 2.4). In the Critical approach, it is defined technology itself, which is not neutral. As previous discussion in this chapter has discussed, technology is just a tool, like a coin with two sides (Arnold, 2003). Social constructivism holds a broadly similar interpretation in the main aspect with the Socio-Technical approach. However, it emphasises more social aspects rather than technical factors, which should be fairly treating technology and social elements. Hermeneutics focuses on individuals rather than groups or organisations.

Table 2.4: Different Perspectives on Evaluation (Klecun and Cornford, 2005, p 235)

Different perspectives	*Critical*	*Socio-technical*	*Social constructivism*	*Hermeneutic*
Main aspects	Evaluation as a political, nonobjective process. Different stakeholders may have conflicting (vested) interests and exercise unequal power. Technology is not neutral but is socially constructed, presenting opportunities for furthering the case of emancipation or detracting from it. Evaluation must be normative (guided by norms and values), and represent interests of all groups affected by the technology. It should be based on learning and dialogue (striving for ideal speech situation).	Evaluation as a political process. Different interested parties should have a chance to voice their opinions about the system and its potential effect. An 'optimal' solution can be arrived at (designed) through a rational process of negotiations. IS are a mixture of social and technical, and thus evaluation should be a socio-technical process itself. The distinction between social and technical is largely preserved.	Evaluation as a political, nonobjective process. Different relevant social groups may have different interests. For the technology (or evaluation) to succeed these groups must be 'enrolled' in the process, i.e. their interests must be engaged. Technology is socially constructed and evaluation is a part of this (contingent and messy) process. The social and technological are closely interwoven and cannot be artificially separated.	Evaluation as an informal, subjective and situated process. Meaning is situated, i.e. technology/ IS are understood in a particular context (e.g. organisational) and within a canvass of our past experiences. Understanding (and thus evaluation) is an incremental, circular process, involving re-interpretations.
Questions about the evaluation process	What is the macro context of the evaluation? In what way macro trends (and their perceptions by different actors) influence the evaluation? Who sponsors the evaluation? What are its underlying (hidden) aims? Are the interests of different groups represented in the evaluation, and how? What are the power relations between different groups? How do the process of evaluation and the choice of measurements effect the evaluation outcome?	Who are the stakeholders? What are the goals and measures relevant to the business, employee and customer perspectives? Does the system help to achieve those goals? Are working lives reflected in the designing of technology?	What are the relevant social groups? What are their views about the system? How are they enrolled in the process of stabilising (and evaluating) technology? What organisational vision does the IS support/appear to support/or suppose to support in the eyes of different groups? In what organisational context is the evaluation being conducted? How is the IS constructed through evaluation?	What are people's daily experiences of the system? Is the IS embedded in their work practices? How do they perceive the system? How such perceptions are constructed? (E.g. What theories-in-use influence their perceptions; What are their past experiences of similar IS?)
Primary focus	Society/organisation	Group/organisation	Group/organisation	Individual

Sommerville (2007, p 2), a famous scholar in software engineering, affirms that "Software is never used on its own, but always as part of some broader system including hardware, people and, often, organisations." Consideration of this broader system, called STS, is essential for software engineers. The elements in STS profoundly affect the technical requirement and operations, such as organisational and human concerns.

In order to make sure of IS appropriate development, Bansler (1989) points out three theoretical traditions, which are technical systems theoretical tradition, Socio-Technical tradition and Critical tradition. Technical determination and critical tradition are not ideal for tackling IS problems to the organisation as in the discussion above, and the Socio-Technical approach suggests that IS needs to be seen as comprising people and technology in a context of organisations. They can enable something practical to emerge such as Smith (1997, p 13) argues:

"An effective Socio-Technical system is one in which the technical nature of the solution (hardware and software) is in balance with the social system (people and procedures) in which it operates. It is not possible to separate the technical nature of the IT system from the organisation into which it is to be introduced, or from the users who are going to operate it."

Very often the specialists speak using different languages, in terms of professional terminology, and communication is poor (Ennals, 2006). Even every school has their own disciplines, the Socio-Technical approach has proved to be one of the most popular concept of IS development (Mumford, 2000; Doherty and King, 2005 and Aarts et al, 2010), as this should enable this research to give an account that brings together people, technology and organisations in health service centre.

Clegg (2000) offered a set of 19 Socio-Technical principles of system design based on Cherns' work in 1987. These 19 principles include Meta-principles, content principles and process principles in Table 2.5. It demonstrates the Socio-Technical approach is a series of continuous process, rather than a specific stage through the design, developing and evaluation of IS.

Table 2.5: Principles of Socio-Technical design and their relationship to those by Cherns, 1987 (Clegg, 2000, p 465)

Meta-principles

1. Design is systemic.
   This perspective is implicit in Cherns' principles and arguments.
2. Values and mindsets are central to design.
   This is similar to the views presented by Cherns.
3. Design involves making choices.
   Cherns very briefly considered social options under his principle of minimal critical specification.
4. Design should reflect the needs of the business, its users and their managers.
   This issue was not covered by Cherns.
5. Design is an extended social process.
   This issue was not covered by Cherns.
6. Design is *socially shaped.*
   This issue was not covered by Cherns.
7. Design is contingent.
   This issue was not covered by Cherns, but the idea was implicit in his writing.

Content principles

8. Core processes should be integrated.
   Processes were not explicitly included in Cherns' principles, but this principle subsumes his ideas on boundary location, information flow, and power and authority.
9. Design entails multiple task allocations between and amongst humans and machines.
   This principle includes Cherns' multifunctional principle and his criteria for job design, but extends to incorporate consideration of task allocation between humans and machines.
10. System components should be congruent.
    This is equivalent to Cherns' ideas on support congruence.
11. Systems should be simple in design and make problems visible.
    These ideas were not included in Cherns' principles.
12. Problems should be controlled at source.
    This is equivalent to Cherns' principle of variance control.
13. The means of undertaking tasks should be flexibly specified.
    This amends Cherns' ideas on minimal critical specification, in part to deal with the issue of technical design for complex systems.

Process principles

14. Design practice is itself a sociotechnical system.
    This subsumes Cherns' principles of transitional organization and incompletion.
15. Systems and their design should be owned by their managers and users.
    This amends Cherns' principle of compatibility and involves a change from his emphasis on user participation to user ownership.
16. Evaluation is an essential aspect of design.
    This is mentioned briefly under Cherns' principle of incompletion.
17. Design involves multidisciplinary education.
    This is not included in Cherns' principles, but the notion of multidisciplinarity is implicit in his ideas.
18. Resources and support are required for design.
    This is not included in Cherns' principles, but is implicit in his arguments. Resources here are interpreted very broadly.
19. System design involves political processes.
    This is not included in Cherns' principles, but was recognized by him.

Rather than providing 19 principles Clegg (2000), Mumford (1983) concluded a clear and operational method base on STS, called ETHICS, which stands for the Effective Technical and Human Implementation of Computer-based Systems. She debated only the three first principles for the ETHICS as the objectives of STS: the Integration of IT and Organisation, stakeholder Participation, and Job Satisfaction. Stahl (2007) argues that ETHICS is continuing in change management of IS since 1980s. The following text explains more details about the ETHICS.

Organisation and ICT Seamless Integration

If IS cannot meet the business or organisational needs, the stakeholder may reject the IS. Sommerville (2007) believes that human factors from IS perspective that affect on STS include: 1. Process change such as training and resistance; 2. Job change likely redundancy; and 3. Organisational change such as power control and structure changes. These are all issues which come with IS implementation, which are controversial and even involve value conflicts between technology and people. Furthermore, predicting the impacts of IS on organisations is complex. In order to understand these influences of IS, various theory. have developed such ETHICS (Mumford, 1983), Soft Systems Methodology (Checkland, 1998). Their study extended sociological research on IS for working organisations.

Mumford (2006) argued that the Socio-Technical approach describes a process and a humanistic set of principles that in the European context is associated with technology and change.

"The results of STS were always closely monitored and recorded to establish if it had led to both the efficient use of the technology and an improvement in the quality of working life of affected employees." (Mumford, 2006, p 318).

Participation

The Socio-Technical approach tends to be discussed in a context of encouraging workers' participation and engagement. The discussions, however, are culturally situated. This raises fascinating issues of working life and working environment. Different parties or group within the same organisation have different concerns. Participation insures the interests from groups or individuals can be considered to 'fit' IS development.

Job Satisfaction

The IS users are influenced by the way organisations process, and by their interactions with other staff and customers. Job satisfaction should be one of the most significant aspects in IS (Petter and McLean, 2009; Melone, 1990 and Wixom and Todd, 2005). STS has been being accepted in the health informatics field. The following section will discuss how the STS is employed in the health sector.

2.3.3 Socio-Technical Systems and Health Informatics

Many scholars in IS keen to discuss the theory of IS success and IS failure (Berg, 1997 and 2001). There is no exceptional in the field of HIS.

Heeks (2006) published a paper exploring HIS failure, success and improvisation. Heeks demonstrated a research model, namely Design-Reality Gap, to conquer HIS failure, a conventional significant problem to IS. Design-Reality Gap addresses that the IS developer should realise that the gap between IS planning and real resource and organisational restrictions. "No panacea for avoiding failure of IS" (Heeks, 2006, p 134). HIS failure, like the other fields of IS, also has a degree of failure: a partial failure. For example, system timing response delay may be within some user's tolerance, but not others; or increasing cost of IS may not be affordable eventually, as the IT system extends its implementation date. As we can see now, defining a success or failure of IS depends on people in organisations, and it is complicated. Heeks' (2006) IS model of Design-Reality Gap has some general suggestions for the IS development. However, his model has its limited consideration of HIS development dynamic processes. The Socio-Technical approach, a flexible IS development and design method, states that what is the Socio-Technical approach, rather than only a few static factors indicating what

is most important to IS. According to Heeks' (2006, p 126)argument, "One's failure may be another's success". But we should keep our eyes on a broader approach from multidimensional organisation issues. In this thesis, the Socio-Technical Approach describes IS usually as a STS.

Berg. M (2001) discussed theories of IS success in Health informatics, emphasising that advantages of STS comparing with others such as technology determination, etc. He pointed out that STS puts the interrelation in central of the IS implementation (Berg, 1999) supported by his cases in personal IS. Success has many dimensions in terms of IS implementation, but the question concerns the success of a system, and then becomes the questions of "success for what?", as Berg mentioned (2001). Indeed, success itself is a multi-dimensional concept in IS. Berg (2001) concluded that there are dynamic developments in IS in health, in which he strongly treats IS as an organisational issues. STS, therefore, a method requesting an interactive approach between technology, people and organisation, is significant for the development of IS. STS has a section about the introduction of the nature of the health work.

Nevertheless, Coiera (2007) points out that some criticize that STS analysis can be at a risk of its extreme, which might form of anti-technology belief. This is not surprising. However, the concept of STS does not hamper the development of the technology. In fact, it enhanced the appropriate development of it. It saves the social resource, human and financial capital so that it can reduce the cost and waste of money (Coiera, 2007). Actually, the original papers of STS about the coal workplace in 1960s emphasise that the working arrangement for workers should be concerned very carefully with the technology, but did not resist new technology.

Haux (2006) retrieves the history trail of HIS. In his argument, he suggests HIS has to be user-oriented or customer-oriented, rather than technology driven; that means the focus of HIS should be defined as a field of information management. A documentary about a hospital IS strategy is presented in the article (Haux, 2006). HIS from digital archive to wireless, from local communication to globalisation, requests more attention to organisation management to fit itself into the new tendency. Haux (2006) summarises the HIS aiming not for more technology, but for more and better care, a care that is affordable in aging societies.

The key element here is human impacts, behaviour and experience. The merits consider more broadly than technical computer-based systems, as this includes how the technology can be used within an organisation. It means that people-ware as inherent parts of the system, are governed by organisational policies and rules and may be affected by external constraints, such as national laws and culture context. The components in IS are inextricably intermingled. Thereby a successful STS depends on the functioning of each component working well with other alignment components.

Coiera (2004) also suggests that four rules for the reinvention of health care: Rule 1, technical systems have social consequences; Rule 2, social systems have technical consequences; Rule 3, we did not design technology, we design STS, and Rule 4, to design STS we must understand how people and technologies interact.

In Coiera's rule 1, it indicates when introducing a technical system into a certain setting, it will affect the users and the people surrounding them. For example, a laboratory scientist or a doctor use IT facilities, they may need to spend some time for operating the equipment rather than fully concentrating

on the interaction with the patients (Coiera, 2004).

In rule 2, using email or text message to communicate with other colleges in a daily basis may depend on the users' habit and other social factors but not the software's intrinsic utility. People with social rules and values use these same rules to decide what to adopt and interact with new technologies. Sclove (1995) comments that people in a society appear more acceptance of social circumstances from what we are more familiar, social structures than the new results from the newly technologies. ICT must receive the same public scrutiny as other social structures do, Scolve (1995) recommends.

In rule 3, Coiera (2004) gives an example about an electronic medical record, which needs to fully support the clinicians, rather than the engineers' technical transcription for the system.

In rule 4, there are always some privacy and security issues brought up by introducing new IS. Private protection is not just concerned with the technical system. It comes with the system users interact with the technical systems.

As argued in Section 2.2.2, MHIS has emerged in recent years. However, do the relevant theories of STS fit into this new type of mobile IS? How do we penetrate years of theoretical distortion to find the truth? The following section will clarify the thesis research objectives and research questions.

2.3.4 Research Objectives and Questions

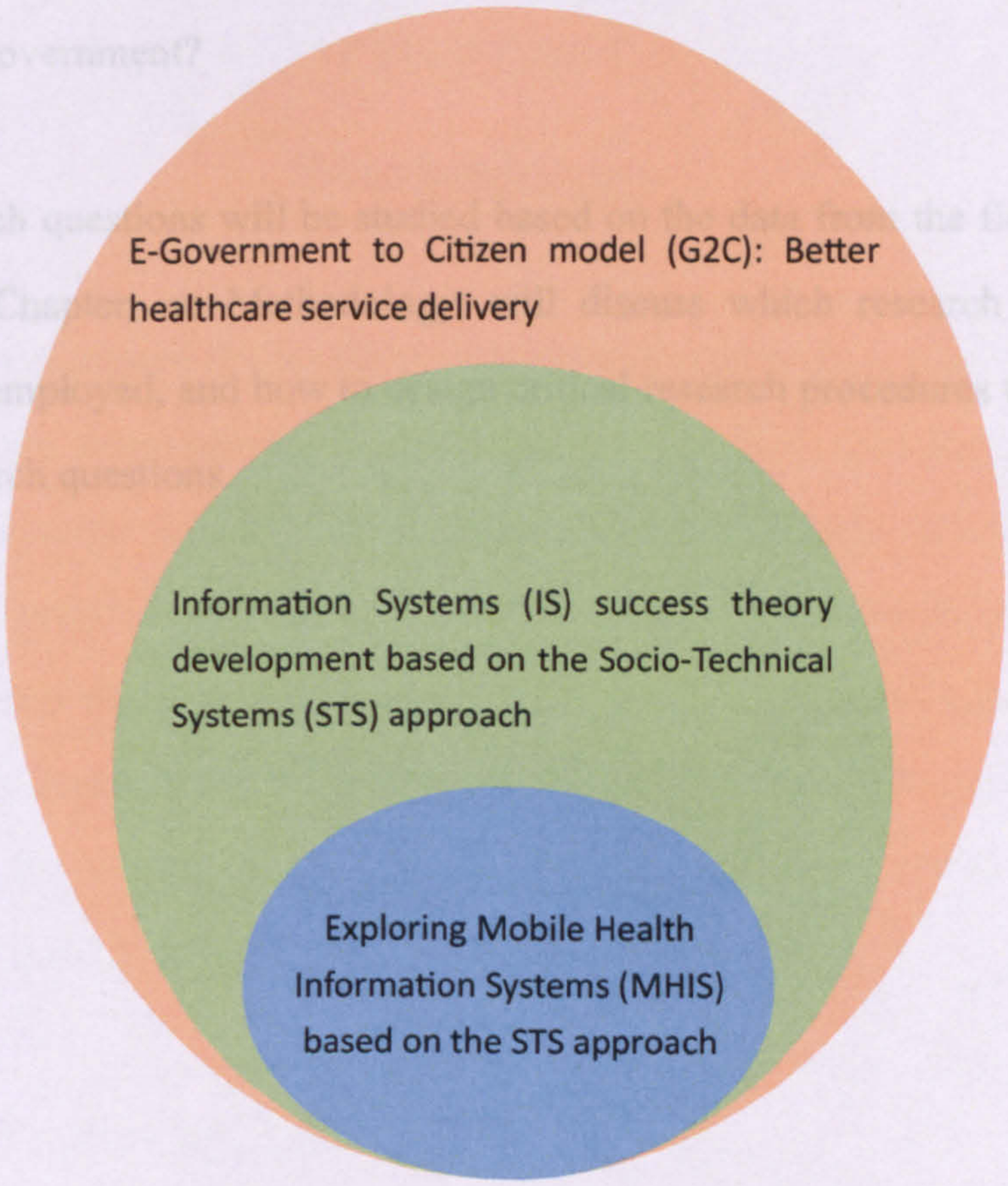
This thesis begins with research on public service information delivery of E-government, and then narrow down to research on MHIS. Bostrom and Heinen (1977b) concluded that STS can offer a more appropriate framework than other approaches, as well as being a useful methodology for the IS design.

Mobile phones are held by individuals. "Systems" comprise individuals working together in organisational structures, networking with a common purpose. Rather than ending up with one simple model or a diagrammatic framework that is trying to cover all the countries, this study based on STS adopts different cases that we can learn from, because in the field of social science, there is not a master key or a panacea for all MHIS.

A research gap can be found from the previous section of the literature review. There has been relative neglect in the literature of an STS approach applied to MHIS within the context of healthcare information service delivery. The potential knowledge of developing opportunities and organisational challenges posed by these mobile IS can be studied from real cases.

Therefore, the aim for this research is to explore the STS approach applying the MHIS evaluation from a perspective of healthcare service delivery. The conceptual framework impacts on both academic research and professional practice. Figure 2.14 demonstrates how this research is structured. The large circle in Figure 2.14 is the research domain for this research. The medium is the scope of the research. The small circle is the topic of this research.

Figure 2.14: Research Structured Diagram



This research objective endeavour to fill the gap in the literature, and to minimise problems that can arise from introducing mobile IS into a healthcare sectors, in order to maximise the public service delivery benefits. The following are four research questions:

1. How can a successful MHIS be implemented from a social management perspective, particular in organisational factors to people and technology, comparing with traditional IS?
2. How do the organisation and technology fit together as a whole Socio-technical System, by adopting MHIS?
3. How are technological and organisational factors influenced by the effectiveness and efficiency of mobile applications in health service delivery?

4. Why is the M-government considered as the transformation of E-government?

The research questions will be studied based on the data from the field work. The next Chapter, on Methodology, will discuss which research methods should be employed, and how to design critical research procedures to answer these research questions.

CHAPTER 3

Methodology

This chapter discusses the research methodology employed in this study, and reflects on the current methodological implications in IS. The theme of this work is to develop the research design for an empirical study, in terms of the theory and practice relationship. Thus methodology discussion places the research within the context of relevant literatures. The adopted paradigm for the research questions is to be demonstrated. At the end of this chapter, we summarise the evaluation of this methodology, based on social research criteria (Bryman, 2004).

3.1 Case Studies in China

Fiscella and Geiger (2006) discover that HIS has an important role in community health centres, in terms of health service delivery. It becomes very clear that Community health informatics has a variety of impacts of change in the work of health service delivery (Luo and Li, 2007). There is a consequent need to understand urban community health informatics change issues in organisational management. Also, there have been numerous studies of this area by Chinese social scholars, who have adopted different perspectives and methodologies (Bao et al., 2005).

Technology and policy in the context of China is different from current western theories. The links between each of these things are not the same. Plus, researchers have these complex questions, these difficulty we are describing. This is the reason why we need to look at case studies, because we need to look at a practical level in which is happening in people, organisation and

technology. Technology and policy in any two countries are not the same. Talking about the impact on organisations will not be the same either. It involves different culture, different power structures and great different approaches. It is necessary to look at some case studies examples to see what we can learn from with these questions with the background. Cases enable researchers to see how these different questions come together. One reason we have so many problems in health policy, and use technology around the world, is because the people in those different research discussions do not talk to each other (Ennals, 2009). People who are concerned with technology tend to look primarily at technology.

People in different countries are trying to make changes, and then they describe their own experience, and they hear experience from others. So they can develop their own case study because people realise how important they are doing may be in different contexts. Data collection and analysis are affected in this way of doing case study. Data collection is about looking for answers for research questions. Researchers are aware that there are difference debates and discourses. Different views can be taken. It is important to try to identify the right theories applied, and therefore ask the right questions in the case study research to produce the kind of material needed.

In some developing countries, E-government refers not only to government affairs, but also to public services including medical services. Since medical institutions are included in government systems, government provides medical services for its people. During the establishment of E-government in China, the "Jinwei Project" (Golden Protector), specialising in medical services, is part of the construction of China E-government System. Municipal affairs also include the building up of Community Healthcare Centres. So in terms of current situations and broad definitions, E-government also contains medical

information.

In a traditional way, public service information is delivered by the visiting government's website, or websites which provide public services, or subscribing to emails which inform people of information such as updating of personal information in driving licenses, new policies by neighbourhood committees, and notice of infection prevention in the communities. Public medical service information delivery is indispensable for community health and emergency management. However, a HIS is generally more complicated than other IS, since the procedures in health institutions are more complex, such as from seeing a doctor, getting a physical examination, to taking medicine or having an operation. Secondly, the healthcare index is more complicated. The format of medical data is of considerable complexity, and data processing is difficult. Thirdly, medical services may get involved in a series of problems such as individual privacy and security. As for the broad sense of E-government, promoting medical information is difficult, with numerous cases of failure. Nevertheless, medical service is of great importance to a nation, a family and to individuals. So the national budget for medical information is continuously increasing. Over the past decades, HIS, in general, has considerably developed. There is no doubt that low efficiency of medical service information delivery will impair the medical service's quality.

Along with the development of information technology, there is a trend that mobile IS leads the development of IS. Some scholars came up with the idea of Mobile Applications such as M-Government and mobile HIS in China (Li, 2005; Li, 2006; Song and Li, 2006 and Zhao, 2006). Early in the 1990s, scholars had described the scene of operating mobile IS, and discussed the application of mobile technology and its developing potential in future (Varshney, 2003 and 2005; and May, 2001). Public service information could

be delivered to mobile phones (Brown, 2001; and Castells et al., 2007).

The application of MHIS is closely related to the whole nation's medical service. As one of the leading projects in government public service information, this system, with high technology, forward looking and proper use, is bound to improve people's health conditions, promote the development of society, make full use of limited medical resources, as well as bringing more benefits to people. Also, mobile medical information could leverage its experience to other mobile IS.

In the last decade, a large number of mobile medical IS have been put into practice, in the form of SMS. SMS medical service applications are more money-saving, and with higher efficiency, and greater ability to meet a health response.

The author focuses on the issues such as management problems which arose during the process of mobilising IS, how management personnel could research and develop mobile IS in a more efficient way, along with what problems they should think over during the process of developing and assessing, so as to make contributions to both theories and practices.

In Guangdong Province China, urban community healthcare centres in several cities developed MHIS with multi-functions. They have put together all the current mobile technologies, which can be used for healthcare delivery. The centres integrated SMS functions into MHIS, which can provide a comprehensive view of mobile IS. Therefore, a research strategy of multi-representative cases is chosen in China. Multi-representative cases are recommended by Yin (2009). In this study, although the China government issues the initiatives of mobile healthcare informatics, each centre is unique,

proceeding in their own way.

Since 2008, China has started a plan of promoting basic medical services. It is expected that by 2012, most areas in China will have provided free basic medical services. Urban Community Healthcare Service Centres play an important role in this plan, and the medical service it provides is also a part of public healthcare services. Guangdong Province is one of the most developed areas in China. Since 2008, some of cities in the area have promoted MHIS for community healthcare service. Some of them are successful, while some failed. In social studies of science, many scholars are using a pilot study for a starting point of a field work. After deciding the study questions, and getting some preliminary findings, one can confirm whether their research methods are appropriate.

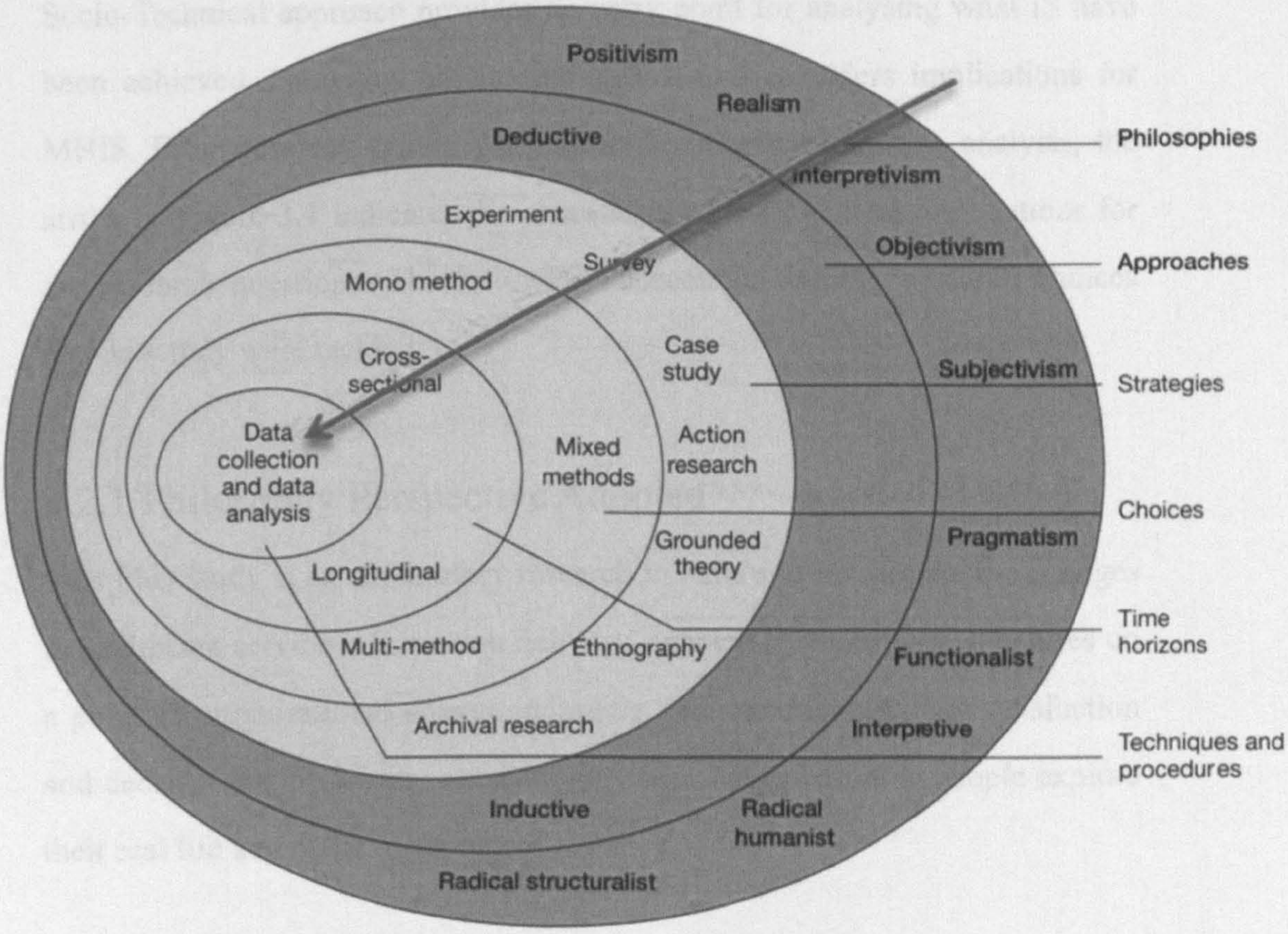
In this study, the unit of analysis for this study is an urban Community Healthcare Service Centre in China. It chooses a successful case and a failure case respectively as a pilot study. The successful one provides some outlines to study questions. The one which failed could provide learning from another point of view, such as the challenges of MHIS brought by system developers, users and customers. Collecting data from an unsuccessful case may be challenging, since organisations will not be proud of its lessons of failure. Triangulation can solve this problem in data collection, to reduce the bias of the data collected. Details are discussed in next section.

3.2 Research Design

The following sections turn attention to the practical issues of the research design, which includes research approach, discussion of research strategies, methods selection, data collection and analysis consideration. Research design is a series of research processes to answer or resolve the research questions

within practical constraints and unpredicted challenges (De Vaus, 2001). The outline follows a well known research process "onion" in Figure 3.1 (Saunders et al., 2009).

Figure 3.1: The research "Onion" (Saunders et al., 2009, p 108)



Four research questions are emerged from Chapter Two Literature Review:

1. How can a successful MHIS be implemented from a social management perspective, particular in organisational factors to people and technology, comparing with traditional IS?
2. How do the organisation and technology fit together as a whole Socio-technical System, by adopting MHIS?
3. How are technological and organisational factors influenced by the effectiveness and efficiency of mobile applications in health service

delivery?

4. Why is the M-government considered as the transformation of E-government?

Base on the discussion in the Chapter Two and the questions, the Socio-Technical approach provides an entry point for analysing what IS have been achieved, compares others approaches, and considers implications for MHIS. From research philosophies to data collection and data analysis, the arrow in Figure 3.1 indicates the procedures of the practical implications for the research questions. The following subsections identify research choices and how they were tackled.

3.2.1 Philosophy Perspective Adopted

This PhD study is an exploratory research in nature to investigate the changes in healthcare service information delivery, enabled by mobile IS. It centres on a point of organisational change including decision making, user satisfaction and decentralisation issues, etc. Ontology tries to explain how people explore their real life and make meanings of it.

Making interpretation and conclusions from source material of transcripts of interviews was considered for this research, whose objective was to reproduce the meanings of the realities as seen by interviewees. According to Weber's note (2004), "Interpretivism can be seen as where researcher and reality are inseparable, and knowledge of the world is intentionally constituted through authors' experience, in terms of ontology and epistemology." (Li, 2009b, p 6) Thus, the ontology and epistemology of this PhD study belongs to interpretivism. Interpretivism enables researchers to provide interpretations to support research views based on the behaviour of people.

In the tradition of the school of STS, interpretivism has been accepted by scholars (Walsham, 1993; and Stockdale and Standing, 2006). Walsham (1993) points out that IS evaluation is a dynamic socio-political process with multi-level social contexts, including people, technology and organisations. Klein and Myers (1999) argue that interpretation can help IS researchers deepen their understanding of the phenomena of complex interaction between human and IT in the setting of social and organisational context; it also offers deep insights into IS.

Having addressed the related epistemological and methodological issues, Siau and Rossi (2007) classify the research methodologies from an IS perspective within a four quadrants in Figure 3.2. They point out that "the quadrant one (realism and positivism) are realism in ontology and positivism in epistemology, while quadrant two (nominalism and positivism) are nominalist in ontology and positivistic in epistemology (Siau and Rossi, 2007; p13)". Nominalism supposes that real world interactions are social constructions rather than a given entity. The quadrant III (nominalism and interpretivism) emphasises that reality is constructed by people, who are involved in the particular situation, while the quadrant uses mixed methods (Siau and Rossi, 2007).

Figure 3.2: Framework for analysing the underlying philosophies of methods evaluation techniques (Siau and Rossi, 2007, p 13)

Positivism	Theoretical and conceptual investigations (metamodelling, metrics analysis, paradigmatic analysis, contingency identification, ontological evaluation), laboratory experiments, field experiments	Surveys
	QUADRANT I	QUADRANT II
	Feature comparison	Cognitive evaluation, verbal protocol, case studies, action research
Interpretivism	QUADRANT IV	QUADRANT III
	Realism	Nominalism

EPISTEMOLOGY

ONTOLOGY

Galliers and Land (1987) concluded that simple transference of research suited to the laboratories of the IS study or similar techniques such as field experiments are almost always failures, particularly in containing the human reaction with technology, and that they cause social and organisational change. Therefore, following the literature reviews and discussion under this research context, the quadrant III is suitable for applying STS into MHIS.

3.2.2 Research Approach

Two fundamental research approaches are inductive and deductive (Saunders et al., 2009). The inductive approach method is to develop theory, based on the analysis of the data. This approach normally owes much to interpretivism,

which is able to explore the reality of study from emotion, action and intention (Arbnor and Bjerke, 1997). With a newly emerging research issue, it might be appropriate to choose the inductive method (Creswell, 1997).

The deductive approach uses data to develop theory based on hypothesis testing (Hesse-Biber and Leavy, 2004). Positivism is usually adopted in deductive research approaches. This approach discovers those studies followed by scientific or physical principles. Deduction is often used in testing existing theory.

In this study, we explore STS based on mobile IS. It indicates why there is a gap between healthcare service delivery and a successful implementation of MHIS, and how to settle the social and technical systems. Consequently, the study adopts the inductive approach.

3.2.3 Research Strategy

Research strategies include strategies of experiment, survey, case study, action research, grounded theory, ethnography and archival research, which all have their own features (Saunders et al., 2009; and Yin, 2009). In specific circumstances, an appropriate research strategy plays a crucial role in answering study questions. In this study, it employs empirical, cross-sectional and multi-cases study, seeking the answers for research questions. Yin (2009) refers to the case study as a way of investigating an empirical topic. It offers meaning and understanding of the world from a local and international perspective (Yin, 2009).

Yin (2009) indicates advantages and disadvantages of five popular research strategies in the social science field in Table 3.1. Social researchers such as Shavelson and Townes (2002) normally consider 'experiments' are for

identification of causes and finding explanations; 'survey' and 'history' are only appropriate for description; and 'case study' is for the exploratory phase of an investigation. Yin also refers to case study as a research method which is a way of investigating an empirical topic.

Table 3.1: Relevant Situations for Different Research Strategies (Yin, 2009; page 5)

Strategy	Form of Research Question	Require Control of Behavioural Events?	Focuses on Contemporary Events?
Experiment	How why?	yes	yes
Survey	Who, what, where, how many, how much	no	yes
Archival analysis	Who, what, where, how many, how much?	no	yes or no
History	How, why	no	no
Case study	How, why	no	yes

(Source: COSMOS Corporation)

Case study, as one of research strategies from the IS dimension, is a way of investigating empirical topics (Darke et al., 1998). Case studies are able to enrich the theory, confronting a real-life problem (Yin, 2009). IS covers complexity, where different issues making the possibility of different interpretations of the same phenomena happening, choosing an appropriate research methodology is essential to take these issues into account (Galliers and Land, 1987). IS research methods consider the nature of the subject matter, and the complexity of the real world (Vogel and Wetherbe 1984).

In accordance with discussion by Walsham (1995), the researcher suggests that, in interpreting case studies for IS, that the research is able to illustrate how IS can be understood by technology and organisation in a systematic manner. At least, that is what scholars conclude from live experience based on reality. Furthermore, according to the research questions, Siau and Rossi (2007, p 10) suggest that case study research strategy is suitable for "how" and "why" research questions, which are "being asked for a contemporary set of events with the setting of the investigators have little or no control". Additionally, in accordance with the literature review, it explains how and why the case study of research strategy has been chosen from the account of STS. Multi-cases study is highly suitable to increase the research of reliability and validities (Stake, 1995; and Yin, 2009).

3.2.4 Research Methods

Qualitative research and quantitative research are two main streams of methodology in social science. Quantitative research is deductive in testing of theory, and focuses on quantification in the collection and analysis of data (Bryman and Bell, 2001), which concentrates on words, views from participants, emergent theory, unstructured and natural settings (Sundberg and Sandberg, 2006). Quantitative research focuses on numbers, researchers' opinions and theory tests, etc. Qualitative research provides a deeper understanding of social phenomenon than numerical data (Silverman, 1993 and 2000). However, as qualitative research is underpinned by descriptions, quantitative researchers have argued that research outcomes from qualitative study are not precise or accurate as statistical results. The interpretative approach is suitable when the subject is a "hard reality". Meanwhile, the positivist approach is suitable when the subject matter involves less subjectivity.

Hybrid strategies, involving qualitative and quantitative together, can also investigate the same theme with regards to IS, according to diversities of research objects and questions (Kaplan and Duchon, 1998). However, Bryman and Bell (2003) argue that in the early of the stage of theory of a subject, qualitative research is better, rather than quantitative. This study uses qualitative methods to answer the research questions, due to the STS requiring the study of real world interventions and deep understanding. Qualitative methods are widely used in healthcare (Barber et al., 2007; Miles and Humberman, 1994; and Murphy et al., 1998). However, Qualitative research specialises in studying complicated situations, opinions from Interdisciplinary and power and benefit sensitive issues, providing a deeper understanding of social phenomena than numerical data.

According to the literature reporting about the MHIS in the UK, community healthcare in Portsmouth is using a mobile service (Adams and Fitch, 2005; and Fitch and Adams, 2006). However, the functions of mobile phones used in the UK cases are mainly simply making calls. The other cases, reported in USA, Korea and Brazil, etc. mentioned in Chapter Two, are much more advanced. They have multi-functions of mobile IS to support healthcare professionals to deliver services such as appointment reminders, medicine reminders, healthcare tips, etc. Nevertheless, these cases, reported in the papers, only have one or two functions of MHIS, lacking integration of multi-functions of MHIS. Those MHIS is only a small part of HIS, but not yet thoroughly using mobile technology integrated into processes of healthcare service delivery in health sectors. There has been a research tradition of this model in Britain that would fit with how China wants to proceed. However, the empirical social science would not always be the same.

3.2.5 Data Collection

A case study can be investigated in many ways, including both quantitative and qualitative methods (Eisenhardt, 1989; Yin, 2009; and Stake, 1995). It can use interviews, archival material, observations, and questionnaires. Day (2010, p 260) reckons HIS is a social structure, which also is able to "shape social interaction and that social experience and interaction shape social structures in turn". That addresses HIS should be followed the rules of STS (Coiera, 2004). This pilot study used two community healthcare centres, examining them on whether they follow the ways of STS in MHIS and how technical and social elements affect the MHIS. Consequently, the STS concept here focuses on organisations' Community Health Service Centres. In the other word, the author in this thesis uses Socio-Technical concepts rather than a "system" to distinguish from the pure technical systems such as hardware and software. STS are defined as IS, and mobile IS is a purposeful collection of interrelated components that work together to achieve some objectives in an organisation. This working definition is based on Sommerville's definition of STS (2007). Human users and decision makers are also components of mobile IS. Socio-technology is a way of describing systems which brings together people and technology. A system is made by people, technology and organisations all in together.

The procedure contains face to face semi-structured interviews. The semi-structured interview is designed to emphasis the research questions to discover new issues during the study (Saunders et al, 2009). Face to face is an ideal way to make contact with interviewees, which gives more chances for explore depth discussion (Bryman and Bell, 2003).

The pilot study involved interviews with centre executive managers, senior managers, general practitioners, nurses, IT project managers, IT technicians,

Mobile network suppliers and citizen users. Archival material was also collected, to establish external validity. Data on less tangible issues such as culture and intention of behaviour are gathered through observation, and interviews. Demographic matters to the interviewees on data collection are considered. The careful structure and iteration of information gathering is important to overcoming problems of validity in qualitative methods.

The team was composed of four researchers, including a PhD candidate (Researcher 1), one associate professor in IS (Researcher 2), one professional in IT (Researcher 3), and a senior manager of healthcare in China (Researcher 4). As the ethical issues were agreed with the research colleagues, and the ethical approvals from the community health centres, this thesis cannot reveal their identities, nor any relevant information which may cause others to identify them. Data protection and ethical data collection issues were also employed by rules of ethical clearance of Kingston University.

The researchers of this study were not allowed to get involved in the implementation of MHIS projects. Therefore, there cannot be active action research intervention. However, the research team had permits to evaluate the MHIS, and pursue the research to answer the research questions.

Taking this difficulty into consideration, researchers should carefully select objects of study, especially for those who failed to develop a MHIS. The interviewers all have good relationships with interviewees, so that they could share the experiences together. Besides the approaches mentioned above, the approach of triangulation is also adopted in this research. Interviewing different people in those centres could avoid the result being affected by one person's bias or personal feelings. Minimising divergence in study and personal subjective cognisance, as well as keeping objective in reflecting the

essential or genuine characters of issues, are critical to a correct qualitative data analysis.

Since privacy of organisations and individuals is involved, we will conceal all the real names of communities and interviewees which appeared in the process of data collecting, and use anonyms or symbols instead. In social science research, privacy protection is the most basic moral requirement for researchers. So this research strictly sticks to the moral requirement of social science research, and makes sure that the interviewees would not be affected due to their views expressed and materials provided. The research process and data collected strictly abiding by laws, rules and relevant regulations.

The researchers are unobtrusive observers and independent interviewers. Being detached external researchers, conducting individual interviews, this provides an advantage in studying social phenomena neutrally, and that ensures the potential findings from MHIS in cases being objective investigated. The choices of cases in these community healthcare centres also have contacts and personal connections with researchers. This is treated as one of the other strong points of this study, because the researcher team can get the truth of the story from the study of MHIS, particularly for failure cases, while people involved usually do not wish to share their experience with others. Besides that, triangulation methods are deployed.

The method of triangulation from different resources by various methods is the key to studying a same phenomenon for establishment of the validity of research findings (Miles and Huberman, 1994; and Yin, 2009). Patton (1987) classifies four categories of triangulation: theories, investigation, methodology and data collection, Theory triangulation uses one discipline for explaining a phenomenon in another one. In this research, the general arena of IS remains

the same. Nevertheless, the theory of MHIS is the main objective of the study, which slightly varies from mobile IS. Investigation triangulation indicates more than one researcher studies the same research topic, under individual working. Interviewing is the main vehicle for data collection. The data gathering is recorded in digital form, and transcribed into text. In this study, interviews are using Chinese as the interviewees are speaking Chinese. The transcription of interviews is in Chinese for the purpose of adding coding accuracy, and avoiding original meanings missed from the first language used within interviews. Translation, sometimes, makes concessions to original meanings in the languages. Archival data such as official reports, policy documentation, and published literature of the centres were studied. Methodology triangulation uses more than one research approach to study a single research question. These may include a mixture of interviews, documentation collection, and questionnaires, enabling the MHIS to be studied from diverse points of views. Consolidated analysis can be built up via comparisons of findings by different research approaches. Data triangulation is to capture viewpoints about the same study situation. The cases selected in this study improve the validity of the findings. Eisenhardt (1989) points out that triangulations are a norm for management studies to increase the credibility of qualitative research. IS are particularly multi-faceted, involving a variety of inputs, processes, people, technology, and organisations. Research on past events, and case study links with qualitative data, are accepted in the scholarship of IS. Benbasat et al. (1987) comment on the facilities of triangulation, as a critical tool to capture the richness of data collection, and the accuracy of the data in case research strategy.

Qualitative data, therefore, requires the collection of as much data as researchers can gather, and that constructs the coding of the language, rather than mathematical numbers and numerical meanings. Yet, the data cannot be

reasonably analysed, putting the qualitative research in great danger (Miles and Humberman, 1994). Thereby, with data collection, it is deemed wise to start with a modest plan, which can be extended if circumstances require. These interviews were conducted within a period of three months. All the transcriptions in interviews are digitally recorded for later analysis, under the permission from the interviewees.

Qualitative scholars comment on the substantial loss of valuable information incurred in note taking from interviews (Miles and Huberman 1984; and Yin 1984). Eisenhardt (1989) and Chen (2000) used multiple interviewers to ensure that this did not happen. In this research, however, all interviews were digitally recorded and transcribed verbatim to manage this problem. They were transcribed by the research team; all were subsequently checked for fidelity of the recorded record. All interviewees were offered the opportunity to check, and amend transcripts; they all declined.

A major part of the data collection was done in interviews with members of the community healthcare centres and the MHIS citizen users. Interviews can take many forms, with key differentiating factors being the number of people involved such as focus group, how the conversations take place by face to face, telephone, or online, degree of structure of the interview, and location of the interview (Bryman.and Bell, 2003). The community healthcare centre 1 and 2 as pilot study was selected for the research on the basis of research criteria and convenience, as a good working relationship has been established with senior managers, who are keen for change. The content of conversation adheres to the basic principles of the Semi-structure: internally consistent, avoiding unnecessary jargon, and precise in expression. The breakdown of these factors for the interviews in the two of pilot cases is as follows:

Community Healthcare Centre 1:

- Number of interviews: 9
- Interviewees: Head of the centre, senior manager, general practitioner, nurse, IT project manager, IT technician, mobile network supplier and two citizen users.
- Style: face to face
- Time period: one hour to one and half hours
- Location of the interview: 7 in the offices of the individuals; 2 in the researcher's workplace.
- Method: Semi-structured, Observation, and Content Analysis

Community Healthcare Centre 2:

- Number of interviews: 9
- Interviewees: Head of the centre, senior manager, general practitioner, nurse, IT project manager, IT technician, mobile network supplier and two citizen users.
- Style: face to face; 2 face to face with two individuals
- Time period: one hour to one and half hours
- Location of the interview: all in the offices of the individuals
- Method: Semi-structured, Observation, and Content Analysis

The outline for the entry interviews contains the research questions for interviewers. They are followings:

- Can you describe your MHIS in your community healthcare centres? Do you have some opinions or suggestions about these new systems?
- Do you know how to implement a successful MHIS in your centres?
- How does your centre fit with the new mobile technology fit as a whole STS?
- Do you know how technological and social factors are influenced by the effectiveness of mobile application in health service delivery?
- Do you know something about the M-government? If yes, what are your opinions about the relationship between M-government and E-government?

These questions are flexible. They may vary, when a researcher interviews different people. These sought general information about the organisation and its MHIS environment, asked for examples of recent mobile IS development made in the organisations. After these entry interviews, the researcher paused and evaluated what had been said, summarising some of the key issues.

The research team made a two-cases-described analysis on Case 1 and Case 2, answering study question one and two by collecting data and theoretical analysis. The Community Healthcare Services Centre in Case 1 successfully developed mobile IS. The well operated system becomes well-recognised and admired in the industry. Sticking to the protection principle, this research provides no materials that contain real names of organisations. The MHIS in Case 2 does not operate as well as the staff of their centre expect.

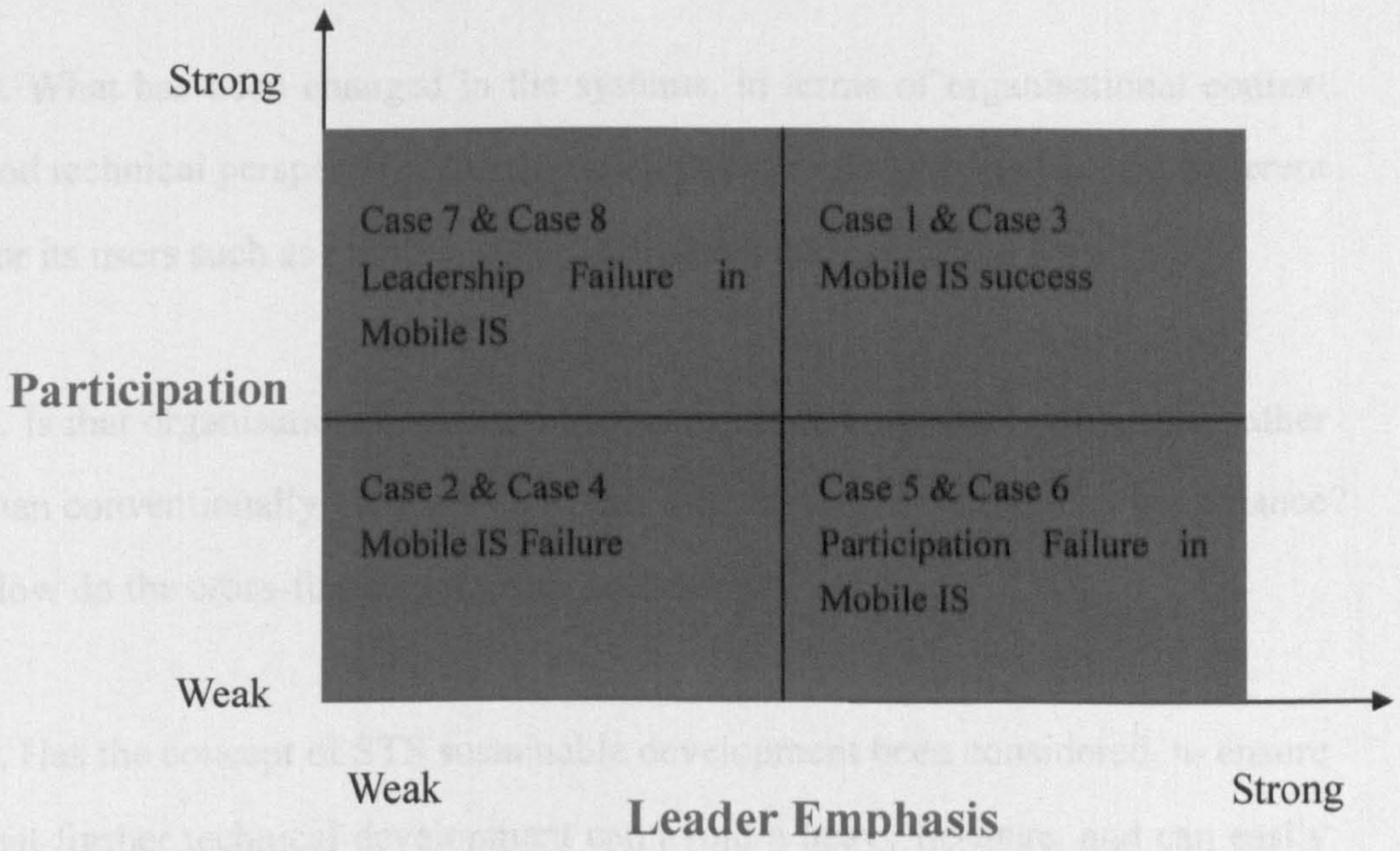
The team discussed Case 1 and 2 experiences, and made in-depth analysis of successful MHIS, corresponding to the three study questions. The team

conducts research, firstly by reviewing relative literature for the further research design, and then introduced key elements of applications of information management. The core of this research is a qualitative analysis. The semi-structured interviews were undertaken. A qualitative analysis is associated with an interpretativist philosophy. This is because the focus is on the observable, and constructed through making meaning from perceptions (Lincoln and Denzin, 2000).

Following the pilot study, the successful Case 1 and the failure one Case 2 (in Figure 3.3) indicate that "Leader Emphasis" and "Participation" are emphasised and repeated by interviewees. The Case 1, in general, obeys the Socio-Technical approach when developing its MHIS. The case 2 focuses on technologies, but failed in management.

According to the preliminary findings from Case 1 and 2, the researchers in this study discussed the design for a multiple case studies, demonstrated in Figure 3.3. Multi-representative cases are chosen to confirm whether the Leader Emphasis and Participation are two important elements for implantation in MHIS in China community healthcare centres. The research team chose Case 3 and 4 for deeper understanding of the success and failure of MHIS in the cases, and then used Case 5, 6, 7 and 8 to reconfirm the robust findings. Therefore, this study's theoretical sampling is eight urban Community Healthcare Service Centres in China. The data analysis about the findings in details will be discussed in the next chapter. The investigations of taking two cases for each quadrant in Figure 3.3 are to establish a solid foundation of research results.

Figure 3.3: Multiple Case Studies Design



Based on the preliminary findings from interviews and archival dominations, the remaining interviews were also semi-structured, but the questions are extended in more details:

1. How can a successful MHIS be implemented from a social management perspective?
2. How do the organisation and technology fit together as a whole STS by adopting MHIS?
3. How are technological and social factors influenced by the effectiveness of mobile application in health service delivery?
4. Why is the M-government considered as the transformation of E-government?

Four questions towards the cases study:

5. What are the difficulties in doing so? What are the failures elements for these centres to build up systems? Why? Which social elements have

significant impacts on development of such systems? Why?

6. What has been changed in the systems, in terms of organisational context and technical perspective? Do the outcomes of these systems become different for its users such as reliable, stable, efficiency and effective? How?

7. Is that organisational structure becoming more horizontal or organic, rather than conventionally vertical? Does this affect traditional hierarchy governance? How do the cross-functional teams collaborate?

8. Has the concept of STS sustainable development been considered, to ensure that further technical development can avoid a heavy heritage, and can easily be updated?

These interviews were done in batches, with up to five being done in a day, depending on the availability of the respondents. Each interview takes around one hour to one and half hours. The interview process ended in the data saturation of the organisation's internal opinions and arguments. During interviews, the interview uses three Chinese languages, includes Chinese official language Mandarin and the other two local languages Cantonese and Teochew. The selection of participants for interviews is made using a purposive sampling technique, as participants are selected with a particular purpose in mind, which reflects relevance to research objective.

53 interviews were digitally recorded totally from eight groups, including heads of the centre, senior managers, general practitioners, nurses, IT project managers, IT technicians, mobile network suppliers and citizen users in eight cases. These eight groups comprehensively cover all the parties and other stakeholders involved with MHIS projects in a community healthcare centre

in China. The participants were of mixed ages and experiences, in order to gain a good cross-section of results. The interviewees of citizen users of MHIS were selected randomly from different job positions within each healthcare service centres. Table 3.2 indicates the details of the 53 interviews.

Table 3.2: Details of Interviews

Community Healthcare Centres	Interviewees Number of interviews totally: 53	Style	Time period and Locations	Method
Case 1	Number of interviews: 9 Interviewer: Researcher 1, 2, 3, and 4 Interviewees: Head of the centre, senior manager, general practitioner, nurse, IT project manager, IT technician, mobile network supplier and two citizen users. Transcriber: Researcher 1,2, 3 and 4	face to face	one hour to one and half hours 7 in the offices of the individuals; 2 in the researcher's workplace	Semi-structured, Observation, and Content Analysis
Case 2	Number of interviews: 9 Interviewer: Researcher 1, 2, 3 and 4 Interviewees: Head of the centre, senior manager, general practitioner, nurse, IT project manager, IT technician,	face to face	one hour to one and half hours all in the offices of the individuals	Semi-structured, Observation, and Content Analysis

	mobile network supplier and two citizen users. Transcriber: Researcher 1,2, 3 and 4			
Case 3	Number of interviews: 6 Interviewer: Researcher 1 and 2 Interviewees: Head of the centre, Senior manager, general practitioner, IT technician, mobile network supplier and citizen user. Transcriber: Researcher 1,3 and 4	face to face	one hour to one and half hours all in the offices of the individuals	Semi-structured, Observation, and Content Analysis
Case 4	Number of interviews: 6 Interviewer: Researcher 1, 2 and 3 Interviewees: Head of the centre, general practitioner, nurse, IT project manager, mobile network supplier and	face to face	one hour to one and half hours 5 in the offices of the individuals; 1 in the researcher's	Semi-structured, Observation, and Content Analysis

	citizen user. Transcriber: Researcher 1, 3 and 4		workplace	
Case 5	Number of interviews: 7 Interviewer: Researcher 1, 2 and 4 Interviewees: Head of the centre, general practitioner, nurse, IT project manager, mobile network supplier and two citizen users. Transcriber: Researcher 1, 3 and 4	face to face	one hour to one and half hours 5 in the offices of the individuals; 2 in the researcher's workplace	Semi-structured, Observation, and Content Analysis
Case 6	Number of interviews: 6 Interviewer: Researcher 1, 3 and 4 Interviewees: Head of the centre, senior manager, general practitioner, IT project manager, IT technician, and citizen user.	face to face	one hour to one and half hours all in the offices of the individuals	Semi-structured, Observation, and Content Analysis

	Transcriber: Researcher 1, 3 and 4			
Case 7	Number of interviews: 6 Interviewer: Researcher 1 and 2 Interviewees: Head of the centre, general practitioner, nurse, IT project manager, and two citizen users. Transcriber: Researcher 1, 3 and 4	face to face	one hour to one and half hours all in the offices of the individuals	Semi-structured, Observation, and Content Analysis
Case 8	Number of interviews: 4 Interviewer: Researcher 1 and 4 Interviewees: Senior manager, nurse, IT project manager, IT technician. Transcriber: Researcher 1, 2, 3 and 4	face to face	one hour to one and half hours all in the offices of the individuals	Semi-structured, Observation, and Content Analysis

In the eight cases, there are 7 interviews with heads of the centre, with one of them not available in a case; and 5 interviews of senior managers. The research team ensure at least one of the head or senior managers can be interviewed in each case. The other interviews are 7 with general practitioners, 6 with nurses, 7 with IT project manager, 5 with IT technician, 5 with mobile network supplier and 11 with citizen users. The interviews with different groups ceased with the data saturation of their opinions or arguments. The research team will transcribe every interview into text, and analysis the transcription in two days afterward. If the last two interviews from a certain group cannot get the new findings, they must compare with the previous ones. The researchers considered that the data from interviews with that group is saturated.

3.2.6 Data Analysis

This section provides an explanation of the proposed data analysis approaches, consistent with the preceding debates, in terms of data collection and the overall philosophical underpinnings of the research. Discussion about various analysis activities will be addressed for this study.

Ontology tries to explain how people explore their real life and make meanings to it. Making interpretations and conclusions from the source material of transcripts of interviews is to be considered for this research, whose objective is to eventually reproduce the meanings of the realities as seen by interviewees. All the transcriptions of interviews were digitally recorded for later analysis with permission from the interviewees. Evidence from the transcript contains information about the names of interviewees, organisation, and some relative personal information. The analysis of strategy is expected to generate meaningful findings that can contribute to the theory (Yin, 2009).

"Qualitative data analysis is essentially about detection, defining, categorizing, theorizing, explaining, exploring and mapping. (Richie and Spencer, 1994, p 176)" As Richie and Spencer (1994) emphasise, in the 'Framework' of qualitative data analysis, the following steps are frequently included familiarization, identifying a thematic framework, indexing, charting and mapping and interpretation. Richie and Spencer's framework analysis (1994) the thematic networks are an analytic tool for qualitative research. Conducting a Feature analysis involves following these steps: 1. select solutions to evaluate; 2. Identify user requirements; 3. Prioritise requirements. Content with thematic coding are the data analysis techniques of this study.

Content and conversation analysis were to assist in understanding the meanings implied in them. The analysis of evidence for study is followed by theoretical propositions (Yin, 2009). The proposition reflects on the theoretical gaps. The analysis of strategy is expected to generate meaningful findings that can contribute to the theory. A coding scheme and an index were developed for content analysis. Through reviewing the coding interview scripts, developing the interviewee's knowledge, expertise, experience and attitudes can be drawn out. The outcome of this research is to develop a theoretical framework of an effective and efficiency model to help in taking mobile IS development strategies into practices for developing countries. The transcripts of the interviews were coded in Chinese as the intention was to keep the original meanings as much as possible. Coding from the original script and content analysis provides meaning frequency and findings. Details of coding scheme, index and output will be discussed and attached in next chapter.

Miles and Huberman (1994, p 38) identify the significance of the skills of the researcher, suggesting that a "knowledgeable practitioner with conceptual

interests and more than one disciplinary perspective" may be a good instrument of data collection and analysis. Quality comes from the refinement drawn from experience, the economy of being able to identify core processes quickly, and greater openness to meaning. In the case of the current research, the fact that the researcher works within the context of MHIS in China, and is familiar with both the context and the conceptual area of strategic decisions, would seem therefore to be positive attributes.

3.3 Summary

Social research design should be relied on, establishing appropriate methods for the concepts of study, being valuable for finding, and which can be generalised (Yin, 2009). These concepts are construct validity, internal validity and external validity. This research describes the context in terms of the literature review. The procedures of this research in random interviews and specific interviews enhance the validity of data and analysis. Yin (2009) suggests it is necessary to minimise errors and biases in social research, namely reliability. The study can be repeated, getting the same results. Digital documentation was kept. The interviews were in chat format following the semi-structured guide lines in interviewees' offices or researchers' workplaces, for a relaxing and friendly atmosphere, chosen according to the interviewee's choices.

Bryman (2004) points out the criteria for social research. He emphasises "the most prominent criteria for the evaluation of a social research are reliability, replication, and validity. Reliability is concerned with the question of whether the results of a study are repeatable." In this study, the procedure of research design is clarified during the methodology section. The data is designed to collect from interviews and recorded, which can be traced back at any time.

Research validity consists of internal validity, external validity and ecological validity. Internal validity focuses on the issue of causality. For external validity, the issue is research result generalisation. In this specific context, MHIS in China is unique. Therefore, external validity is not strong at this study. Nevertheless, the findings can be as a reference for other courtiers. The last validity is ecological validity. The research findings are applicable to people's every day, natural social settings.

This chapter reflects on various research philosophies and methodologies, and formulates the research approaches and strategies. Different methods have been reviewed. The methodology of this research is not simply counting numbers from the literature and field work, but gets insight of the phenomena to understand the research topic. The research design has been studied, thus intervenes in a multi-faceted and multi-disciplinary field. One complication of working in the field of IS is that several different philosophies of knowledge are at work, and communication between researchers from the different traditions can be limited. Therefore, the empirical study is suitable to the purpose of the study, and the overall research aims and objectives. It is possible to concentrate on instances that will produce a variety of results to illuminate the research objectives.

Giving evidence of understanding the advantages and disadvantages of the research methods when compared against alternatives and in terms of the overall contribution of the research, the proposed data collection methods are appropriate with the overall philosophical underpinnings of the research, the proposed methods are placed within the context of IS literature.

The Figure 3.4 demonstrates the research design of this study, following the logical line to multi-cases study. Procedure of the field study (Figure 3.4) for

this research illustrates five stages. It provides the outline of the research design.

The choice of STS gave the researchers access to a language which can bridge separate disciplines and research philosophies, then built up a framework which had been adapted from the IS literature. Attempts to quantify the new variables encountered difficulty. The cases studied, in reconciling different philosophies and perspectives, cast light on the widespread failure of government to run IT projects. Perhaps the tendency to outsource and quantify what one does not understand is inherently dangerous. The descriptions of cases and data analysis in details are presented in the next chapter.

Figure 3.4: Procedure of Field Study

1. Two Pilot Cases 1 & 2 Study: Start the research by studying a successful case and a failed one, based on criteria such as reputation and working performance, etc. The successful case is for answering research Question One and Two through descriptive analysis, while the failed one is for making comparisons and reconfirming the findings of the successful one.

2. Research Question One and Two are answered by the two cases study. It proves that STS are suitable for the MHIS in these cases. It is found that Leader Emphasis and Participation have a major influence on the development and assessment of MHIS in these cases. Also, a new decision making process model (p108) replaces the old one (p106), bringing organisational change, such as structure, power control and culture. etc.

3. Further Discovery: to find out the influence of Leader Emphasis and Participation in selected MHIS. Then the researchers pick another 6 cases, focusing on leadership and user participation, therefore, altogether there are eight cases for research demonstration, and eight case studies (p84) for a 4 quadrant analysis. A new decision making process model can be developed through other failure cases, and is useful for emergency management (p131).

4. The result supports the initial research conclusion. The main ways of data collecting for case analysis (p135 and p156) are studying documents, official reports, policy analysis and semi-structured interviews (p87). A thematic model (p158) describes comprehensively the Socio-technical approach within the Centres.

5. The analysis conclusion agrees with the findings of qualitative research on Leader Emphasis (p168) and Participation (p172). Leader Emphasis is first introduced in IS. Furthermore, the thematic model (p158) of STS in MHIS is significant to Mobile IS. Therefore, the final research findings are verified after qualitative research.

CHAPTER 4

Case Description and Analysis

This chapter sets out contextual information about the research settings, and the specific case study background. The descriptions of cases and data analysis in details are presented in the following section, and the details of the coding scheme, index and output will be demonstrated and discussed.

The healthcare service delivery enabled by informatics in E-government is very complicated. The area is varied in different countries. If we take case studies in different countries, the results will not the same. The operations of community healthcare centres in China may not fit other countries. However, this research pursues looking at the situation in China, because the healthcare informatics problem is not really to be solved. However, these are problems we need to understand more.

The frequent views in academic publications are that the researchers can bring these things together in a straight forward effective way. The discourses and ways of researching are different. Bringing them together is difficult, and it should be expected to change, but the practical examples of how the progress can be made needs to be explored in particular cases.

4.1 Community Health Service Centre in China

The case study of MHIS in China community health service centres has its own background and culture. Hence, a description of the health service centre's context and its related issues is indispensable. The community health service has been pursued for many decades by governments across the world.

In China, this issue has been re-emphasised after the Chinese government learned lessons from Severe Acute Respiratory Syndrome (SARS) in 2003.

China has enormous territory and the largest population in the world, with around 1.3 billion people and around 960 square kilometres of surface area (United Nations Statistics Division, 2008). Its culture and the way they perceive the world, however, are different from Western countries, as well as having a big regional development gap between east coastal cities and the inland rural area. As a typical developing country, China has been trying to develop, and ensure that E-government supports the public healthcare service (Li and Song, 2008). E-government is the provision of information and services by governments to citizens, using a range of ICT. It is based on technology innovation in management; since IT is relevant to all areas of government.

China has the largest number of internet users currently over 250 million, while there are 600 million mobile phone subscribers, with ever-increasing rates (Economist, 2008). China introduced mobile phones starting in 1987 (Castells et al., 2007), and now is holding over 750 million mobile phone users (ITU, 2010), which is the largest group of mobile users among developing countries. The penetration of mobile technology is surging strongly into people's daily lives, with the rapid spread of SMS (Castells et al., 2007). Meanwhile, the priority of how to enhance the capabilities of community healthcare to deal with public management in a way that is efficient and economically sustainable nowadays has come to the top of the agenda in the governance of Chinese government.

In 1979, the Chinese government started to reform the market and open trade with the world. Chinese economic development now is among the fastest in

the world, growing at an average annual Gross Domestic Product (GDP) rate of 9.4% for the past 25 years (Malik, 2005). At the end of 2005, the People's Republic of China (PRC) became the fourth largest economy in the world by exchange rate, and the second largest in the world after the United States by purchasing power parity at US $8,158 trillion [Central Intelligence Agency (CIA), 2006]. Last year 2010, China GDP reached the second position of economy in the world (The World Bank, 2010). Yet, this still gives an average GDP per person of only an estimated US $8,000 in 2010 (International Monetary Fund, 2011), about 1/5th that of United States. 10 million people are living without electricity reported by Chinese official media. That means China is still standing in a position of a developing country.

Hence, China is facing complex problems currently from various aspects; large challenges have not been solved completely, such as welfare and healthcare. China was ranked 144th out of 191 states in 2000. In terms of access to medical care, it was fourth from bottom. How to build up a health system for supplying healthcare to citizen in a way of cost effective and delivery efficient is always vital for a modernising government, treated by Chinese citizens as a milestone of symbolic civilisation. Healthcare and medical treatment only provided by hospitals were not free, and citizens have to pay for them. The healthcare welfare system in China had failings before the 2000s.

Furthermore, in 2003, the issue of community health service centres was emphasised after the lessons of SARS (He et al., 2004). The resource of healthcare was not arranged well during the time of the epidemic SARS. Hospitals faced lots of challenges of lacking information about patients and the exact number of community citizens, which made it difficult for hospital to judge how much resource they had to prepare. Without General

Practitioners (GP), specialists had to cure patients' general diseases, which caused a waste of resources as well (Sun et al., 2004). Having learned these lessons, the Chinese government had realised that establishing a community health service may align healthcare resource well with distinguishing responsibilities of GP and specialist, collecting personal health information, and distributing public health information for community citizens. The community health service has been pursued for several decades by governments around the world (Smithies and Webster, 1998). However, Chinese community health centres have their own objectives for citizens. Not only are they to build up a better health welfare system, but also to be able to provide public healthcare service delivery for both health authorities and citizens.

Community health service centres have been set up throughout the country, based on an establishment unit of an average of 50,000 people. Every service unit is based on a local council in urban areas, or country towns in suburban or rural areas. Centres are to provide public healthcare services such as health policy support and providing free healthcare education, etc. (Wang and Gong, 2004). By 2011, each of 700,000 villages is going to set up a community clinic; 2,000 county hospitals will be built; 3,700 community healthcare service centres in suburban areas and 11,000 in urban areas will be built or renovated (Watts, 2009).

Health systems became free in some parts of the healthcare service. Health service is provided by hospitals and community health service centres. Due to the massively huge population in China, Chinese government cannot afford the entire health system to be free to its citizens. Therefore, healthcare became partially free of charge for Chinese citizens. A new theme indicates that the government has the ambition to provide free "basic healthcare and medical

(equally to primary healthcare)" for 1.3 billion citizens, and these free services are provided mainly by community healthcare centres. The responsibilities of urban community health service centres, a vital part of health welfare system in China, provide free of charge basic healthcare and medical service.

The health welfare systems in the rural areas of China formerly were pioneered by "barefoot doctors", who are working in healthcare work, without high proper professional training. But now, health working staff are educated in higher education institutes concerning the subjects on which they will work. Health equipment and ICT infrastructure have been already established at the community and county level. It has been asserted by many scholars that IS improves organisational effectiveness and efficiency, but appropriate use of ICT is always an key issue about these ambitions. Chinese government has given strategic priority to community health, and community health centres. This has been partly in the context of the need for rapid and effective responses to natural and health emergencies, namely "Strategic Health Initiative" (Ennals, 1986). Additionally, the case of the Sichuan earthquake that demonstrates intermediate and appropriate uses of ICT is discussed in Section 4.1.4. The approach to management in the centres is described in the following subsections.

The reasons of mobilisation of community healthcare service delivery

Though the case studies, the researcher found that cases, such as where a failure in epidemic control between government and health sectors such as SARS and pandemic flu, have amplified the need to scrutinise community healthcare information and mobilisation distribution practices.

Department for Health in China statistics suggest the healthcare staff spend

billions of hours per year filling out patient disease paperwork. It is not uncommon for GP, nurses or house visitors to duplicate patient information e.g. names, disease history, and addresses, around 10 times for a single patient. Furthermore, the bureaucratic and paperwork based nature of policy delivery can cause poor data quality, and loss of real-time information.

Therefore, MHIS is addressed by healthcare sectors in China. Ammenworth et al. (2000) point out that mobile applications in healthcare have five attributes: 1. Routine use; 2. Mobile communication; 3. Mobile information access; 4. Mobile documentation and 5. Integration. Routine use means that mobile technology can be suitable for clinical routine in its functionality and operability, and sufficiently powerful and robust. Mobile communication needs to be managed to fit healthcare sectors. Mobile information access implies information must be designed for meeting the needs of healthcare professionals. The issue of mobile documentation is to support documentation activities by mobile facilities. Integration means how MHIS can be seamless working with other HIS. These characteristics of MHIS can solve the challenges and difficulties of health service delivery. Some community healthcare centres in China have decided to develop the MHIS supported by local health authorities. This raises questions about the roles of technology, human knowledge and judgement.

4.1.1 Context of cases from a Socio-Technical Perspective

STS are discussed in this section. The literature in China emphasises that the technology, people and organisations have to link together. China has a tradition of good history in using appropriate technologies, linked to institutional structures and work organisations. As China is still at the developing stage, they have to consider what new advanced technology is affordable to them, and whether it is able to really work within the context of

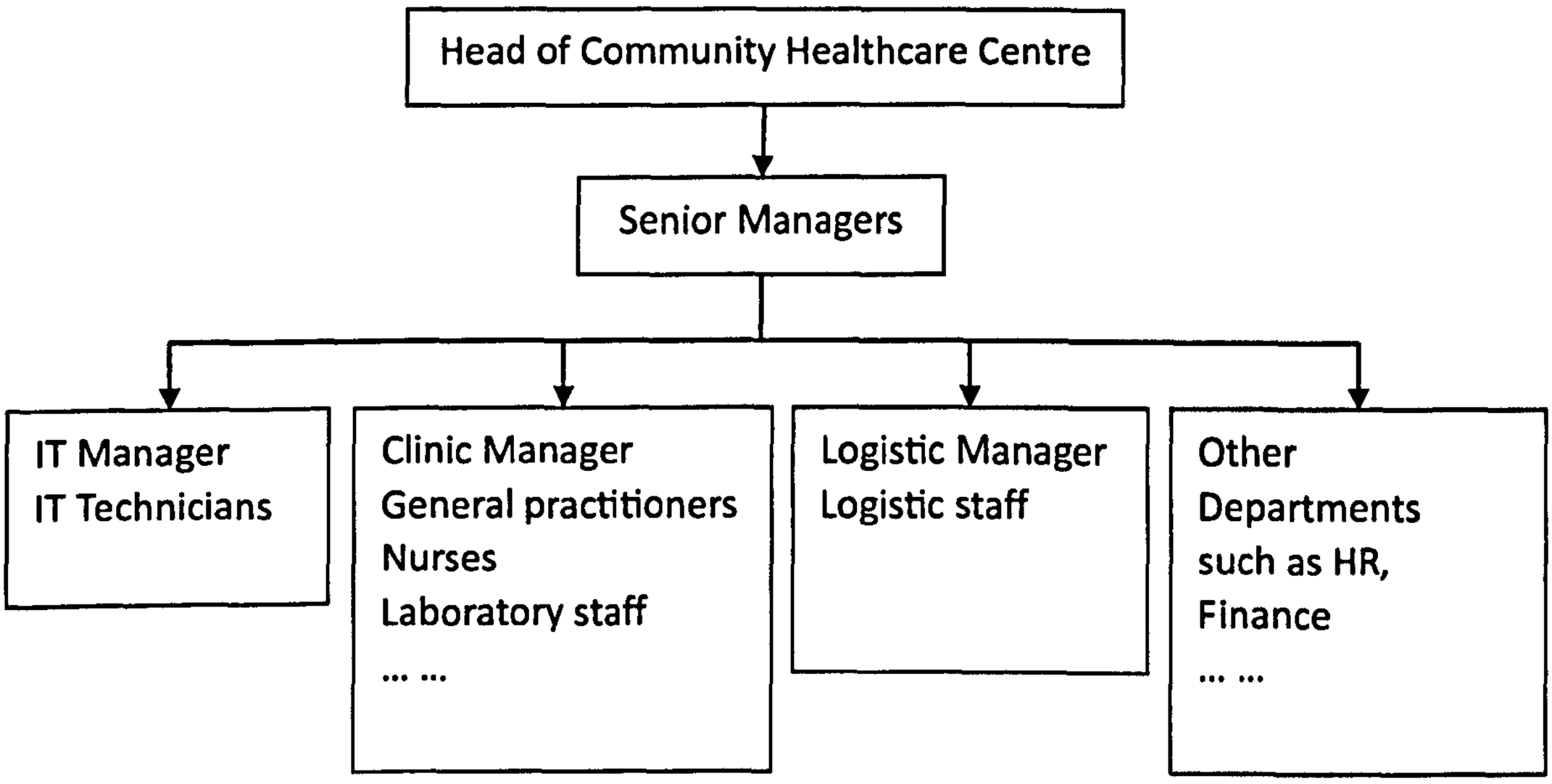
work organisations, while proposing new IS. Therefore, the applications of ICT within public sectors seems not to be a new fashion seeking style, which is different from reliance on new technology.

The community healthcare centres have been using mobile technical systems for the first time since 2008, China Health Department official report says. It seems a change for STS, due to the introduction of these new technical systems. A basis of STS in centres for discourse with ICT, health and community practitioners is outlined in the following text, and starts from organisational structure, one of the most important aspects of an organisation.

Organisational Structure in China Community Healthcare Centre

The organisational structure is illustrated in Figure 4.1. The heads of community healthcare centre are in charge of the management of the centres. Generally, several senior managers associate with the heads to manage departments. The clinical department is the most important in the centres. GP, nurses and laboratory staff, etc. are based on the clinical department. The IT department is responsible for development and maintenance of IT technical systems, and contact with the IT suppliers. Other departments include logistics, Human Resources (HR), finance, etc. The organisational structure in Figure 4.1 is based on the traditional functions driven, which is still adopted by many organisations (Cadle and Yeates, 2008).

Figure 4.1: Organisational Structure of China Urban Community Healthcare Centres



Cadle and Yeates (2008) argue that the organisational structure in IS can affect the progress of projects. They suggest the matrix structure, but this structure can consume much more resource than others. As a matter of fact, the development of HIS in the successful cases Case 1 and Case 3 built up a flexible structure, similar to the organic model which is more cross-functional and cross-hierarchical in Table 2.1 (Robbins, 2005). By using the organic model, the decision making processes in the centres are evolved.

Table 2.1: Mechanistic Versus Organic Models (Robbins, 2005)

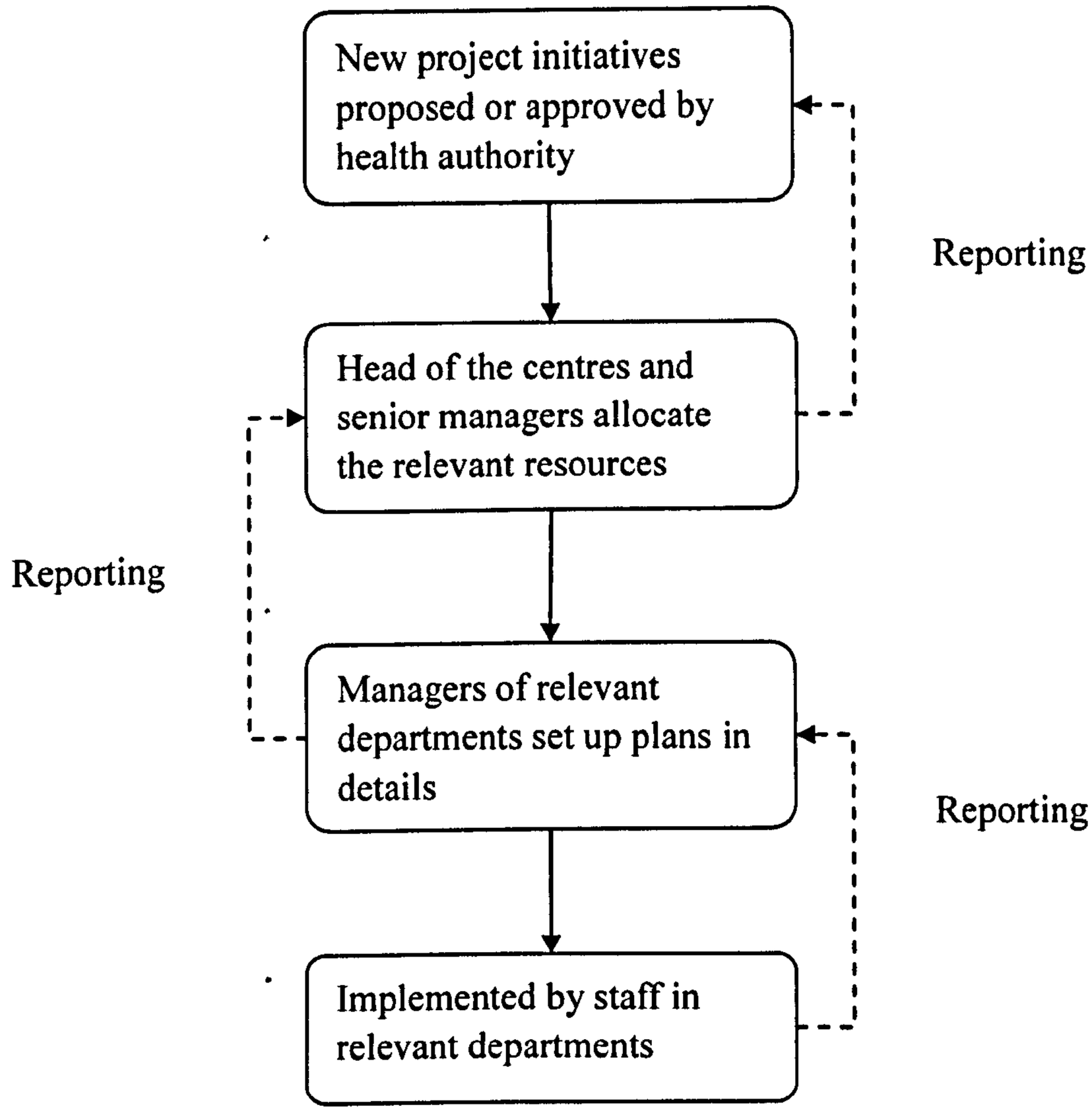
The mechanistic model	The organic Model
High specialisation	Cross-functional teams
Rigid departmentalisation	Cross-hierarchical teams
Clear chain of command	Free flow of information
Narrow spans of control	Wide spans of control
Centralisation	Decentralisation

High formalisation	Low formalisation

Decision Making Processes

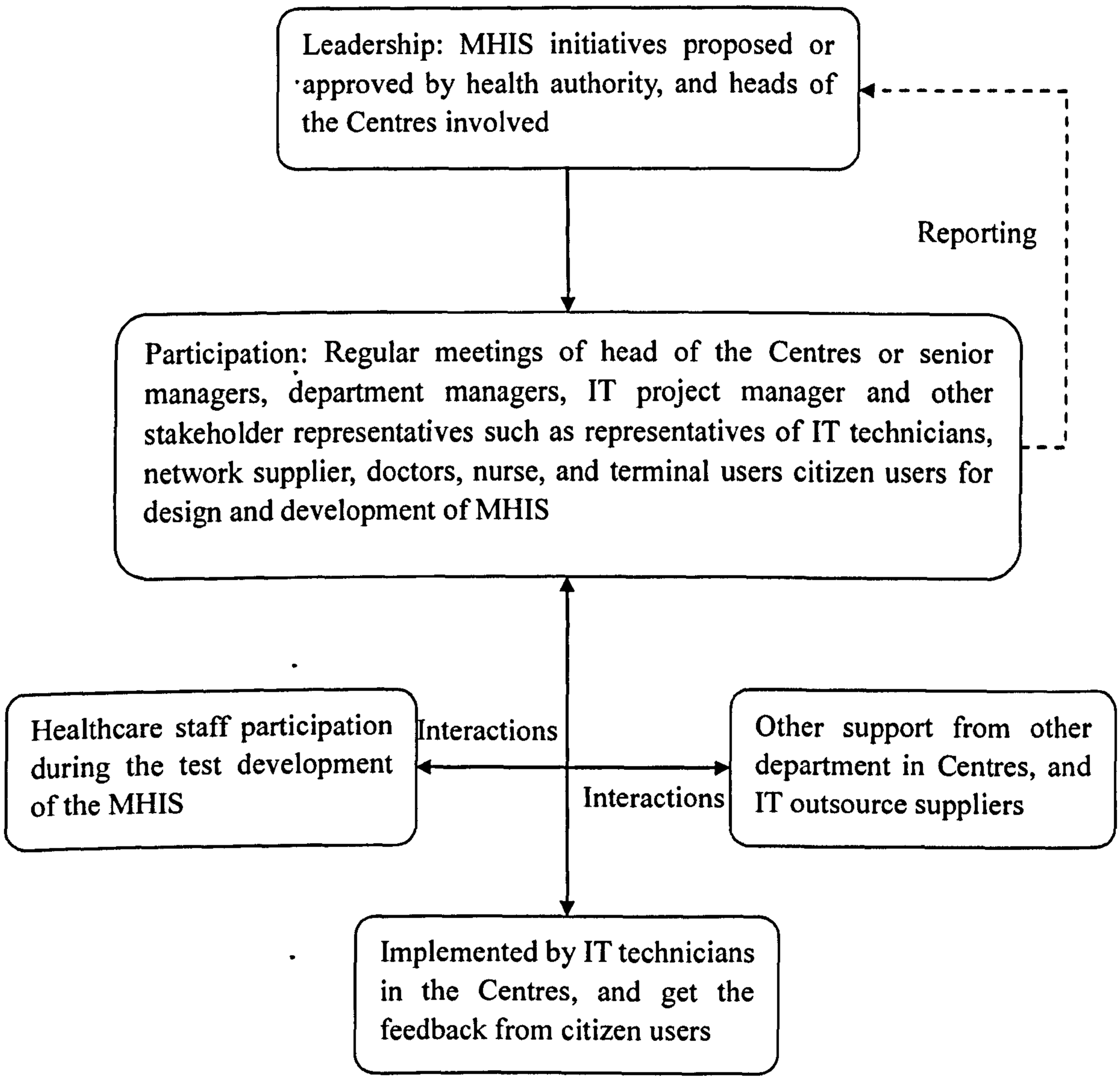
Though the study of Cases, the researchers note that they have similar changes of decision making processes. The Figure 4.2 illustrates the conventional processes of decision making abstracted by the research team from the archival documentation. New project initiatives for the community healthcare centres are normally proposed or approved by health authorities, then passed down the outline plan of the projects to top management team of the centres. The top management team allocates the resource for the development of projects, following the detail plans set up by department managers. Eventually, the staff in relevant departments will execute the implementation of the work. In case of any progress or enquiries, the reporting process has to be from bottom up, step by step, which is definitely ineffective.

Figure 4.2: Previous Vertical Hierarchy Decision Making Processes



After investigating successful cases of MHIS, the research team clarified that the centres, in Case 1 and Case 3, adopted new approaches for implementing the MHIS, because of the complex of IS project development. The management teams of the Centres suggested that the heads of the centres get involved with the MHIS initiatives approval. Once the approval is passed down to the Centre, the top management teams of the centres organise regular meetings for the stakeholders, for which details are demonstrated in Figure 4.3, which is concluded and drawn by the research team based on the archival documentation. The regular meetings will draw out the details of plans for the implementation within the feedbacks from different parties. Interactions from different groups in the Centres create horizontal communications between each other, making sure that the options and dialogues share knowledge efficiently from the stakeholders. The advantage of the new approach of management of IS projects ensures that different concerns and difficulties can be considered, and efficiency be resolved.

Figure 4.3: Current Horizontal Communication Decision Making Processes of IS Projects



The users involved in the design and development of MHIS in centres include healthcare staff and MHIS subscribers. The healthcare staff, such as GP or nurses, may need to distribute the SMS for the subscribers. IT technicians have to set up training for the healthcare staff, about how to operate the interfaces of the MHIS, meanwhile mobile network suppliers will help the test and training programmes. Network suppliers have more interests in research about HIS, because of the intention to improve their business. The IT department normally will follow advice from network suppliers. This would be supposed to be appropriate most of the time. However, network suppliers, from a business perspective, normally will highly recommend newly expensive technology solution packages for those, who plan to build up MHIS. This fallacy only focuses on technology, and completely neglects the social elements in organisations. The processes in Figure 4.3 can prevent these potential problems. The interactions ensure that issues about technology, people and organisation can be taken into account during the design and developing of MHIS. The processes of Figure 4.2 ignore the importance of users, who are seen as being inefficient for getting useful feedbacks to the managers, which may cause the rate of failure of IS.

The decisions are made at the most of the time of participation in Figure 4.3. The multi-party representatives of professionals are involved, and at all the levels. These fill up the gaps in communication between specialists and discourses for different groups. The heads of the centres are in charge of the MHIS. The leadership in Figure 4.3 indicates the power and control of MHIS in centres, and creates impacts on the organisational structures. The decision making becomes more horizontal. The horizontal structure settles problems between many groups of experts in health, IT and management, who cannot easily work with each other.

The participation meetings are organised by heads of the centres or senior managers. Every group of knowledge and experience are taken into consideration seriously. Sometime, the centres will invite IT consultants for advice, but the opinions from users are mainly concerned. MHIS users' feedbacks in the meetings during participation are the knowledge explicit for IT department, and necessary for managers. MHIS is driven by the expressed views of the people. The original views of the IT department are usually challenged by other group of representatives, because of the diversified views of users. The conflicts are resolved by discussions or voting. The suggestions from citizens, ordinary people participating in developing and testing MHIS, are treated as being as important as GP's.

China has less legacy IS, particular in community healthcare centres, but long traditions of concentration on human factors as technologies. The MHIS, at the centre level, approaches new way of making decision from the conventional model, which contributes a new approach to leadership and user participation in the field of HIS in China.

Backing to the two organisational structure models in Table 2.1 (Robbins, 2005), the previous vertical hierarchy decision making processes, in Figure 4.2, has the characteristics of the mechanistic mode, while the current horizontal communication decision making processes of IS projects, in Figure 4.3, belongs to the organic model. The organic model has more flexible procedures to deal with the complex problems in the development of IS.

4.1.2 Community Healthcare Service Delivery

According to the official state report in 2006, the State Council of the central government requests the local government to build up urban community healthcare service, based on community healthcare centres. The community

healthcare service plays an important role of the health welfare system; and is also the foundation of the free basic healthcare service for citizens. The community healthcare service is non-profit, and provides public health benefits for citizens such as disease surveillance and epidemic control. Basic healthcare service and basic medicine is the first step of health welfare benefits in China. The China Department for Health defines some free treatments for common diseases such as asthma and hepatitis, etc. Some basic medicine for these common diseases is free for citizens from community healthcare centres. Additionally, the centres have to take responsibility to distribute the healthcare information for disease prevention. The development of IS is stressed in the official reports as well. The reports suggest the centres should develop IS for more efficient service delivery, and recommend citizens and healthcare professionals to get involved in the development of HIS for the centres.

The head of the centres, with the senior managers, have to take responsibilities for the management of the centres; and the local government or health authorities have to fully support the work of the centres, the report says. In China, many projects have to be supported by governments because of the approval of permits and authorisations needed from governments. On the other hand, governmental support can enhance the success rate of the projects.

The healthcare services enabled MHIS in centres are delivered by SMS to the citizens. There are around 2 million citizen users in China at present. There are mainly five types of service the MHIS can deliver, coving almost clinic processes for an outpatient: Healthcare Garden, Healthy Life, Recovery Guidance, Industrial Healthcare and Assistant Doctor (China Mobile, 2009).

Healthcare Garden provides self-healthcare information for different group of

people, such as aging care, or young ladies skin care. The aim of it is to improve the perception of self-care for citizens. Healthcare Garden has series of options for citizens, including Mass Healthcare, Lady Healthcare, Children Healthcare, etc.

Healthcare Garden has service for pregnant women, from early pregnancy to the delivery period, providing healthcare knowledge for mothers about what to do, and what should they know via SMS. For instance, a text may be sent to users: "[Healthcare Garden] Dear Mother, if you can keep your mind working, your baby will be wiser! Mum and the foetus have interactions with each other. Your baby can perceive mother's thinking. If pregnant mothers can learn and think about what they see and listen, that can activate and improve the growth of nerve cell in baby brains."

Healthy Life provides some self-healthcare service based on the knowledge of Chinese traditional herb medicine. "Recovery Guidance" is designed for the recovery patients, corresponding to different diseases. It provides healthcare information about treatment, prevention, nutrition and recovery for a certain disease. The services cover 42 common diseases e.g. diabetes and chronic bronchitis, and the content of them are approved by medical specialists, including physicians, surgeons, gynaecologists and psychologists, etc. Giving expert opinions for patients, it explains how the diseases are caused and how to self-protect against them, etc. For example, a text message from Recovery Guidance about osteoporosis: "[Recovery Guidance] A disease in which the bones become extremely porous, are subject to fracture, and heal slowly, occurring especially in women following menopause and often leading to curvature of the spine from vertebral collapse. Symptoms: pain, kyphosis, sometimes fractures."

Industrial Healthcare provides healthcare service for different people working in different industries. For example, a text message of Industrial Healthcare for teachers: "[Industrial Healthcare] Tips for taking care of your throat! Speak less beyond working time, and reduce unnecessary long-time chatting; using appropriate voice, and use a microphone to enlarge the volume; slow down the pace of the speech, and it is better to have short stops between sentences. Keep the sentences from being too long; try to use the muscles in abdomen to help speaking, and do not use too much force on the muscles on breast or neck, when you speak... ... ". The other text message of Industrial Healthcare for professionals: "[Industrial Healthcare] Nutrition for Cervical Spondylosis! Cervical Spondylosis patients have to eat something containing rich Calcium, Protein, Vitamin B, Vitamin C and Vitamin E. Milk, fish, yellow beans and black beans contains rich Calcium. Protein is the nutrition for ligaments, bones and muscles. Vitamin B, C and E can release the pain, and reduce tiredness."

The last type SMS of healthcare service delivery is the Assistant Doctor. The Assistant Doctor is the most popular service provided by the community healthcare service centres to user citizens and patient users. The centres and mobile network supplier normally will work together to develop several functions of seven. The Assistant Doctor usually has seven functions. They are Booking Appointment, Appointment Reminder, Same Day Appointment Reminder, Examination Reminder, Examination Result Informing, User Feedback, Medicine Advice and others (China Mobile, 2009).

1. Booking Appointment involves the patient users using mobile phones editing a text message to make an appointment. The user sends a message to a sever number to request an appointment. The message is composed of Name, Healthcare Reference Number, Name of GP and Time period. The

appointment server can automatically reply whether the appointment is successfully arranged. For instance, "You are successfully making the appointment. Please come on the 'data' at 'time' to first floor of reception, and bring your paper patient records. If you want to cancel the appointment, please reply MQ 'Healthcare Reference Number' and 'Your Full Name'."

2. Appointment Reminder: A text message can be automatically sent out from MHIS servers of the centres to remind patients to attend their appointments. It normally occurs around 4:30pm one day before the day of appointment.

3. Same Day Appointment Reminder: In order to release the stress of waiting, a text message will be automatically sent out to patients, if they are in the fourth position of the waiting queue to see GPs. The text is normally like this: "There are 'number' of people before you see the GP. Please be patient, and check the screen. If you are late, you may need to re-queue. Thank you for your co-operation."

4. Examination Reminder delivers a reminder message to user one day in advance to remind the user of the time, location and something needed to be noted. For example: "Your 'item' is at 'time' 'date'. Please wait at 'location or department'. You must be in limosis, or wait 2 hours after a meal for examination. Please bring a bottle of drinking water. Thanks!"

5. Examination Result Informing: When doctors input patients' results of examination into MHIS, then the technical system will automatically inform the citizen mobile user to collect their results. "Your results of examination: 'Item, result; Item, result; ... ...', you can collect the paper report on the first floor in the community healthcare service centre. If you need more advice, please make a appointment with your doctor. Thanks! "

6. User Feedback is to get the feedback from the users or patients via SMS. It can easily pursue surveys for user satisfaction, or help the centres deal with complaints from citizen users or patients, which can improve the healthcare service or other issues of management.

7. Medicine Advice advises patients when and how much medicine every time they have to take, particular for chronic diseases such as coronary heart disease. Medical treatments for chronic diseases are often complicated, as different tablets have to be taken during different periods advised by doctors.

Others services of the Assistant Doctor may distribute information, including public healthcare seminars, centre annual report download weblink, newsletter weblink, epidemical knowledge, and emergency healthcare response, etc. This kind of information delivery is free of charge for citizens in communities requested by local government.

The operations of main five types of service - Healthy Life, Recovery Guidance, Industrial Healthcare, Healthcare Garden and Assistant Doctor, is illustrated in Table 4.1 (China Mobile, 2009). The tariff is accepted widely by citizen users. The income from the tariff is not enough for the fee of maintenance for the MHIS. The local health authority has to provide subsidies for the centres.

Table 4.1: User Operation to Subscribe to the Services

The Services	The code of subscription	Subscription	Unsubscribe	Port	Tariff	SMS frequency
Healthy Life	-JKRS	1	QX1	1065 8266 086	80 pence/per month	Wednesday, Friday and Sunday
Recovery Guidance	-KF			1065 8266 00891 + Disease code		
Industrial Healthcare	-JKBD			1065 8266 080		
Healthcare Garden	-JKJY			1065 8266 088	30 pence/per month	Tuesday and Saturday
Assistant Doctor	-ZYKX			1065 8266 0xx (relying on the centres)	Depends on the centres and the service subscribed	Depends on the cases
Others Public Healthcare Service					FREE	Decide by the centres or government, when it is necessary

From the point of view of patients, MHIS can help user simplify the clinic procedures, remind them to following the treatments on time, and save their time to queue. The healthcare professionals can use the MHIS to trace the patient records, when they are doing house visits. The healthcare service centres saves their resources. The SMS is widely adopted for healthcare delivery in other countries as well.

Koshy et al. (2008) and Costa et al. (2010) respectively examine the effectiveness of SMS reminders for ophthalmology outpatient appointments in London, and the clinic outpatient appointments in Sao Paulo, Brazil. The results of the studies both justify the positive effects of SMS increasing the rate of attendance of appointments.

Joo and Kim (2007) argue that the SMS should be introduced for community healthcare centres in Korea, which can significantly modify the behaviour of citizens who are involved in a weight control programme. SMS can be an effective way of educating citizens about healthcare knowledge. The results of SMS in different countries convinced scholars that SMS should be a new way of delivery healthcare service for citizens. However, in order to successful implement MHIS to provide healthcare, the SMS has to be concentrated not only on human factors, but also technology. The next section focuses on mobile technology, which is employed in the successful cases of Case 1 and Case 3.

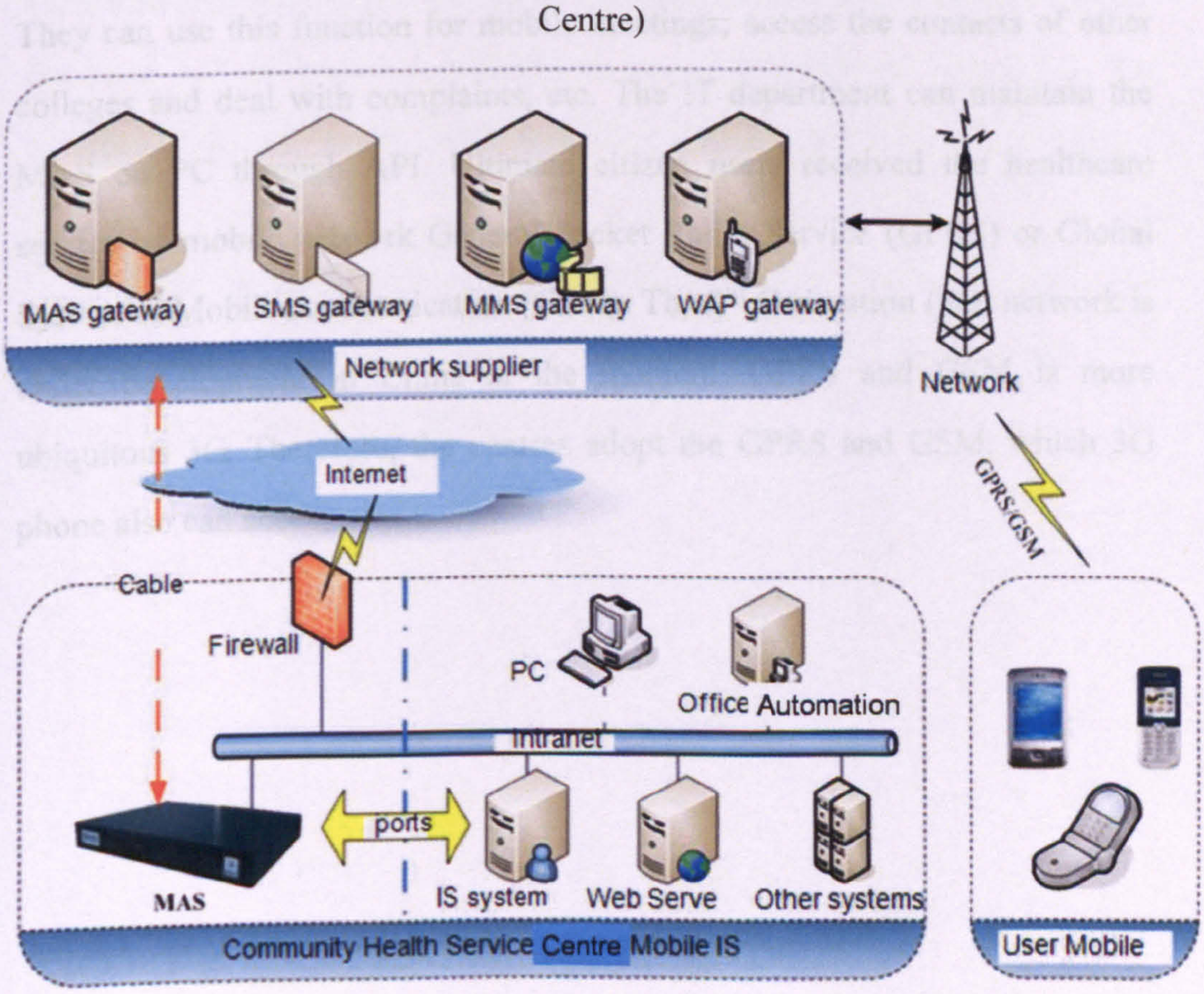
4.1.3 Technical Infrastructure

"Connecting for Health" in England was too ambitious. "Connecting for Health" is trying to build up a uniform system within the same technology (Brennan, 2005). In a practical way, it is really hard to implement. One of the problems in the UK is that hospitals already had many computer systems,

which is different from China. Many different systems in the UK are already representing the data. China, in principle, has the advantage of no technology legacy in the pass. A new system might be introduced into China that would work. However, HIS in China is learning from the approach of "Informing Healthcare" in Wales, supporting the health sector to implement technical systems by IT professionals.

Ennals (1995) argues that not everything should rely on technology. People have to know what technology can do, or it cannot do. He suggests not setting up a system where you reply on computers, to always do what, in fact, it cannot do. It is a matter of how do we take things in a practical way. Therefore, technology has to be understood well for development of a good MHIS.

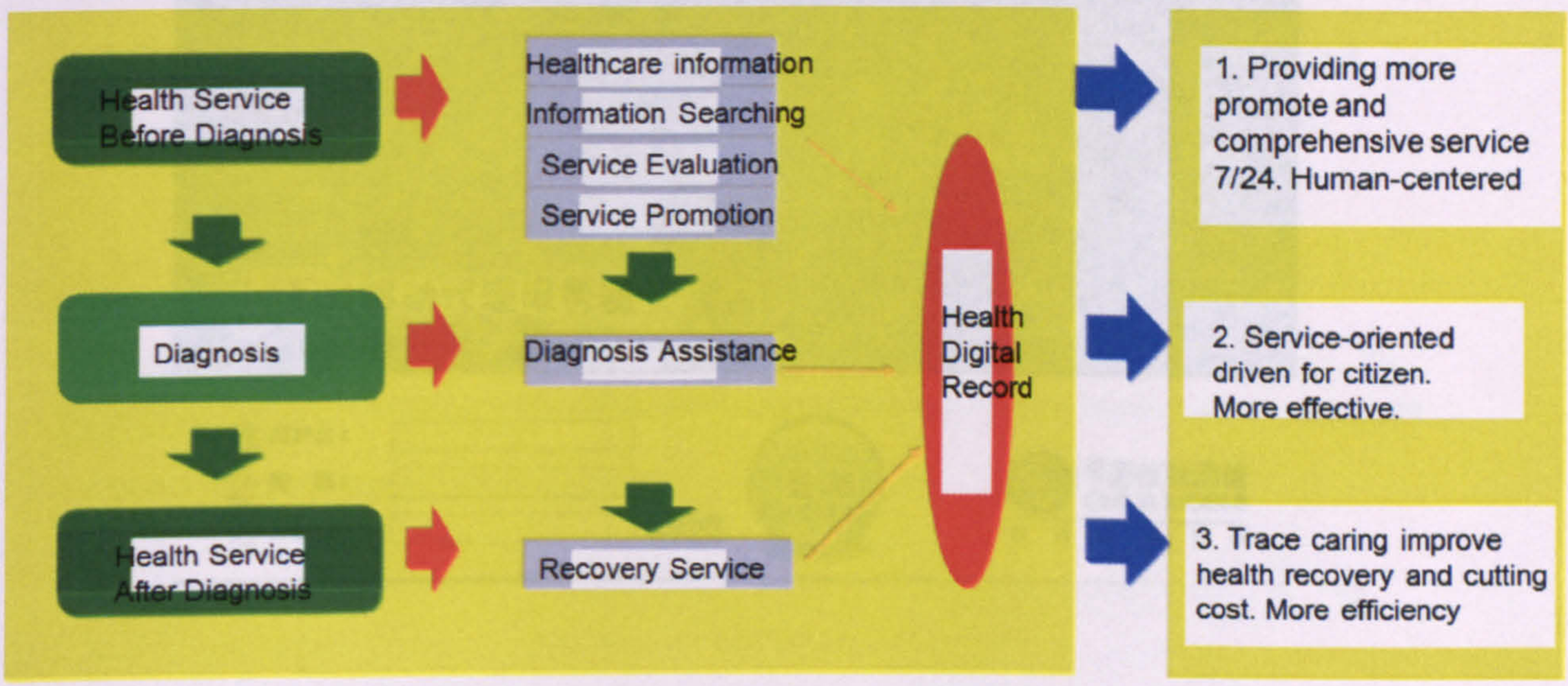
Figure 4.4: Technology Infrastructure of MHIS (Source from: archive in a Centre)



The technical infrastructure of MHIS delivers health information to the user's mobiles via network suppliers (Figure 4.4). Mobile Agent Server (MAS) (Black Box in Figure 4.4) in Community Healthcare Service Centres connected to the gateway of MAS in the network supplier, through the Internet or Mobile Cables. The MAS gateway will communicate with the other gateways including SMS, Multimedia Messaging Service (MMS), Wireless Application Protocol (WAP). Healthcare service requires high security protection. Therefore, the connections between mobile network supplier and the server use mobile communication cables.

On the other side, the MAS connects to the current HIS in centres though Application Programming Interface (API), a particular set of coding and specifications that programmes can follow to communicate with each other. The MAS also can provide the Intranet access to the staff working in centres. They can use this function for mobile meetings; access the contacts of other colleges and deal with complaints, etc. The IT department can maintain the MAS on PC through API. Ultimate citizen users received the healthcare service by mobile network General Packet Radio Service (GPRS) or Global System of Mobile communication (GSM). The 3rd Generation (3G) network is under development in China at the moment. GPRS and GSM is more ubiquitous 3G. Therefore, the centres adopt the GPRS and GSM, which 3G phone also can access.

Figure 4.5: Conceptual Model of Health Service Delivery



A conceptual service process model of service delivery for a patient in centres is illustrated in Figure 4.5. There are three parts from left to right in Figure 4.5. Health service information can be sent to users before or after diagnosis, then the trace will be recorded in MHIS at the middle part of Figure 4.5. The outcome of the conceptual model is on the right in Figure 4.5.

If healthcare professionals want to deliver a message to a citizen user or a group of users, they have to login into their accounts of MHIS. The Figure 4.6 is the login interface of China Mobile proxy server.

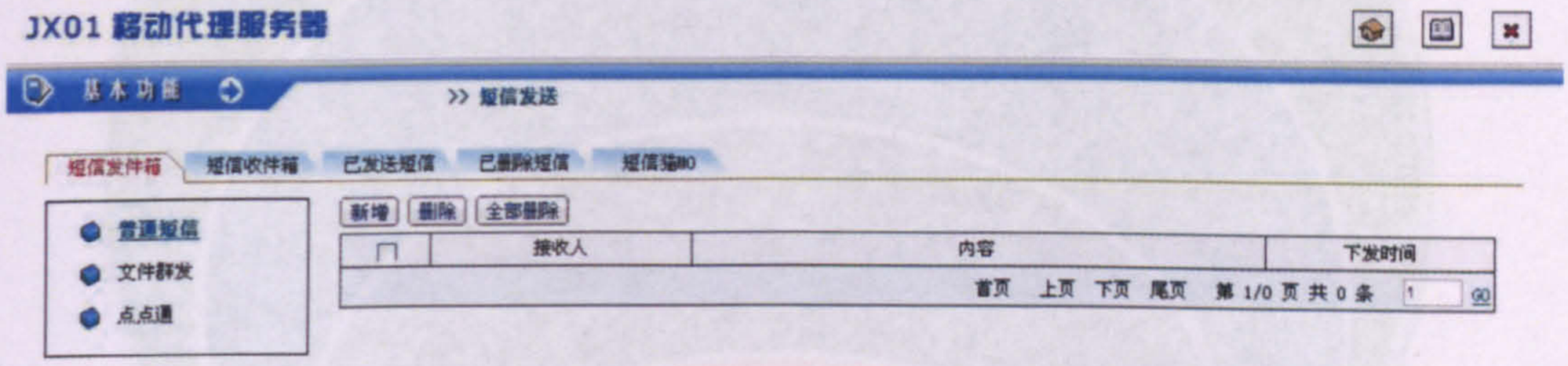
Figure 4.6: Login interface of MHIS

The main operational interface for IT technicians is illustrated in Figure 4.7. The IT department of the centres can redevelop the mobile applications for their contain service.

Figure 4.7: Main operation interface

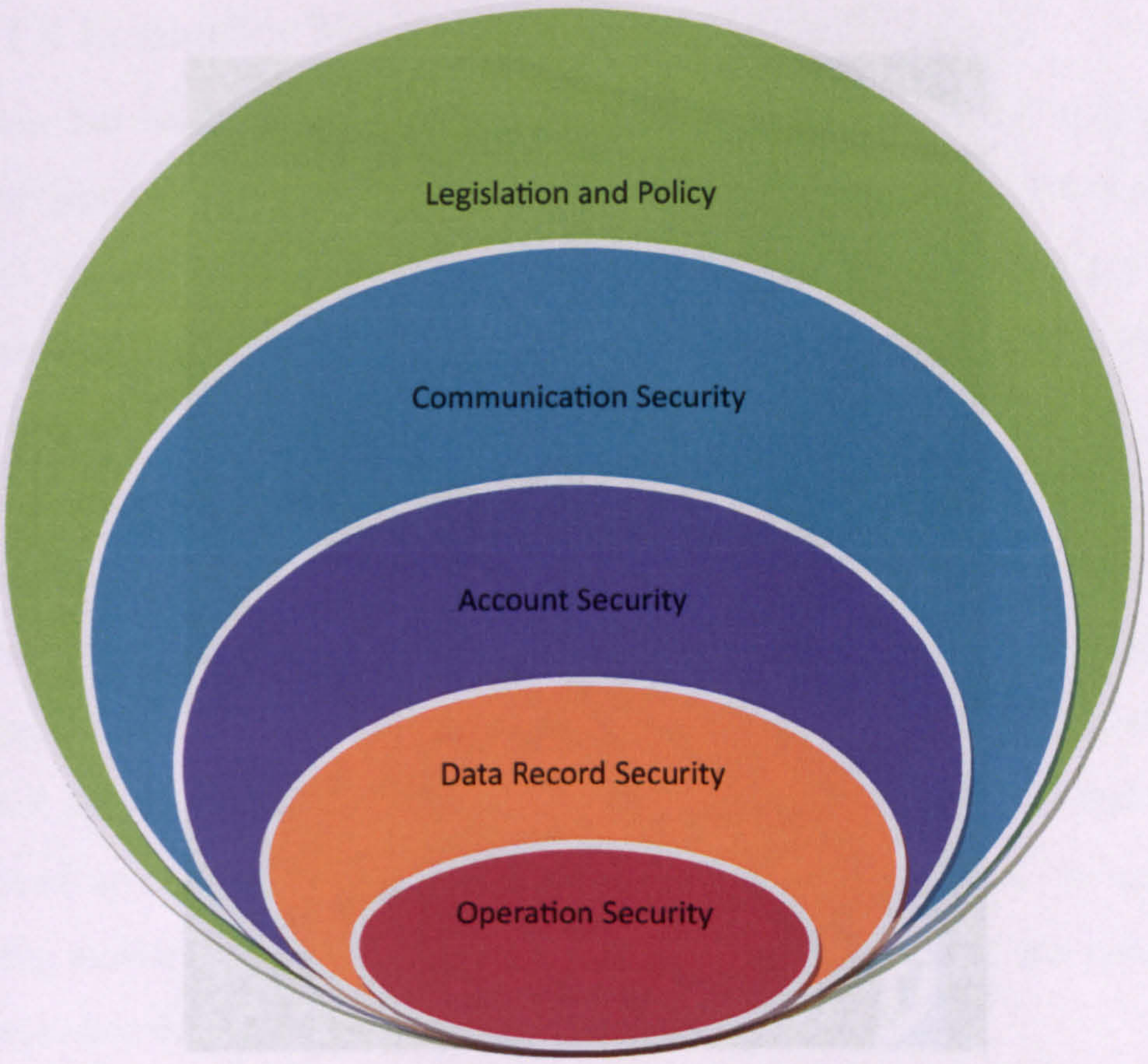
In Figure 4.8, the users of MHIS in centres can edit their messages for the ultimate citizen users. In order to set up technical systems easily to be learned by the healthcare professional users, the interfaces on the PC are very simple.

Figure 4.8: SMS Distribution Operation Interface



Security is very critical for MHIS, because of important personal data stored in the databases of centres. Therefore, a comprehensive solution is designed in Figure 4.9. Legislation and policy ensure the data within MHIS must be protected from a social perspective. In order to avoid network attacks or virus, communication security supports Virtual Private Network (VPN) and network firewalls. The communication from other networks has to be through VPN under the security of internal monitor. If the MHIS internal users access the Internet, the data will be Secure Sockets Layer (SSL), which are cryptographic protocols that provide communication security over the Internet or Intranet. Account security sets up authorities to access different data for different groups. The communication digital certificate and IP will be recorded. Data from users mobile will be validated. Data record e.g. patient personal data and medical treatments stores in dependent database within backing up every hour. Operation security controls the administration levels for different accounts. "*The operating systems in MAS use Linux, which is much safer than other operating systems such as Microsoft Windows Series*", one of the interview IT technicians says.

Figure 4.9: Data Security Protection (Source from one centre's document)



There are two technical development strategies of MHIS in centres: outsourced and self-developed. Based on the results, the successful cases recommend the method of outsourcing, but also suggest user participation and leadership within appropriate design and development processes of MHIS. The network suppliers often become contractors with the centres, because of their technology infrastructure and abundant experience in mobile technologies. Figure 4.10 is one of the experience exhibition centres set up by one network supplier. The outsourced contractor with the IT department of community healthcare centres is taking the responsibility to train the healthcare professionals how to use the technical interfaces of MHIS.

Figure 4.10: One of the Experience Exhibition Centres for MHIS

In the context of technical systems, Chinese community health centres are "green field sites", which do not have the problem of legacy systems, with inconsistent standards, etc. But, some limitations of technology are clear. The technology is primarily using SMS. The video calls have not yet been used in MHIS, which can achieve remote diagnosis. A majority of aged people are not able to use the text message function properly. They have to be assisted by their families. Mobile facilities for house visitors are still at the stage of the testing process, which can transfer the data from patient immediately to the server of MHIS. Some healthcare professional complain that the operation of the technical interfaces is hard to learn, and their time is limited. These problems and the issues concerned by different professional group will be analysed and summarised in Section 4.2. The next section discusses the other important role of MHIS can play during emergency responses.

4.1.4 Emergency Management Enhanced by Mobile IS

There has been considerable literature review in mobile IS applied in public emergency management, since the dramatic damage caused by the catastrophe 9/11 in 2001 and pandemic SARS in 2003 (Liang and Xue, 2004). As IT is constantly upgraded rapidly, new forms of IT applications such as mobile technology and online virtual community have been adopted, particular in public emergency management (Turoff and Hiltz, 2008 and Landgren and Nulden, 2007). Mobilisation informatics puts MHIS in the status of facing new challenges of theory contribution. In recent years, academic scholars have explored impacts of new mobile facilities on management and business (Rettie, 2009; Brown, 2001 and Barkhuus, 2005). However, investigation of mobile technology application on emergency management is important for daily living mobile usage (Iluyemi et al, 2007). It helped to save lives and reduce devastation during the disasters (Landgren, 2007).

Public health and medical service are key aspects in emergency management. Much literature reveals that the community is playing an essential role in emergency response (Palen and Liu, 2007; Gomez and Passerini, 2007 and Wu et al, 2009). Thus, for those organisations adopting mobile technology for community service within a function of emergency management response are the suitable cases matching of this research requirements. Throughout the literature, community healthcare centres in China are undertaking public healthcare service for citizens. Plus, some of them use the IS to distribute information for ultimate users in communities as an infection disease protection tool in emergency situations.

Mobile IS dramatically raises capabilities of rapid response in emergency management, in terms of healthcare service delivery. MHIS in community

healthcare centres taking responsibilities of rapid response in emergency management were studied by the author during the relief work of China Sichuan Earthquake in 2008, and the author published in an international conference of International Association for Development of the Information Society (IADIS) (Li and Song, 2009). Li and Song (2009) discovered that mobile IS within community health sectors and hospitals contributed a lot to emergency healthcare service delivery. E-government can be achieved with the collaborative work of central government, local government and citizens in urgent situations.

In May 2008, a massive earthquake unexpectedly destroyed Sichuan, China. Hundreds of thousands were killed. China had a quick response on the Sichuan earthquake relying on ICT. This time, Chinese relief work gained lots of positive comments and praise from the world, rather than experiencing negative opinions from the West, as on other previous occasions. China's rescue operations played an essential part within aspects of applications of mobile technical systems, and developed a solution to enhance the knowledge and practices of IS to improve emergency management from ICT dimensions. The experience of government informatics in emergency response is valuable for developing countries.

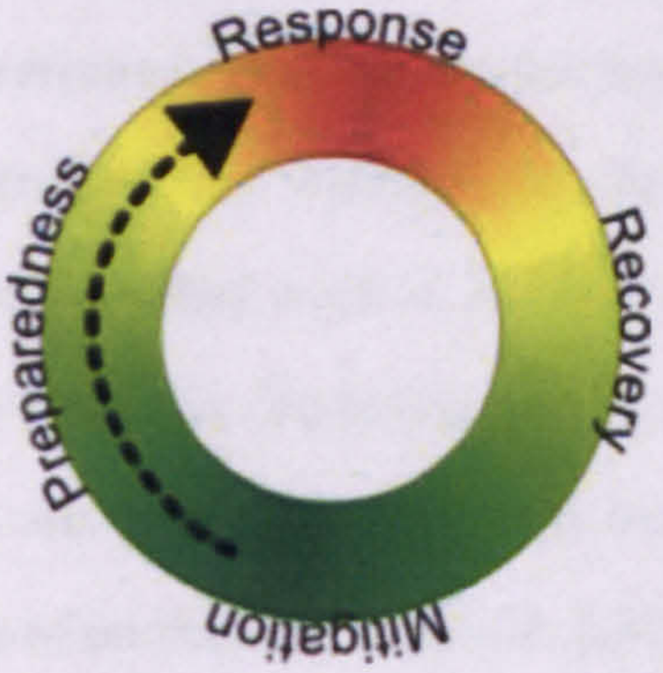
600,020 people were rescued, and 6 million homeless caused by earthquake were resettled during the period of emergency work and reconstruction (Xinhua, 2008). Emergencies put organisational decision making and organisation structures into demanding tests. Citizens benefited from the improvement of new ICT applied in emergency situations or natural crisis, so that efficient rescue work can save more lives.

Emergency, or disaster or crisis, management is a set of disciplines of dealing

with and avoiding risks (Haddow and Bullock, 2004). Generally, disaster management involves individuals, groups, and societies to manage hazards to avoid the impact of disasters. Cuny (1983), a disaster relief expert, argued that emergency management contains long-term work on infrastructure, public effects, and education on relief knowledge, etc.

Alexander (2002) states that the process of emergency management includes four stages of an emergency management circle: mitigation, preparedness, response, and recovery in Figure 4.11. Efficient emergency management demands the integration of managerial plans at all levels of public sectors, groups and societies involvement. Erickson (2006) states that the management of information is vital to the success of emergency response, because of the act of making decisions. Information must be collected, evaluated, and acted upon, etc. Therefore, MHIS in China played a crucial role in risk communication during the earthquake. Chinese government used mobile facilities to report the relief work in real time. Mobile facilities enable authorities to distribute the text messages to users. It appears that the pressure of the emergency helped to accelerate the process of information opening up in China. People were using personal blogs, websites, and website forums. These have been .changing the internet culture in China. Information is becoming more transparent, which influenced approaches to the use of particular information technologies, and also to government informatics.

Figure 4.11: The Emergency Management Circle (Alexander, 2002)



Over the past decades, expert systems have been developed for emergency planning and response. The Emergency Management Information Systems (EMIS), connecting to MHIS in the centres, is a database for disaster response with support for executing and tracking the contingency plan in disaster response. EMIS provide emergency managers support, offering integration of plans to public or private sectors for the emergency management. EMIS is embarking on the use of mobile facilities for community citizens to enhance the mobile capabilities of emergent responses.

Erickson (2006) argues that even the most sophisticated technology is no guarantor of competence, nor can it correct the consequences of incompetence. Therefore, he stressed that technology needs to be clarified in some of the most common conceptions: the specific objectives of computerisation can be clearly defined in lights of the needs of the response; information must be critically evaluated for its veracity; each programme has its capacities and limitations; and flexibilities are required at a practical level in the use of centralised computerisation. A team approach with the depth and diversity of expertise in emergency responses is a preferable way to conduct a database, and associated retrieval systems (Erickson, 2006). Systems designed by specialists groups from IT to keys members of the community partnership for

emergency plans are very likely to meet the technical criteria. In the Sichuan earthquake, data and information processing strategies were undertaken by dynamic linkage among various response expertise teams organised by official authority at the beginning of the catastrophe (Xinhua, 2008). Different specialist teams supported the relief work in incident sites. Supporting groups were from a wide range of fields, including public and private sectors and non-profit organisations. An organic model with horizontal communication matched the requirements of earthquake rescue in Sichuan.

Canton (2007) argues that the ultimate test of any strategy or plan for responses is an actual crisis event. This emergency management study was live, is very rich, and is not repeatable. Yin (2009) refers to the case study method as a way of investigating an empirical topic that is able to confront a real-life problem. It offers meaning and understanding of the world from a local and international perspective. The study adopted personal interviews to collect primary data. The procedure contains one kind of interview, face to face semi-structured interviews. The semi-structured interview is designed to emphasise the research questions to discover new issues during the study (Saunders et al., 2009). Face to face is an ideal way to make contact with interviewees, which gives more chances to explore depth discussion (Bryman and Bell, 2001). Telephone interviews were used to talk to interviewees, who are living in Sichuan, where the earthquake epicentre was. Secondary data were mainly collected from news agencies and official reports, for instance, BBC and Chinese national news agencies – Xinhua.

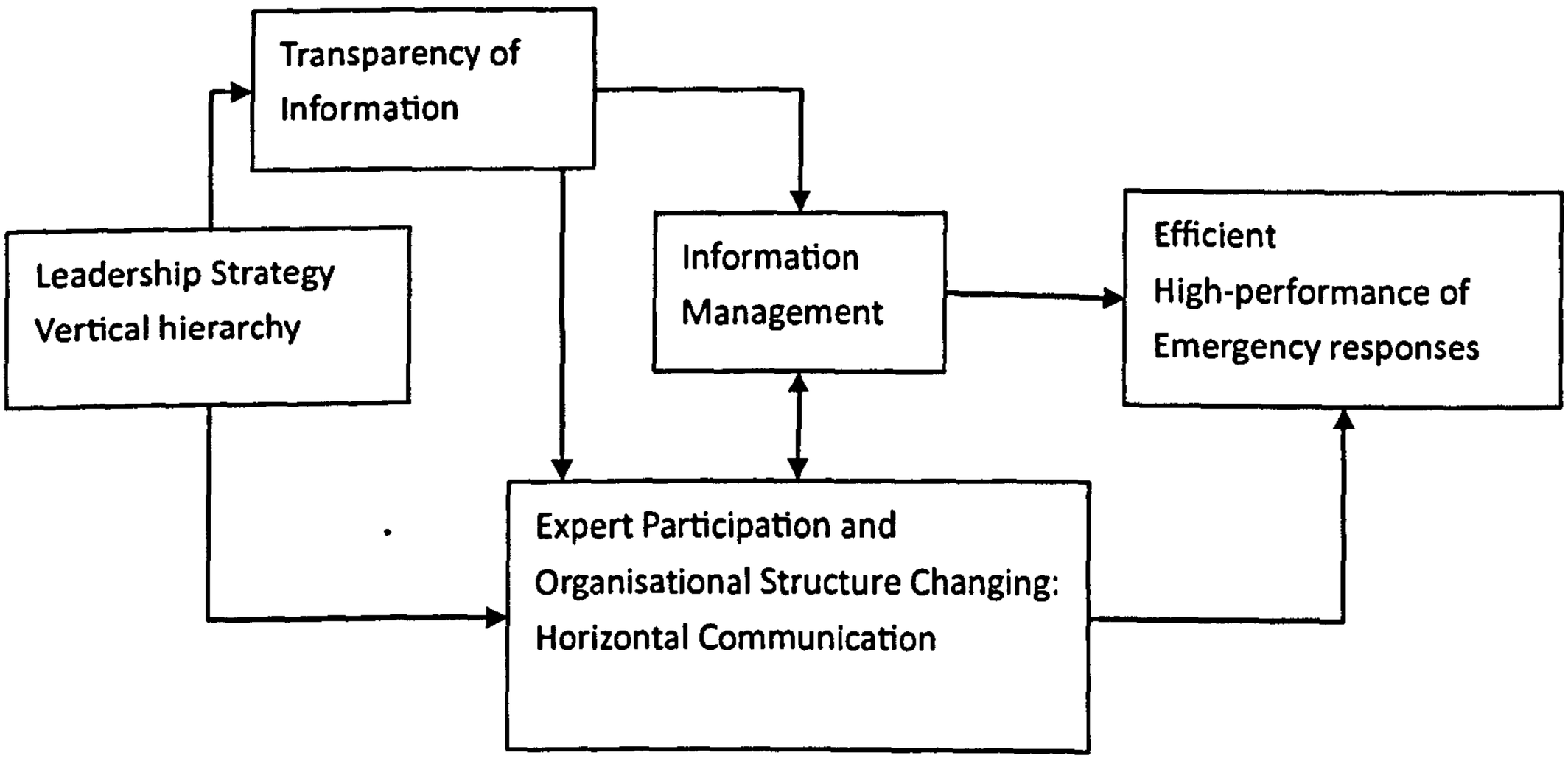
All the transcriptions of interviews were digitally recorded for later analysis with permission from the interviewees. Evidence from the transcript contains information about the names of interviewees, organisation, and some relative personal information. The analysis of strategy is expected to generate

meaningful findings that can contribute to the theory (Yin, 2009). The qualitative dataset is from twelve interviews. Occupations of the interviewees were diverse. They are largely professionals, such as Chinese government civil servants, IT technicians, rescuers, citizens and academic researchers, who had direct and indirect connections with rescue work after the Sichuan earthquake. The average time of a semi-structured interview was around 10 minutes. Having applied a coding scheme, a code-book for this dataset, and an index was developed to the transcript of data. The index work shifts some less relevant data from the raw data of the dataset. Through reviewing the coding interview scripts and the charts for references to the interviewee's knowledge, expertise, experience and attitudes, key dimensions of opinions from interviewees were drawn out.

Four key elements have been abstracted from data, which are emphasised by most interviewees: 1. Leadership; 2. Information open access; 3. Quick emergency response and 4. Multi-party co-operation and horizontal communication. The associations between them have been illustrated in An Operational Emergency Response Model in Sichuan Earthquake Figure 4.12 (Li and Song, 2009). The very beginning of emergency response was only counting from minutes to a few hours. At this early phase, leadership is top-down to make a quick and right decision. At the second phase, the focus is on information and publicity. Without doubt, it has to be transparent based on communications, so that the detailed organisation work can operate smoothly. Information technology management requires a higher level for efficient emergency response. Wireless generation was being called for in demanding circumstances. A bottom-up structure in governance was adopted within 72 hours, which create an environment for experts' participation to generate specialist relief planning. The case of donating blood indicated that horizontal communication is necessary. Citizens are now able to call for help via Internet

or mobiles.

Figure 4.12: The Operational Emergency Response Model in the Sichuan Earthquake (Li and Song, 2009)



One common opinion from all the interviewees was agreed, that making the right decision by leaders in time ensured that the succeeding procedures could be processed and taken. Interviewees were satisfied with the information, transparently and effectively delivered by governments. The media published the news of the earthquake five minutes after Sichuan had been shocked. Comparing with historic archives, during this period they used real time information updating by text, photograph and video in the internet rather than only TV channels and newspaper. 72 hours are a vital time for rescuer efforts to save lives (Coppola, 2007). One interviewee, who worked in rescue work, mentioned that the military had been contacted and involved. Sichuan has complicated terrain and mountains. Unfortunately, a couple of days after the disaster happened, there was heavy rain. Roads and communication between the epicentre and outside were totally interrupted. The air force had to drop mobile phones from airplanes to connect the victims. This solution kept up the

communications for several hours, before it was due to run out of mobile phone batteries. "We should learn from this. When the IS infrastructure is destroyed, what we should do. If rebuilding the earthquake area, we may consider mobilising facilities." He said. Military assistance was speedy. Interviewees from Sichuan consented. Urgency service including healthcare, water and food had been delivered in time. A high-tech Mobile Hospital donated from Germany was encouraging the health carers, eased by transparency of information.

Mobile phones helped the work of emergency response. But that was not impressive due to batteries' tolerance, signal receivers and other technical flaws. As mobile users are increasing within a high rate in recent years, researchers are starting to explore how mobile phones work stably in emergency situations. Then next generalisation of the information age will be mobilisation (Economist, 2008). Rural areas in China, as with country areas with poverty in Africa, do not have an internet infrastructure to welcome the dotcom boom and Web 2.0 application. Nevertheless, they may now be leapfrogging the industrialised world in the mobile era. That will substantially improve the emergency responses in crisis management.

Experience of the Chinese emergency response to the Sichuan earthquake demonstrates the vital important of collaborative working, with technical expertise and understanding at the most senior levels, which re-emphasise the significance of STS, combining human factors and technologies. Therefore, not only is it for health service delivery, but also for pressing saving of lives, seeking a suitable theoretical STS success model for MHIS development is significantly important.

4.2 Empirical Qualitative Data Analysis

The section embarks on elaborate qualitative analysis, displaying the procedures of content analysis based on the framework skills (Ritchie and Lewis, 2003). Silverman (2006) suggests criteria for success in qualitative research: 1. Analysis methods are appropriate for research questions; 2. Qualitative analysis connects to the relevant theories. 3. Data collection in a systematic way. 4.. It has critical procedures for analysis. 5. Data has to be systematically analysed through codes and themes. 6. The research outcomes are distinguished from interpretation. 7. The theoretical stance findings are explicitly. These suggestions are general rules through the interview data analysis.

Burgess (1984) argues that there may be no fixed procedures for researchers to prescribe record, code, index, analysis and ground theories. However, it is important to organise, reflect and commit on the data. Different analysis methods are presented in literature. Nevertheless, the critical process does not to be changed dramatically. Saunders et al. (2009) highlight that a common characteristic about the strategies of analysis involved disaggregating the large volume of data, and then arranging the data into meaningful patterns.

Most qualitative approaches have similar procedures to analysis the data. Miles and Humberman (1994) emphasis the coding and charting, while Ritchie and Spencer (1994) suggest that the researchers build up a framework from the results of analysis, involving five key steps: 1. Familiarisation; 2. Identifying a thematic framework; 3. Indexing; 4. Charting and 5. Mapping and interpretation.

Based on the popular works by peers (Creswell, 1997; Miles and Huberman, 1994; Ritchie and Spencer, 1994 and Silverman, 1993), Attride-Stirling (2001), a scholar from a health background, summarises a tool for the procedures of

qualitative data analysis in Table 4.2. In order to yield meaningful deeper understanding of social phenomena and their dynamics, Attride-Stirling (2001) argues that the data has to be scrutinised in the manner of methodical processes.

Many suggestions about the processes by scholars may vary about the analysis. However, the significant concept of analysis is to code out the data. Therefore, in recent years, IT companies have developed some software tools to help researchers to code. They are Computer Assisted Qualitative Data Analysis Software (CAQDAS). Yet the software tools cannot understand meaningful human languages all the time, such as rhetoric, particularly in metaphors, so nodes of theme for analysis can be set up by researchers. The key point of qualitative analysis is to understand the insights of human behaviour including languages, accents and even body language, which computers cannot do. The nature of the framework suggested by Ritchie and Spencer (1994) is expected to help researchers to provide a versatile means for analysis rather than being 'strict scientific' techniques. A social phenomenon needs to be deeply understood and explored. Certainly, the results of software can the assist researcher to get an outline of the codes. But, it cannot bring us insight into the studies. In this project, the researchers tried to use Qualrus and Nvivo at the beginning of the analysis on the transcriptions of interviews. But, when the researchers listen again to the digital records, they found lots of rhetoric during the conversations that implies that some important messages had been missed by CAQDAS. Therefore, we had to abandon the software tools.

Table 4.2: Steps in Analyses Employing Thematic Networks (Attride-Stirling, 2001, p 391)

Analysis Stage A: Reduction or Breakdown of Text

Step 1. Code Material

(a) Devise a coding framework

(b) Dissect text into text segments using the coding framework

Step 2. Identify Themes

(a) Abstract themes from coded text segments

(b) Refine themes

Step 3. Construct Thematic Networks

(a) Arrange themes

(b) Select Basic Themes

(c) Rearrange into Organizing Themes

(d) Deduce Global Theme(s)

(e) Illustrate as thematic network(s)

(f) Verify and refine the network(s)

Analysis Stage B: Exploration of Text

Step 4. Describe and Explore Thematic Networks

(a) Describe the network

(b) Explore the network

Step 5. Summarize Thematic Networks

Analysis Stage C: Integration of Exploration

Step 6. Interpret Patterns

The method of thematic network, in Table 4.2, is used for this study due its advantages of analysis. This analysis section is divided followed by the Attride-Stirling's method (2001) into six steps in Table 4.2. "Thematic analyses seek to unearth the themes salient in a text at different levels, and thematic networks aim to facilitate the structuring and depiction of these themes. ... ... What thematic network offer is the web-like network as an organising principle and a representational means, and it makes explicit the procedures that may be employed in going from text to interpretation (Attride-Stirling, 2001; p387)." There are four categories of extractions: 1. Coding from the transcriptions of interviews (Codes); 2. Categories of codes grouped together as Basic Themes; 3. Arrange the Basic Themes grouped as Organising Themes; 4. Global Themes encapsulate the Organising Themes as

a whole (Refer to Table 4.3 in Section 4.2.3). Then, a web-likely map can be drawn to depict the salient themes at each of the three levels. Figure 4.13 (Refer to Section 4.2.3) illustrates the relationships between themes. Once a collection of Basiç Themes has been derived from the original text, the Organising Themes can be categories, which reinterpreted their Basic Themes. Global Themes illustrate a single conclusion of the whole theme. Attride-Stirling (2001) produces six steps to create a thematic network (Table 4.2). Every step for this study is demonstrated in the following subsections. Step 1 to 3 is at analysis stage to reduce or breakdown text. Step 4 and 5 is at the second stage of exploration of networks. Step 6 is the final stage of integration of exploration.

4.2.1 Code material

In Table 4.2, the first step is to code material. Coding the material is regarded as an indispensable technique at the beginning of qualitative research to reduce the original text data (Miles and Humberman, 1994; and Ritchie and Lewis, 2003). Attride-Stirling (2001) points out there are two more sub-steps in code material: 1. Devise a coding framework, based on the theoretical concepts and researchers' objectives; and 2. Dissect text into text segments using the coding framework, managing chunks of text, such as paragraphs or quotations, etc.

The first set of qualitative data in this study in eight case studies includes 53 recorded interviews (Refer to Table 3.2). 32 codes of this study of MHIS were derived on the basis of theoretical literatures regarding the Mobile IS in Chapter Two. The researcher coded more codes in the beginning based on the IS theories, then after pilot study, we develop different codes, dropping some unuseful codes to eventually get to 32. The most patently constructs in the conversations were identified, and shaped into a set of codes, that can avoid

text redundancy. Following the suggestions by Attride-Stirling (2001, p 394), "the transcripts were dissected, classified and organised according to these codes."

The interviewees in different groups have different main interests and concerns about the MHIS. The general concerns from a same group are lists below:

Heads of the centre: They normally concern the policy of health from the governmental sectors, and expect the MHIS can be successfully developed with the minimum cost. Some of them have some knowledge of IS, some of them not. Good leadership can make them listen and judge whether to accept the different suggestions from different group of experts and users. In the case studies, if the heads fully support the MHIS, they normally will emphasise the importance of the projects again and again during the meetings. Additionally, they are concerned with their power of decision making, and the structure of the centres. Through the studies, the successful cases indicate that the heads are delighted to decentralise some decision powers to senior managers and relevant experts, to make sure the design and development process of MHIS can be appropriate.

Senior managers concern the top management of the centres, the process of decision making, and they often take responsibility for organising the meetings, if the management of MHIS allow the stakeholders to participate or involvement with the development of MHIS. Some of them deem that the MHIS with those appropriate technologies are able to enlarge the capability of public sectors to meet the requirement of basic healthcare delivery of the national reform, and the emergent response to public disasters.

General Practitioners (GP) or doctors: The reason to put GP and Doctors in the same group is that they both have rights to give patients medical suggestions and prescriptions. This group is hard to persuade to accept the new technology, as their time is always limited, and they do not desire to learn new skills. But, they are often not going to say no to the managers. They say the project provides unsuitable information, and they do not want to accept MHIS, if it is a failure. Through the comparison of the cases, the research team found that it is not impossible to enhance the user acceptance of this group. They have their own desires and needing. If the management team of MHIS can hear their voice and suggestions about the MHIS, what they expect to be, they may collaborate with the IT department to get trained. Therefore, this group, the core expert team in centres, concerns the participation of the development of MHIS, the service the technician can provide, and the usability of technical interfaces. In a word, if they find it easy to learn how to operate the MHIS, the results can save their time in the end. Their user satisfaction is optimistic.

Nurses or other healthcare professionals: Even this expert group, in the case, reject the MHIS, they do not speak it as loudly as GPs or doctors. However, the healthcare professional group operate the MHIS to send out messages more than any other groups. Doctor will ask the nurses to send out some text message to citizen users, if it is not very critical. As a consequence, this professional group cannot be ignored. Their opinions, suggestions, acceptance, and technical training should be treated as foremost as doctors. They concern the supports from colleagues, and have similar requests as GPs, such as the efficiency of MHIS, etc.

IT project managers: this role in centres is taking responsibilities for the technical implementation of MHIS with the management of IT technicians.

They have to discuss and record the requirements and suggestions from other groups. All the allocated resource from the management of the centre is put together under their arrangement, and the challenges of communication with other professional groups is not easy. They have carefully considered the feedback from colleagues, taken charges for the technical design and evaluation of the technology all the time, within their understanding the social and technical needing, and get insight into the MHIS about what technologies can do, and what the technologies cannot do.

IT technicians: this group is the front line of working in technology. Sometimes, they cannot fully understand the requirements from doctors or other professional staff. They have their own adverse situations. For instance, if the technology cannot meet up some organisational requirements, they have to talk to the network suppliers or report this to IT managers. If other groups complain about the technical flaws, they have to resolve technical problems, and explain them to users. Unfortunately, some of users may not know the technology well, which causes the dialogues to be hard to be understood. They concern the stabilities of the technical systems, and other technical issues.

Mobile network suppliers: this group does not belong to the centres, but they have contracts with the centres. They like to sell expensive and newly advanced technologies to centres, because of their business. The research team finds it is good to invite them to get involved with the meetings with users, which can release the pressures from other groups on the IT departments. The meetings of participation can increase the understanding of the organisational traditions and working processes, etc, which help the network supplier to collaborate with IT technicians to develop a better technical system.

Citizen users: Citizen subscribers of MHIS are concerned about the price of

the mobile healthcare service, and the effectiveness of it. Some of them may be randomly selected to be invited to attend the meetings of design of MHIS. They also concern service quality and information quality of the centres. Personal data security is regarded as an essential issue to them as well. Through the study, the citizen users can give many helpful feedbacks to the team of MHIS of centres, because they are the ultimate users of the technical systems.

4.2.2 Identify Themes

Two sub-steps of identifying themes: 1. Abstract themes from coding segments of text or listen again the digital records; and 2. Refining Basic Themes grouped as Organising Themes is to encapsulate a set of opinions contained the codes. Attride-Stirling (2001, p 392) highlights "each Organising Theme has to be specific enough to pertain to one idea, but broad enough to find incarnations in various different text segments."

In this study, the 39 codes were grouped into 12 emerging Basic Themes in Table 4.3. The discrete Basic Themes are across the conversation of interviews. The criterion of basic themes is intended to attribute overall explanatory meanings on the specific interests of IS. The Basic Themes abstracted from the codes are listed in the following.

1. Leader Emphasis: This Basic Theme emerged from the codes in transcriptions of the interviews at the pilot study Case 1 and Case 2, and it with the another Basic Theme, Participation, guides the researchers to design the other six case studies (Please refer to the Figure 3.3). Leader Emphasis as a theme or a construct is the new finding for the field of IS. The definition and the details of this concept will be discussed in Chapter Five. Three codes Leader Concern, Leader Support and Leader Intention make up Leader

Emphasis. The following list is some examples of text segments about the Leader Emphasis.

Heads of the centres: *"In the centres, we (heads of the centres) are normally treated as leaders to lead because of our responsibilities to the centres."*

"According to policy from health department of our local governments, it requests us to development mobile healthcare service... ... Although I don't have knowledge about IT, I suppose I can know something about it through the meetings with experts and users that can help the management team to make good decisions. We are pretty much concerned with this project... ..."

"I full support MHIS, and request our colleagues in our management team to support the IT department to develop it."

"My intention is that the mobile service can improve our healthcare quality eventually."

"I emphasise the importance of MHIS again and again during the meetings with the representatives of professional groups, and claim that we have to fully support the development of our project."

Senior managers: *"If our heads fully support MHIS, the resource allocated for the project will be abundant, and that increase the successful rate of our project."*

"How do we know our leader's intention? It is not too hard. If he concerns something, he will re-emphasise more times than the project should have. That is usually the way we perceive."

"As you know in the context of China, if you hear or know something the leader emphases a lot, that means something is very important, and they may be relevant to the assessment of our performance evaluation at the end of the year."

General practitioners: *"We know the MHIS is important because of the*

Leader Emphasis."

"We will try our best to collaborate with the development team of MHIS, if our head of the centre emphasis we have to."

"The intention of our head is easily got from his speech in the meetings."

"The emphasis is such important to us, because we can distinguish which agenda is in the top priority."

Nurses: *"When I represent our group to attend the design of MHIS meetings, I think the attitude of our head at the beginning of the meeting can give us a judgment of how many support such as IT training we can get from the centres. You know, sometimes other stuff may be not so concerned by our head, then the resources will be limited, which restrict their developments."*

"If our head, managers and doctor pay great attention on MHIS, then we suppose it is worth to do it."

"The Leader Emphasis leads us to learn the tendency of STS."

IT project managers: *"I am delighted to hear that our head and senior managers can support the mobile health service delivery. One of the way is to tell other department colleagues to fully support us, and it is better to emphasise their concerns of the project MHIS. "*

"The successful development of MHIS can be implemented without the leader's support, concerns and attention. In one word, we call it Emphasis. "

IT technicians: *"I think it is good to know that our head and the senior mangers speak out clearly they want to make sure we need a substantially successful MHIS, that implies we are able to get the friendly support from our departmental colleagues."*

"Even though, the leader may not know much about IT, but we think their concerns and intention are much important. He can lead us in a direction for mobilisation, and we do the technical details."

Mobile network suppliers: *"We cannot co-operate with the centres without the permission of the top management team, particularly the head of the centre. Furthermore, we expect the leader of the centres would emphasise the importance of the MHIS, otherwise the doctors may not want to work with us together. They suppose their leader do not care MHIS too much."*

"Some leaders in the centres concern and support the MHIS, which help we focus the technical development, avoiding some political confliction of the organisation such as who will control the budget of the MHIS. If leaders of the centre emphasise it, they will sort it out these for us."

Citizen users: *"I was invited to attend the participation meetings in centres. I think it was great to see the project support from the head. She is very concerned with mobile healthcare service."*

"As a mobile health service user, I think whether the development of project goes smoothly depends on how much leader concern and support that. The leader's emphasis can express their concerns to their employees."

2. Participation: This Basic Theme is not new to IS (Mumford, 1983; Lodge, 1989; Smithies, 1998; Martinsons, 1999 and Henfridsson, 2010), but still very critical to the MHIS. In this study, Participation is as vital as the Leader Emphasis to the success of MHIS. Again, the details of this concept and its implications will be discussed in Chapter Five. To yield the Participation, Three codes from interviews are User Participation, User Involvement and Expert Dialogues. The following list is some examples of text segments about the Participation.

Heads of the centres: *"I heard of the participation suggestions from consultants, which I am not so sure whether it is working. But, at the end, I found it is very helpful for us to learn different experience from our*

colleagues, suppliers and users that improve our MHIS a lot and save on the budget!"

"Participation meeting is the key process to lift our centre into a new era of Socio-Technical systems."

"The opinions can be reached directly to us the top management team, which was not quite possible before with the old structure."

Senior managers: *"We felt the user's participation may delay the schedule project development at the beginning. However, it brings us a surprise that actually reduce the timeline of the development of MHIS."*

"Democracy can be carried out by participation, which everyone has the right to speak out something, if they need."

General practitioners: *"We really appreciate the participation meetings of MHIS. That provides us an opportunity to understanding it, and learns. We doctors have our own concerns, and that now be heard by our colleagues and leaders. "*

"I think it is a great and decent change to allow multi-parties to attend a development of a IS project. Our voices were missed without the participation. So that we rejected the old IS, because they did not meet up our requirements. "

Nurses: *"As a representative of nurses, I feel honour to say our concerns in the participation meetings, which was a great change."*

"Indeed, it is very acceptable to us to attend participation meetings. We have our rights to express our thinking about the new MHIS."

"We are ultimate users of the interface of the technical systems. Therefore, how come our concerns can be missed? It was not right to miss our suggestions and considerations. If there is somewhere nurses' concern can be heard, it would be great."

IT project managers: *"The participation process derived us IT department to consider more issues than before. We will select the good*

suggestions, and implement them into our MHIS. This process is rather critical."

"I love to communicate with our systems (technical systems) users. It is path to understand each other."

IT technicians: *"I did not get used to attend participation meetings. But now I think it is very good to share the diversities, which we have to concern during the technical implementations. "*

"The participation is as important as Leader Emphasis for the project of MHIS. I think other IS project may have the same priorities."

Mobile network suppliers: *"To be honest, user participate the design of an MHIS causes lot of jobs to us. We are not really like it. But, I have to admit this enhances our successful rate of the project, and now we recommend the centres to organise some participation meetings for users."*

"The participation is a process of learning to us as well. Different professional groups have different concerns, which we cannot ignore."

Citizen users: *"I felt interesting participate the design of a MHIS. They ask me what our citizen users really concern. I say... ... This is really good way of communication with the healthcare centre. "*

"Our suggestions in the participation meetings were accepted by the centres. They (the centre) thank us! "

"Participation is users-centred process, which I think it is really valuable to help them to create a IS."

3. Decision Making Processes: In the description of the Case 1 and Case 3 in the section 4.1 of this chapter, Figure 4.2 and 4.3 and the case of emergency management illustrate the two different processes of Top-down and Bottom-Up. The researcher team deem that these two methods have their own advantages under certain circumstance. The Top-down process can ensure that

the resources can be fully supported, arranged by the top management. The Bottom-up process is able to deliver the expert opinions or suggestions and user feedbacks to the management team, and enhance different groups involved in the project understand each other. The following list is some examples of text segments about the Decision Making Processes.

Heads of the centres: *"Sometimes, top-down is more efficient than bottom-up such as emergency."*

"We create the bottom –up decision making processes to support our participation process."

Senior managers: *"The new bottom-up decision making process should be insisted on in the participation process."*

General practitioners: *"They (the management team) now respect our viewpoints now. The bottom-up processes deliver these to our leaders and heads of departments."*

IT project managers: *"I can hear the suggestions from my colleagues in my department as the change of decision making processes. I fully support this change. I feel my power in my department become stronger, because there is an environment for us to open debate and discussion, and that let us understand each other much better than before. "*

IT technicians: *"Our senior managers treat us with more respect. We like this perception. I think it is the change of decision making process. I prefer bottom-up change. "*

Mobile network suppliers: *"The centre changes their decision process, which has more democracy, and their requirements are delivered to us more effectively."*

4. Organisational Structure: Organisational structure has crucial impacts on MHIS in this study. Three types of it have been mentioned during the work of coding: Horizontal Structure, Network and Vertical Structure. The following

list is some examples of text segments about the Organisational Structure.

Heads of the centres: *"We benefit from the new decision making approaches. But, in corresponding to the changes, we consider the horizontal structure or network will be more fit to the new approaches."*

Senior managers: *"Vertical structure of the centres usually does not working efficacy for organising participate meetings. We are thinking about changing our structure into more flat, which helps us to manage in a new way."*

General practitioners: *"New structures such as horizontal or network that may make us more to right to say our opinions, which is great!"*

Nurses: *"Our specific working needing about the IS was neglected. When the management team to restructure the organisation to support us to participate the design of an IS, we found our experience and issues can be paid attention by other colleagues."*

IT project managers: *"User Participation needs the foundations to support, which is the modern organisational structure."*

IT technicians: *"I found the network structure can be more helpful to support us the participation work, and everyone can share our knowledge."*

5. Service Quality: Petter et al. (2008, p 239) define the service quality as "the quality of the support that system users receive from the IS department and IT support personnel." Service quality in this study includes Customer Service, Responding Time, and Easy to access. The following list is some examples of text segments about the Service Quality.

Heads of the centres: *"We (the management team) emphasis the service should be human-centred, which should focus on the customers, responding time and the access available 24 hours for our patients."*

Senior managers: *"The service quality is the support for our technical*

users to seek help from our IT department likely the customer service. This service is absolutely needed for any IS projects."

General practitioners: *"I found the responding time of technical service support is very vital to us."*

Nurses: *"The availabilities of technical service are very important. Occasionally, we have some problems occurring at night. The IT department has to arrange someone working with us all the time."*

IT project managers: *"We are considering setting up a scheme to support the service. The quality of it is very important to our number of our system subscribers (citizen users)."*

Citizen users: *"Take a time procedures of outpatients comparing before use of mobile technology."*

6. User Satisfaction: Petter and McLean (2009, p 161) define User Satisfaction is "the Approval or likeability of an IS and its output". This basic theme is treated as an important construct in the literatures of IS (Melone, 1990; and Wixom and Todd, 2005). In this study, the researchers code its items as Repeat Subscribes, Feedback and User Surveys. The following list is some examples of text segments about the User Satisfaction.

Senior managers: *"We also know the user satisfaction is important to us. Therefore, we regular design some mobile surveys for our citizen users to give feedback on our mobile service. "*

General practitioners: *"If we are not satisfied with the service IT department provides. The project is hard to implement successfully unless the leader is really concerned with it."*

Nurses: *"Participation meetings can enhance job satisfactions."*

IT project managers: *"Not only are the ultimate users (citizen users) important, but also the internal colleagues in our centre. The technicians will collect some suggestions and options from our other departmental*

colleague to improve our technical supports. Doctors and Nurses are the users of MHIS as well."

Mobile network suppliers: *"We help the centre to collect some feedback and survey data as well."*

Citizen users: *"My friends and family continue to subscribe the mobile community healthcare service for another year, because we found it is useful. The service is great. We are satisfied."*

7. User Acceptance: User Acceptance is the degree to which a user accepts a technical system (Davis et al., 1989; and Venkatesh et al. 2003). In this study, there are three codes Easy to learn, Time saving, and Economic for this Basic Theme. The following list is some examples of text segments about the User Acceptance.

General practitioners: *"If let doctors to accept some new knowledge skills, this first thing we concern is whether it is easy to learn."*

Nurses: *"The technical interfaces are all right with me. Because my nurses friends all thought that is not so hard to learn to operate."*

IT project managers: *"User acceptance is to our users, and the degree of good or bad of it will apparently affect our results of MHIS."*

Mobile network suppliers: *"The user acceptance is important to us. We learn from the experience. The users normally will consider the price of the service, and how much can increase their working efficiency. Usually our customers mean efficiency means time saving."*

Citizen users: *"If we are going to use the mobile service, the first thing we are going to consider is the cost. If it is economic and save our time, we will use."*

8. Technical Design: Mumford (1983 and 2003) addressed the technical design, which has to fit the organisational working process. In this study, the

researchers also code out this Basic Theme, including Designing Process and Technologies comparison. The following list is some examples of text segments about the Technical Design.

Senior managers: *"We build up an environment for participation, which helps us a lot for the technical design. The designing processes were changed from only discussed in IT department to different expert dialogues. "*

General practitioners: *"We do not need the advanced technology for the systems. Therefore, I suggested IT department to do some technology comparisons, then we know which technology can do something we need, and which cannot. I think that is the important contributions for the design process."*

IT project managers: *"I fully support the agenda of designing process discussed in the participation meetings. The result of it guide us to outsource the right technology rather than a expensive one, which sometimes does not work out the result we expected. "*

IT technicians: *"Technical systems design is a complicated process. Everyone has to plan it very carefully and well."*

Mobile network suppliers: *"We learn a lot from the re-process of technical design in the participation meetings. The technologies comparison helps us and our customers to understand each other. "*

9. Technology Implementation: Heeks (2002 and 2006) argue that some IS can be partially failure or success, which it is also a Basic Theme in this study. Applications Developed, Full usage and Partial usage are the three codes for Technology Implementation. The following list is some examples of text segments about the Technology Implementation.

Heads of the centres: *"They (Colleagues) reported to me that some functions of the system (technical system) are not implemented at the end*

as the doctors rejected. I really should emphasise they had to work hard on this project, and make sure it is fully implemented."

Senior managers: *"Implementation all the applications of mobile health is not an easy job, it is actually a process. Channing the details is happening during this process."*

General practitioners: *"If the results of the interface are wired. Clearly, we do not use it, because that is not we expected."*

IT project managers: *"Technology implementation is the main body of development of an IT project. Our department spent large amount of time to do this to make sure it can satisfy everyone's concerns."*

IT technicians: *"I think it is good to talk to each other, and then we can make sure the systems can be fully used at the end. But to do this, we have to know each other's concerns well."*

Mobile network suppliers: *"Sometimes we cannot develop a technical system as they expected originally. They did not understand us..... It may be communication problems."*

10. Technology Test: When a technical system is implemented, it has to be tested before it operates, which is very important for a technical systems. There are two types of test, Functional Test and Programming Test (Sommerville, 2007). Functional test means the expected functions should be tested, while the programming test is more technical that the IT technicians need to test the programme codes. The following list is some examples of text segments about the Technology Test.

Senior managers: *"Except for the technical staff, we don't know much about the technology stuff. But we did fully support them to carry out this process, even though it cost some resource."*

General practitioners: *"I hear of this concept from the participation meetings, and we spent some days to co-operate with the IT department to*

tackle some technical flaws. It is necessary, I know it now."

Nurses: *"If the leader or the top management team emphasis, and explain the necessaries of it, we will fully support it such as a job of IT test."*

IT project managers: *"The technology test is very very important to any IT project, and we are the team to take responsibilities to do this."*

IT technicians: *"We do programming Test with our suppliers."*

11. Technology Quality: Technology quality is the performance of an IS (Petter and McLean, 2009). In this study, the technology includes stability, quick responses, and technical security. The following list is some examples of text segments about the Technology Quality.

Heads of the centres: *"During the meetings, we recognised that the technology quality is very important, and the IT team did a survey to explore which were most important items for technology quality."*

Senior managers: *"Some citizens' complaint the quality of technology such as missing one or two regular text messages for regular healthcare. But, we improve it immediate. We do understand health service is very important to everyone. So we have to resolve it without waiting."*

General practitioners: *"I think the technology about security is the most important, with a focus on system stability, and delivery of the information on time."*

Nurses: *"Quick response of technology is advanced. It saves us a lot time."*

IT project managers: *"MHIS is operating fast and stable so far, which makes me feel a bit relaxed."*

IT technicians: *"We are satisfying the technology quality provided by our network suppliers."*

Mobile network suppliers: *"To provide safe and stable service is the most concerning issues to us for the technical quality."*

Citizen users: *"I am very much concerned with the security protection of our personal data in the service centres. I think the centre will have good technologies to protect our health data."*

12. Information Quality: Timing and Good format composed of Information Quality, which is different from other items of Information Quality construct such as DeLone and McLean's study (2003). Petter et al. (2008) define information quality as the desirable characteristics of the technical system outputs. Timing and good format are the items most concerned within this study. The following list is some examples of text segments about the Information Quality.

Heads of the centres: *"The ultimate service is the information quality, which I require our colleagues have to attention to improve it all the time."*

Senior managers: *"We discuss the issues of information quality. We got lots of feedbacks from the participation meetings concerned with the information quality."*

General practitioners: *"We control the contents of SMS. There are at least two persons to operate. One is select or writes a message in a good format and easy understood, while the other is to double check the content of SMS."*

"Patients' feedbacks tell us that we need to improve a good format of text messages and easy understanding to them. "

Nurses: *"Considerable volume of sending messages has to be sent out every day. We have some prototypes for the message, but we still need to make sure the service we delivery is at the right time and to the right persons."*

IT project managers: *"Information quality is critical to our systems (technical system). In MHIS, it varies from other IS. I think the timing and*

the content is two important points for mobile health service."

IT technicians: *"Though the SMS is simply as text, the length of the text is limited due to the screen of mobile phones. So, we instruct the healthcare professional to edit well formatted and concise text messages, in order to make the quality of information. "*

Mobile network suppliers: *"Because the contents of healthcare service content is sensitive. Therefore, we set up the exclusive cable to transfer the messages to the ultimate users on time."*

Citizen users: *"I have subscribed the text message service from the community healthcare service centres. I think the quality of information is pretty important, which I expect I can receive the timing and good format messages to tell me how to do next."*

4.2.3 Construct Thematic Framework

Six sub-steps to complete the network (Attride-Stirling, 2001) in Table 4.2. In general, the sub-steps are to arrange the relationship of Basic Themes and Organising Themes, and clarify the Global Themes, based on the theory of certain subjects. They are: 1. Arrange themes; 2. Select Basic Themes; 3. Rearrange into Organising Themes; 4. Deduce Global Theme; 5. Illustrate as thematic network; and 6. Verify and refine the network.

Following the sub-steps of Constructing Thematic Framework, Figure 4.13 illustrates the Thematic Framework of this study, based on the theories of STS discussed in Chapter Two. The 12 Basic Themes were arranged into two broad groupings, on the basis of STS conceptual content. They are Social Elements and Technical Infrastructure, correspondence to the 12 Basic Themes (Table 4.3). These two Organising Themes were then deduced into one Global Theme, A STS of MHIS.

In this study, the researchers define one Organising Themes as Social Elements. There are seven Basic Themes for this Organising Theme, including Leader Emphasis, Participation, Decision Making Processes, Organisational Structure, Service Quality, User Satisfaction and User Acceptance. Social elements, which may affect on IS, have more than hundreds from the literature review. Nevertheless, in this study, the researchers abstract the seven important issues for these case studies of MHIS.

The other Organising Theme is Technical Infrastructure, including Technical Design, Technology Implementation, Technology Test, Technology Quality and Information Quality. Similar to Social Elements, hundreds of technical factors are discussed in the literature review. But, we only found five of them are significant to these MHIS.

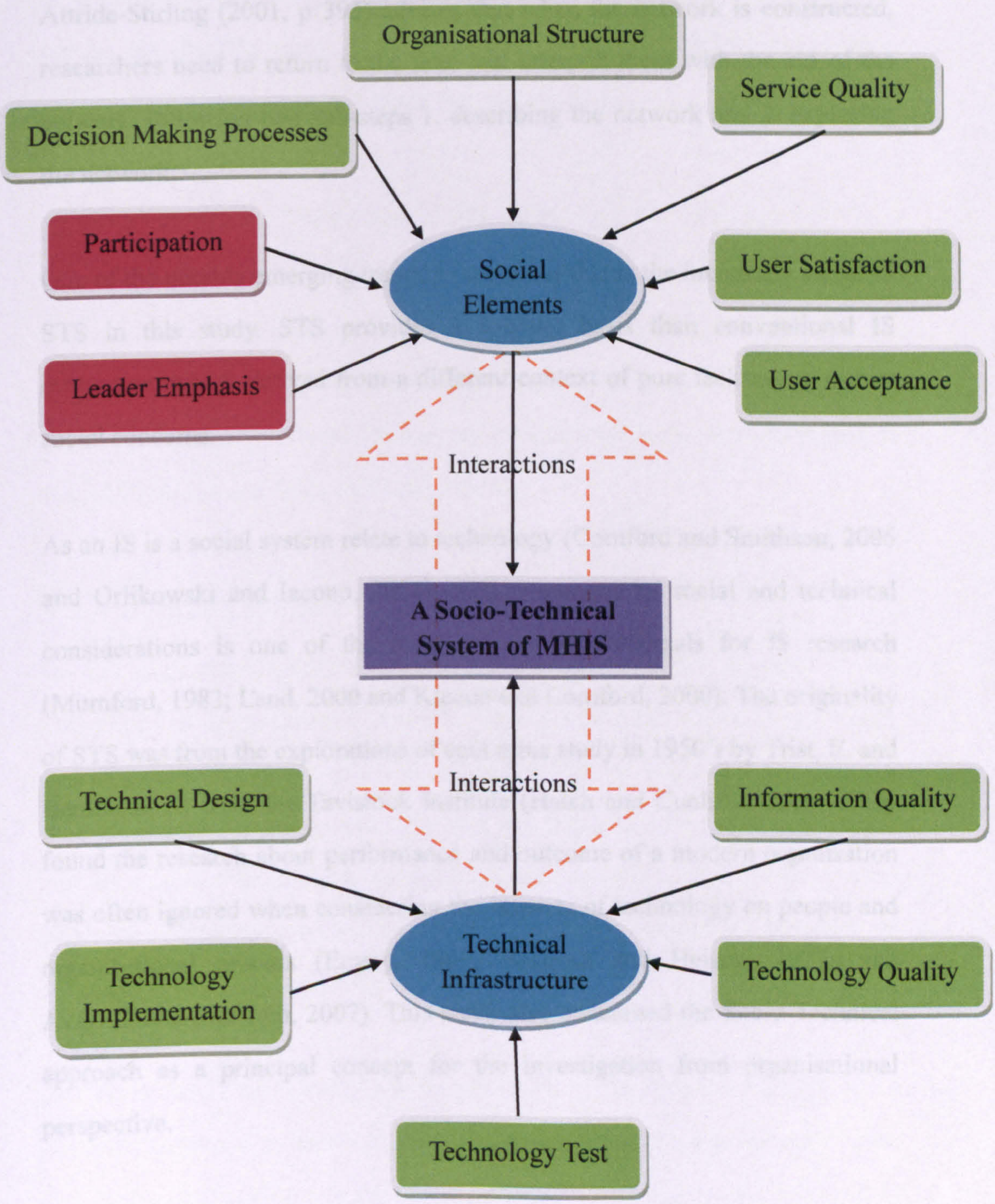
In Figure 4.13, there is a dual arrow between Social Elements and Technical Infrastructure. This is based on the theory of four rules for the reinvention of health care in STS (Coiera, 2004). Rosenberg and Holden (1998) argue that IT in an organisation should interact with human elements. Thus, Interactions between organisation and technology always exist. The basic themes are not independent, but intertwined with each other. Here we can only list the important Basic Themes, but it does not mean other social or technical factors do not in existence.

Table 4.3: From Codes to Themes

Codes	Basic Themes	Organising Themes	Global Theme
Leader Concern Leader Support Leader Intention	1. Leader Emphasis	1. Social Elements	A Socio-Technical System of MHIS
User Participation User Involvement Expert Dialogues	2. Participation		
Top-Down Bottom-Up	3. Decision Making Processes		
Horizontal Structure Network Vertical Structure	4. Organisational Structure		
Customer Service Responding Time Easy to access	5. Service Quality		
Repeat subscribes User Surveys Feedback	6. User Satisfaction		
Easy to learn Time saving	7. User Acceptance		

Economic			
Designing process Technologies comparison	8. Technical Design	2. Technical Infrastructure	
Applications developed Fully usage Partial usage	9. Technology Implementation		
Functional Test Programming Test	10. Technology Test		
Stable Quick Security	11. Technology Quality		
Timing Good format	12. Information Quality		

Figure 4.13: Thematic Network for "Socio-Technical System" in MHIS



4.2.4 Describe and Explore Thematic Networks

This step reaches the analysis process of exploring the meaning of the study. Attride-Stirling (2001, p 393) advises that when the network is constructed, researchers need to return to the text, and interpret them with the aid of the network, following two sub-steps 1. describing the network and 2. exploring the network.

One of the notable emerging trends to solve out this is the increasing usage of STS in this study. STS provides a sounder basis than conventional IS evaluation, which derived from a different context of pure technology or just social concerns.

As an IS is a social system relate to technology (Cornford and Smithson, 2006 and Orlikowski and Iacono, 2001), STS composed by social and technical considerations is one of the most popular fundamentals for IS research (Mumford, 1983; Land, 2000 and Klecun and Cornford, 2000). The originality of STS was from the explorations of coal mine study in 1950's by Trist, E. and Bamforth, K. from the Tavistock Institute (Hatch and Cunliffe, 2006). They found the research about performance and outcome of a modern organisation was often ignored when considering the impacts of technology on people and organisational process (Emery, 1969; Bostrom and Heinen, 1977a and Avgerou and McGrath, 2007). This study also concerned the Socio-Technical approach as a principal concept for the investigation from organisational perspective.

The language and approaches of STS have much to offer, as this research is seeking to make sense of people in organisations using IT. In essence, the thematic network can be expressed in the language of STS, alongside presentations using illustration. The Global Theme in Figure 4.13 is 'A

Socio-Technical System of MHIS'. This constitutes two Organising Themes and twelve Basic Theses. This network represents and exploration of interviewees' conceptualisation of STS in the context of MHIS on nature. As we can see, the STS draws the whole picture of MHIS. The STS brings further insights into the Community Health Service Centres.

4.2.5 Summarise Thematic Networks

The summary step is to present the network sufficiently, and explicitly interpret more compelling information. The network is central in the conceptualisation of STS as natural. Two Organising Themes are two parts of a STS for MHIS. The Basic Themes are divided into two groups belonging to Social Elements and Technical Infrastructure.

4.2.6 Interpret Pattern

In this step, Attride-Stirling (2001, p 394) states, "Bring together 1. the deductions in the summaries of all the networks (if more than one was used), and 2. These deductions and the relevant theory, to explore the significant themes, concepts, patterns and structures that arose in the text. The aim in this last step is to return to the original research questions and the theoretical interests underpinning them, and address these with arguments grounded on the patterns that emerged in the exploration of the texts."

Attride-Stirling (2001; p402) also suggests taking the thematic network into a cohesive argument or debate by relating them back to the research questions; and "researcher must relate the principal themes and patterns that emerged in the analysis to the original questions; and propose some explication of the questions grounded on the content and exploration of the texts, and on the theoretical constructs guiding the research."

In this study, as the two vital constructs, Leader Emphasis and Participation, recurred in the codes many times than others, they are the two most fundamental critical elements in this thematic network. Returning to reviewing the transcript of the interviewees, it confirms the same results that Leader Emphasis and Participation are far more important than other Basic Themes for MHIS success. Participation is discussed in many of IS literature review, while the Leader Emphasis is totally new to the field of IS. Therefore, it is necessary to explore deeper for Leader Emphasis and Participation in the next chapter. Then the research questions can be answered afterward, which will be completed in Chapter Five.

The case studies demonstrate the understanding of the researchers, concerning many issues involved in the implementation of practical MHIS. A new generation of doctors and other medical professionals can benefit from the insights of the study. In particular, the exploration of the use of mobile phones and SMS opens up new possibilities for healthcare service delivery. Figure 4.13 offers a demonstration of a successful STS model for the cases.

Furthermore, this chapter implements the methodological issues discussed in Chapter Three, in the context of the chosen problem domain. Note that the chosen transcriptions of case studies link with the conversation discourses and qualitative research traditions.

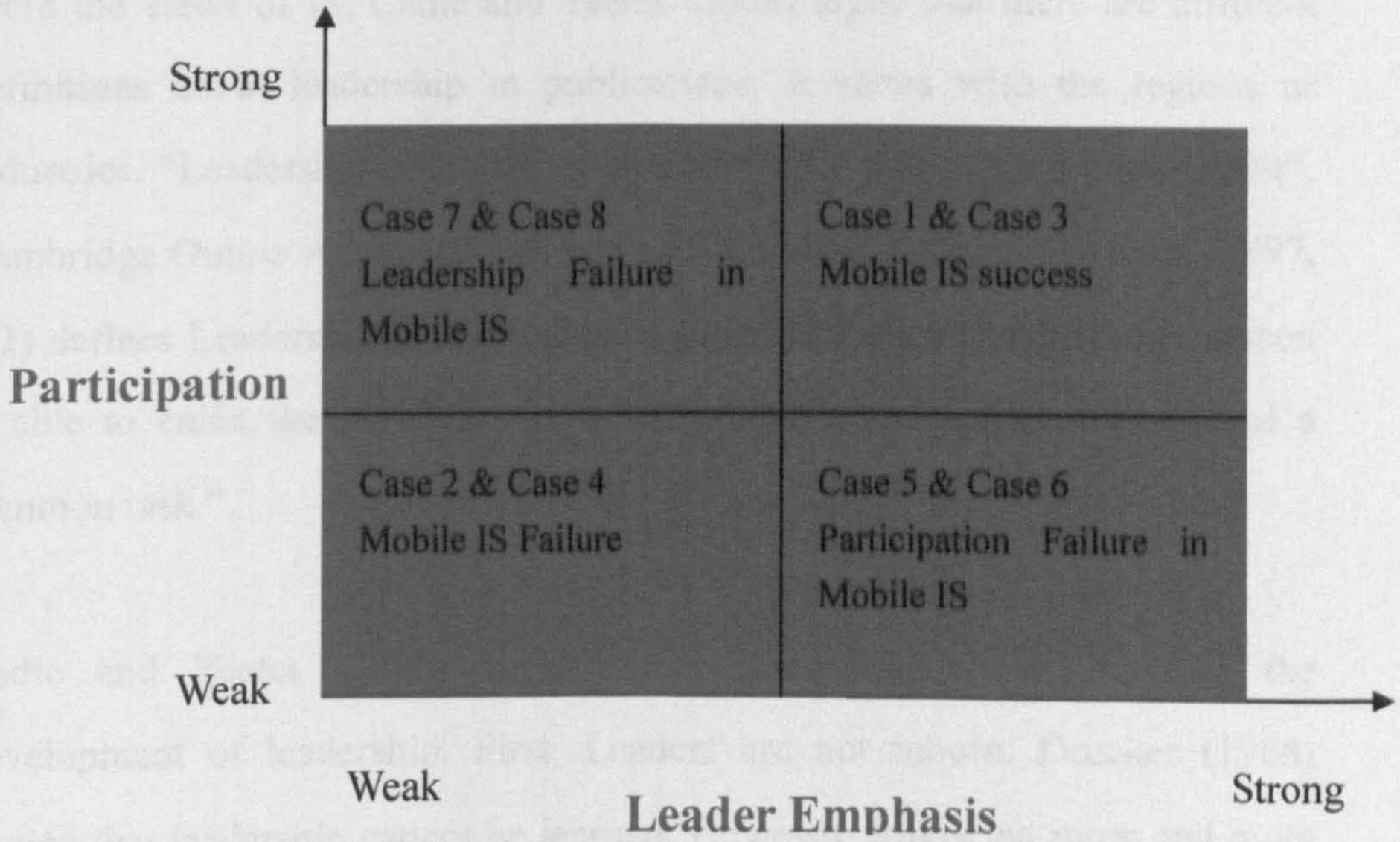
CHAPTER 5

Research Findings and Reflection

This chapter explores the research finding, a new theoretical concept "Leader Emphasis" for IS, and discusses the contextual contribution of "Participation" within the context of MHIS. The research questions which emerged in Chapter Three are answered at the Summary section 5.3.3, following the discussion of STS.

The Thematic Network for "Socio-Technical Systems (STS)" in MHIS brings together healthcare service and mobile technology in the real world. In these Chinese cases, looking at where people are situated, what they trying to do with social and technical systems; how advanced they are at the moment are integrated as a STS. However, as the discussion in Chapter Three and Four, after the multiple cases study, illustrating in Figure 3.3, the results indicate the "Leader Emphasis" and "Participation" are two essential elements to the MHIS within the STS thematic network. Therefore, the following sub-sections discuss these two elements in detail first, and then interpret the STS pattern to answer the research questions.

Figure 3.3: Multiple Case Studies Design



5.1 Leader Emphasis

Each of the quadrants states their Mobile IS evaluation status in Figure 3.3. For instance, Case 5 points out its Mobile IS failure due to the weak Participation, even though the centre has strong Leader Emphasis. The multi-cases study underpins the finding of Leader Emphasis and Participation. As a consequence, eight other cases have been chosen.

Leader Emphasis as a social shaping factor, Shamir et al. (1998) and Shamir et al. (2000) present the Leader Emphasis from a perspective of Leadership in Managerial and Psychological fields. Nevertheless, the concept of Leader Emphasis has not yet been proposed in IS. One reason can be considered is that, in the English language literature most of the field work is based on western countries, where Kim and Peterson (2003) points out that leaders have less discretion and control power in management and making decisions. Therefore, Leader Emphasis was seldom treated as important as cases in Western countries.

From the views of IS, Cadle and Yeates (2008) argue that there are different definitions about leadership in publications. It varies with the regions or industries. "Leadership is the set of characteristics that make a good leader", Cambridge Online Advanced Learner's Dictionaries defines. Chemers (1997, p 1) defines Leadership is "a process of social influence in which one person is able to enlist the aid and support of others in the accomplishment of a common task."

Cadle and Yeates (2008) suggest that three stages can describe the development of leadership. First, Leaders are not inborn. Drucker (1968) argued that leadership cannot be learned. However, following more and more results of empirical studies, this inheritable trait of leadership becomes less supported by scholars (Cadle and Yeates, 2008). Then, the scholars started to focus on responsibilities of a leadership. They argue that the responsibilities are not unchangeable, but depend on the specific settings. The leadership can be executive, planned and organised, etc. Adair, a famous British leadership scholar, proves that the efficiency of leadership relies on capacities of leaders themselves, difficulties of tasks and needing of the team (Adair, 2006). Adair and Reed (2003) stress when team's goals and needing of individuals can be combined, leadership outcomes will be positive. The last stages are styles of leadership. Cadle and Yeates (2008) reckon a single hierarchy position cannot be enough anymore for responsibilities of a leader now, particularly with knowledge creation organisations such as IT company. The conventional style of leadership was to instruct the employees to do orders following strict working instructions, for example, Taylor's scientific management. Modern leadership involves reward management, motivation management and encouraging team work, etc. Tannenbaum and Schmidt (1973) publish four patterns for leadership.

1. Leaders use authority to tell their employees what to do their work. This is popular in military contexts.

2. Leaders and experts plan schemes, and then their employees learn and accept the proposed schemes.

3. Employees use some advice and support from the management team to independently make working plans.

4. A decision making team, involving leader and employee, meet up and discuss together for making decisions and plans. Many IT knowledge creation organisations adopt this pattern, such as Facebook.

The first two styles of leadership are top-down processes of decision making using authorities, while the last two are bottom-up, releasing the freedom for subordinates to participate the decision makings. Tannenbaum and Schmidt (1973) also state that the style of leadership may be affected by leaders themselves, their employees, situations of their organisations and the context of societies.

According to the literature review, currently, most IT managers adopt the fourth pattern (Tannenbaum and Schmidt, 1973). Cadle and Yeates (2008) suggest it is good to have regular examinations, and discuss, with the IT team, the development of IS.

Some IS scholars (Hsu et al., 2006; Teo and Ang, 1999; and Ravichandran and Rai, 2000) discuss the effectiveness of Top Management Support in a successful IS. Top manager support and Leader Emphasis have similar approaches for decision making. However, the power from top manager support is more likely from a senior management team, rather than from a single person such as a Chairman or a Head of an organisation. Leader Emphasis usually implies that person is in charge of an organisation.

Therefore, Top Management Support and Leader Emphasis are different.

In this study, leadership is studied in the context of China. In China, the management levels are hierarchies in governments and public sectors, and people in the higher level have much more managerial discretion and control power in management and making decisions. They can choose which decision model they are going to use; how much resource they want to support a project and the staff promotion, etc.

In the community healthcare service centres, the heads are normally treated as leads in the centres. Luo and Li (2007) definite that good leadership is to guide or lead a team to complete a successful IS project. The leadership involves the allocations of human resource and financial resource, etc. Luo and Li (2007) state that communication is one of the most important key points for the leadership, suggesting leaders encourage stakeholders to get involved with the design and development of IS projects. This concern is similar to the Tannenbaum and Schmidt's fourth pattern (Tannenbaum and Schmidt, 1973).

Notwithstanding the progresses of Participation in the centres is closed to the fourth pattern, the inevitable precondition is Leadership. However, the researcher team considered Leadership cannot be a key social element for a successful MHIS, but Leader Emphasis. There are two main reasons for this. The first reason is that Leader Emphasis was coded from the interview data. The second one is that Leadership is a general broader concept in IS. For example, Armstrong and Sambamurthy (1999) concludes leadership in IS may include IS knowledge, IT-related strategic knowledge and Organisational strategies, etc. Therefore, Leadership Emphasis is chosen for important social elements in this study for research design, rather than Leadership, even though

it is part of Leadership.

5.1.1 Leader Emphasis on Mobile Health Information Systems

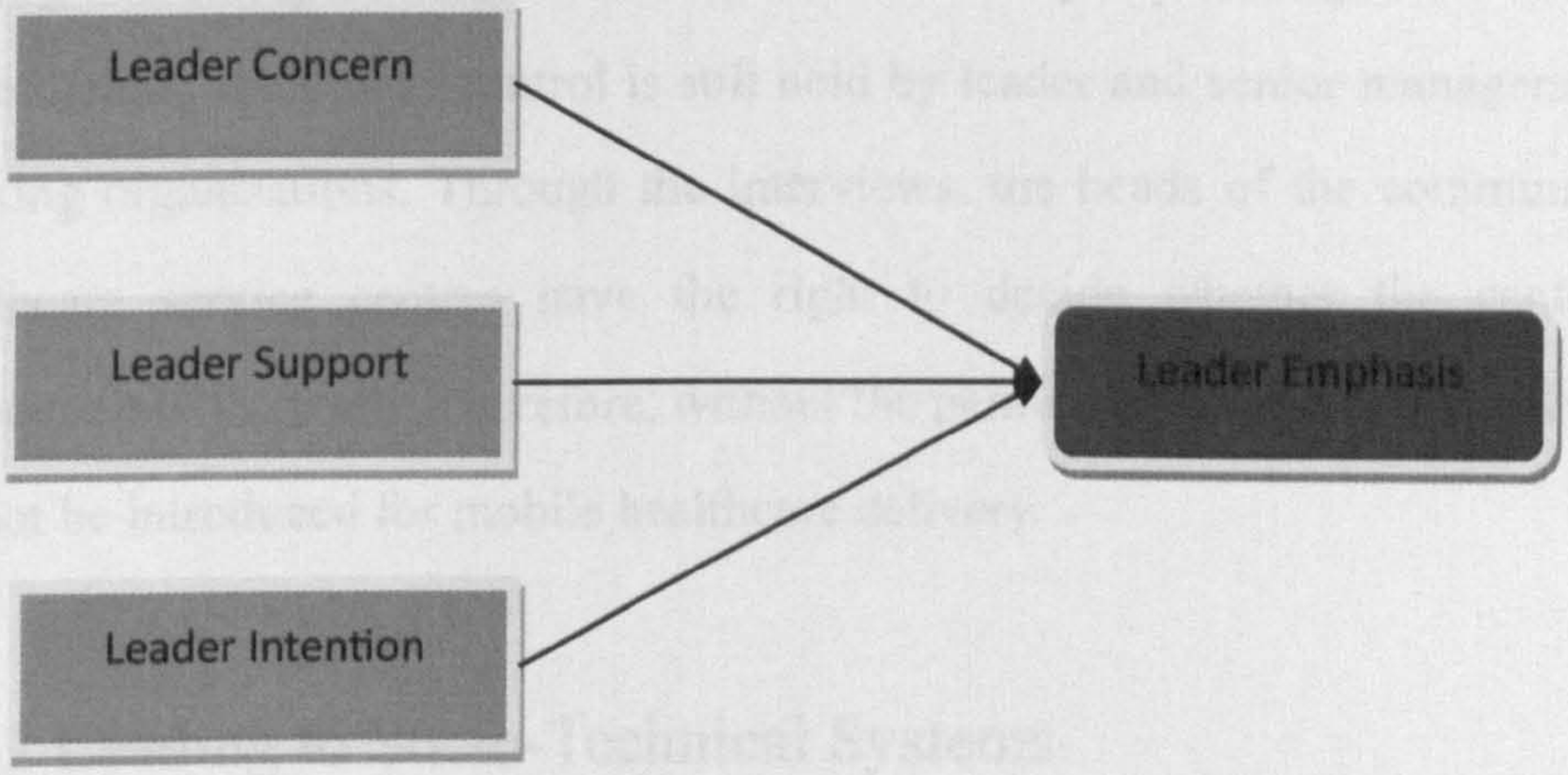
From the analysis in Chapter Four, Leader Emphasis contains three Basic Codes, which are Leader Concern; Leader Support; and Leader Intention in Figure 5.1. Two example text segments below indicate the relationship between the Leader Emphasis and the Basic codes.

"If our head is concerned, or he wants to arrange resource to support the development of the MHIS project, he will emphasise when the senior managers meet up together." a senior manager says.

"We can judge the importance of our projects to our centre from intentions of our leader. We get these intentions based on how frequently the head gives emphasis." a doctor says.

In some transcripts, Leader Attention was coded in several times. But, the researchers argue that Leader Attention is similar to Leader Concern, and in this setting, we can treat Leader Concern as Leader Attention based on the original meanings in the text.

Figure 5.1: Social Items for a Social Element Leader Emphasis



Theory about Leader Emphasis in IS is absent. Shamir et al. (1998) state the Leader Emphasis is one of a number of leader behaviours from military management perspectives. Their studies on leaders' behaviours can conclude three categories of Leader Emphasis: an emphasis on collective identity, an emphasis on shared values, and inclusive behaviours. Jung and Avolio (1999) explain one of the reasons why leaders like to emphasise is that organisations have a collective sense of mission. Leader Emphasis can be a leadership style, which leaders expect the members of an organisation working toward collective goals for the sake of a group, rather than for individual achievements. Collectivism usually requires staff members to accept top-down orders without discussion such as in the army. Jung and Avolio (1999, p 209) says, "Consequently, we expected that a transformational leader's emphasise on achieving collective goals would be more readily accepted when group members' cultural orientation was more collectivist (Jung et al., 1995; and Jung and Avolio, 1999, p 209)."

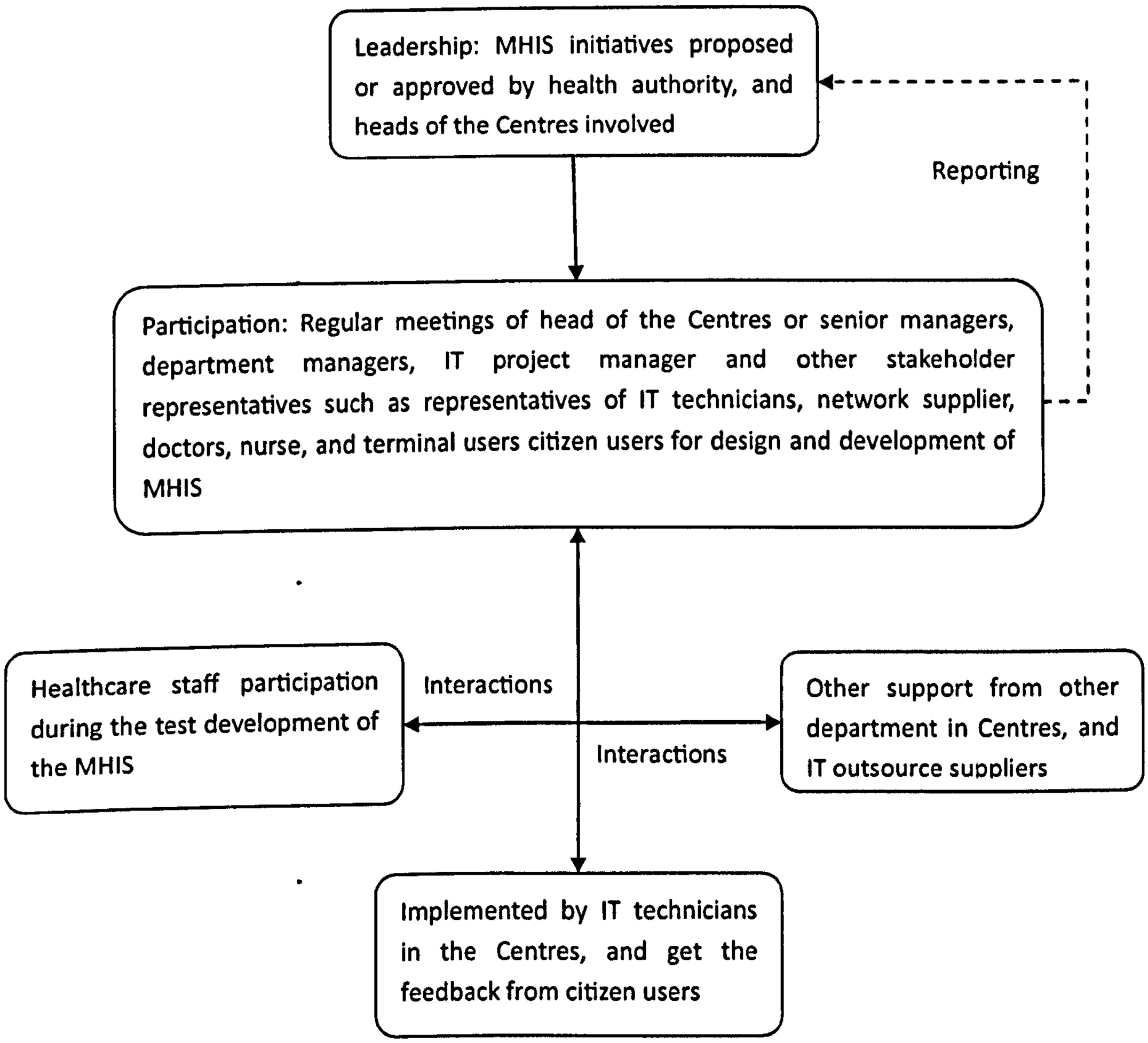
In China, the collective tradition has been being prevalent in China for many years. However, as the market has been open for more than 30 years in China, now the collective culture in working organisations has become weaker than

before. Different opinions and discussion from experts and professionals are gaining more respect, and have been considered by top management team. Nevertheless, the power control is still held by leader and senior managers in working organisations. Through the interviews, the heads of the community healthcare service centres have the right to decide whether the centres introduce MHIS or not. Therefore, without the permission from leaders, MHIS cannot be introduced for mobile healthcare delivery.

5.1.2 Leading to Socio-Technical Systems

As the Figure 4.3 demonstrates, the MHIS initiatives have to be proposed or approved by health authority and heads of the Centres. That is a top-down progress, while the second stages of interaction are more likely bottom up approaches. This is Leader Emphasis, closely linked to approaches to Participation. The actions of decision making are dictated by Leader Emphasis.

Figure 4.3: Current Horizontal Communication Decision Making Processes of IS Projects



Leader Emphasis in this Leadership has considerable influence for a successful delivery of a MHIS in centres. A good Leader Emphasis leads the organisational attitude about IS from technology determination to STS, which focuses on social and technical elements, and the interactions between them. Organisational changes are affected by STS. The perception of Mobile IS originally treated as merely IT department's business by other professional groups, now getting on the right track of STS led by leadership.

5.2 Participation

Participation is another key element in the study. It is addressed by IS scholars from the Socio-Technical school. Mumford (1983 and 2003) suggests IS design should not ignore Participation. In the literature review Chapter Two, she states Socio-Technical approach tends to be discussed in a context of encouraging workers' participation and engagement. Not surprisingly, in this MHIS study, successful systems' development cannot be designed properly without Participation either.

The Participation for the centres is broader than user participation, because it involves the stakeholders joining this process, illustrating in Figure 4.3. Stakeholder participation in centres tackle down the problems of IS complex design.

The main stakeholders for MHIS design includes the people working in the centres, citizens, and people from the governmental health departments. Stakeholder's representatives engage the participation meetings of MHIS development.

"Sometime conflicting opinions about how to develop MHIS happen, as different people have different concerns and views, but this is acceptable, I

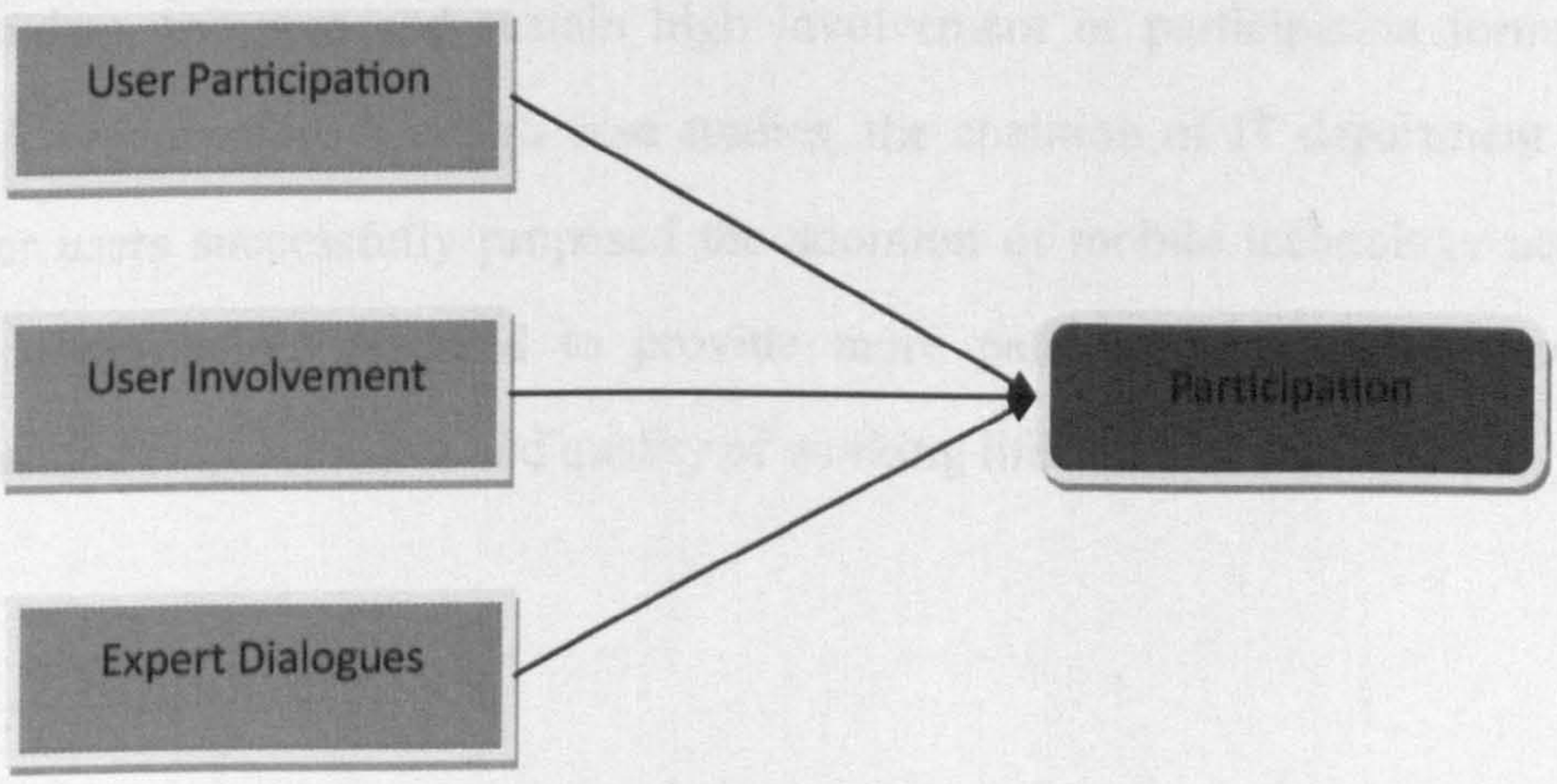
think. The debate can drive everyone to explore more deeply on the relevant issues about MHIS." an IT manager says.

"A final solution, considering different parties' concerns, will be planned eventually, even though this is not an easy process. But at least, it makes sure we do not miss any critical problems about introducing a new IS system." a GP says.

From the discussion in Chapter Four, Participation contains three Basic Codes, which are User Participation; User Involvement; and Expert Dialogues in Figure 5.2. Participation is also the key for IS success during designing process.

"A Key challenge is to design and adopt a proper mobile technology, rather than to use advanced ones, which may not be suitable for us." a Senior Manger says.

Figure 5.2: Social Items for a Social Element Participation



"User participation and user involvement are as important as the suggestions from experts. We learned lessons from development of old IT systems. Internal

users, doctors and nurses, and ultimate citizen users play important roles in the system design." another Senior Manger says.

The representatives in the participation meetings from different stakeholder groups collect the opinions and suggestions from their group members. If any member wants to directly attend the meeting, this is allowed and welcome. This is the nature of the relationship between representative and direct participation in the workplace.

5.2.1 Role of User

Leadership prompts the workplace partnerships to address user involvement and user participation throughout the centre. Compared with Participation, Involvement implies the organisation requires its member to get engaged in some project, where the original intention is from mangers rather than voluntary intentions. But, users can activate the participation motivation of the stakeholders. The role of user is as important as experts' in MHIS.

Participation meeting is on the ways in which workplace social dialogue can stimulate, resource and sustain high involvement or participation forms of work organisation. Through case studies, the coalition of IT department and other users successfully proposed the adoption of mobile technology across the organisation, designed to provide more patient-centred care, through enhanced empowerment and quality of working life for staff at all levels.

5.2.2 Empower User

Participation meetings are regarded as a way of empowering users, while others are merely taken in nature such as questionnaire survey, which cannot provide an insight of what users concern. Drawing on STS, the centres have highlighted issues of Leader Emphasis and Participation, which had been

largely ignored by earlier work, which concentrated on technology and senior management.

Empowering users examine changes in decision making, being a shift from top-down decision making, towards networking. After the leaders decide the centres to adopt MHIS, the procedures will get into the design of MHIS. At participation meetings, the roles of IT professionals not only provide expertise to the centres, but also empower users to learn and understand the IS. Then, the professional users or ultimate users will start to consider whether that is what they expect or want. This step inspires the thoughts of the users.

The user's issues will be fully discussed and considered in the participation meetings. The IT professional will reply to these users' concern carefully. They have to explain clearly why, how and what they will do about the technical mobile system until the users accept their developing plans.

5.3 Discussion.

In a classic paper about the issues of power cad control in IS, Markus (1983) concedes that resistance to IS exists in organisations. The causes of resistance can be recognised by 3 categories: personal internal factors, poor system design, and interaction of system features with aspects of organisation context and system use. He furthermore concludes with several familiar comments regarding resistance are: 1. user involvement; 2. technical sound systems; 3. user friendly; 4. being equal; and 5. cost out with the benefits. Totally speaking, an IS can alter bases of power in an organisation. Change is inevitably caused by IS.

In this study, the failure cases indeed neglect the important needing of technical system users, and there were not effective equal communications

through the different function departments. Technical systems have to be sound, but that is not the same as new and expensive technology. The IT departments should carefully choose which technical solution is fitting their organisation, through collecting the feedback from stakeholders in centres. These outcomes of strategic approaches bring benefits to organisations. However, the most paramount and general IS strategies nowadays is a Socio-Technical approach to building up a consolidating Mobile IS.

5.3.1 Leader Emphasis and Participation within Socio-Technical Systems

The discussions in Chapter Two Literature Review point out that conventional IS evaluation cannot comprehensively convince the technical system users to accept their needs from IS. Though STS provides language analysis and thematic networks to discuss these matters without mathematical numbers, they solve problems by bolting on participation and leaders, in qualitative analysis forms.

Leader Emphasis and Participation are two of the important elements found in this study of MHIS. They are features of a mobile IS based on the exercise of power for decision making, and thus central to STS. The leaders guide the centres to the new direction of organisational value sharing culture, and the essential process to implement is Participation. The successful experience of MHIS can be argued that STS was introduced to counter-balance the power from top management.

"Traditionally, from a point of view of IS development, a good leader was supposed to have to have some knowledge about IT technology. I don't think this is right. We are not really IT professionals. As being a head of our community centre, I can decide whether we are going to use mobile healthcare

service, and introduce such a mobile system. If I am aware of the necessity of it, I will emphasise the importance of it to my colleagues during the participation meeting. The important point is to re-lease everyone's motivation to discuss how we can introduce a mobile system. In a word, a good leader is to motivate our staff to share their knowledge and opinions. The IT manager will get a detailed solution, and then report it in the meetings. All the head can do is to lead them to this good direction." one head of the centre comments.

"I have some very basic IT knowledge learning from schools. I decided our IT department to should take charge for the mobile technical systems, without other departments being involved, and suggested they try to adopt the most updated mobile technology to make sure we will not fall behind in technologies. But now looking back, we spent lots of money on doing this, and the results are not so good as we expected..... "another head of the centre concludes.

Collectivism desires for charismatic leadership, because that organisation heavily relies on the capabilities of a leader (Shamir et al., 1998 and Hunt, 1999). Yet, in the information era, leaders are unable to grasp all the knowledge they need, respecting the users and experts' knowledge is just what the management team needs to bear in mind, and encourage them to participate the development of IS.

"Participation process releases our freedom of views about the IT technologies. We don't have much expertise on it, but we want to know how it can be at the best situation to help us on medical service." One of the GP representatives says.

STS in centres give MHIS a IS successful strategy, alongside with the two

notable elements Leader Emphasis and Participation in the study. The Leader Emphasis and Participation is the two key points to achieve the Horizontal Communication Decision Making Processes (Figure 4.3), which is one of critical procedures for a successful MHIS in centres.

In sum up, this research studies mobile IS in the case centres, to explore a Socio-Technical approach for successful MHIS implementation. A thematic model is developed using the interview data, drawing attention to two important elements Leader Emphasis and Participation, which cause organisational changes, such as organisational re-structuring, decision making re-processing, and decentralisation of some power and control from the top management.

In the context of China, Leader Emphasis and Participation, bringing new thinking for mobile IS, enhance the people, organisation and technology, working together as a whole STS.

Traditionally, Leader Emphasis is more about power and control; on the other hand, Participation is encouraging stakeholders to engage in IS, which that creates more of a sense of democracy. These two main concepts are normally treated as opposed, or contradictory. However, in this research, the researchers found that this contradiction did not happen in the successful cases.

The new decision making model (refer to Figure 4.3), indicating the relationship of Leader Emphasis and Participation, is a processing model. That implies firstly that the MHIS initiative is decided by senior managers, which is centralisation. Then, the details of planning pass down to Participation, which is more likely to mean decentralisation. These are processes, rather than happening at the same time. The participation focuses on more details of

implementation; meanwhile, the leadership is set up with resources and boundaries for the mobile IS. Hence, Centralisation and decentralisation can work together, as Robbins (2005) suggests organisations can adopt the organic model for their decision making (refer to Table 2.1), which is more flexible and practical than the mechanistic model. Therefore, in essence, the combination of Leadership Emphasis and Participation works perfectly well in successful cases.

5.3.2 Working Life, Dialogue and Tacit Knowledge

To some degree, STS provides implications for democracy in the centre via participation. Community Citizens benefit from expressing and sharing their views about MHIS development. This does not only impact on the deployment of particular technologies, but also arouses their motivation about the democratic working life.

"We learn some sense of democracy through the participation meetings in centres, and some knowledge and information about our community through the dialogue." One of the Citizen Representatives says.

The discussions of STS are culturally situated. This also raises fascinating issues of working life and working environment. Participation insures the interests from groups or individuals can be considered to 'fit' the IS development. Experts dialogue with each other and users, which turns knowledge being from tacit to explicit.

One reason we have so many problems in health policy and use technology around the world; It is because the people in those different research discussions don't talk to each other (Goranzon et al., 2006). The people who are concerned with technology tend to look in terms of technology. Those are

concerned with business, outsourcing and making money have different focus.

"Learning experience from other dialogues is beyond our plans. Participation meetings dig deeply into every issue, and we share our view, which is a learning process." an IT manager admires.

Participation brings democracy to healthcare, expert dialogues and knowledge contribution for the centre. However, we cannot forget the STS is culture situated. A IS study by Kim and Peterson (2003) based on a model of national culture (Hofstede, 1980) points out Asian courtiers have strong collectivism, which will affect the development of IS. In this context, China has its own disciplines. Leader Emphasis is an important element, for somewhere which has a strong collective tradition. A good leadership can set up a democratic environment for stakeholders' participation.

5.3.3 Summary

The successful development of MHIS is based on the setting of rapid mobile technology, updated in modern society. The MHIS in the field work have enhanced the community healthcare service, and improved the harmonious environment of the community.

The community health service has become a crucial part to play in efficient and comprehensive strategy making for community healthcare in China, from three different perspectives: public health service delivery, medical and disease research, and personal or family healthcare information profile (Li, 2007). Based on the Socio-Technical approach, Chinese community services provide substantial and accurate information support for crisis management in public health, from three different perspectives: data source, decision making and information sharing.

A successful MHIS can be implemented from a social-technical approach. The thematic network in Figure 4.13 demonstrates the outline of the STS for the centres with illustration of important Basic Themes. This pattern interprets the complicated relationships between technology and human factors. The interaction between technology and organisation cannot be ignored. Participation meetings provide meaningful thoughts for the management to integrate the centres and technology, fitting together as a whole STS by adopting MHIS. Besides that, a combination of Leader Emphasis and Participation are associated with each other. Without any one of them, the STS cannot be successfully constructed.

The elements of technology and organisation influenced by the effectiveness of mobile application in health service delivery are unfolded in Chapter Four with the original text segments. The difficulties to implement a successful MHIS are due to a lack of Leader Emphasis and Participation. The implementation for this research is that the Leadership and Participation are culturally situated. This argues that IS development cannot lift the technology alone without considering social influence.

The decision processes have been changed in these centres for development MHIS, which also affect the organisational structure from hierarchy to network, in terms of organisational context. Mobile Technology is installed with the existing HIS. The network suppliers provide technology implementation for this. The technical communication ports are designed to connect the old HIS, which can avoid a heavy heritage of technical systems. Because of interface programming, the technicians in centres can easily update these systems, when it is needed. SMS provide reliable, stable and efficiency healthcare information delivery for ultimate citizen users.

The mobile community healthcare service strengthens health conditions and living quality for citizens. Meanwhile, it solves the shortages of health resources, and heightens the level of community healthcare and the urban emergency management, in terms of information delivery. The community healthcare service centres, using the MHIS, have achieved the requirements of the health reform in free basic health and basic medical service (Zhang, 2010). Community healthcare service can be an essential part of Chinese health system in changing the problematic situation in health in China. "Hard to get treatment and Expensive treatment for patients" is a general challenge which might be tackled down through adoption of the proper technologies. This outcome of this study on the centres can be a reference for other centres, which may deepen the China health reform, and eventually build up a substantial and sustainable health welfare system.

In the broader context, the researchers can confidently consider M-government as the transformation of E-government. This issue is discussed in the next chapter.

CHAPTER 6

Research Implication

A new technology, like a coin that has two sides, is endowed with a positive side and a negative one (Arnold, 2003 and Ennals, 1995). The success use of information depends more on human, rather than technical factors. This opinion has long been generally accepted in the field of IS (Bostrom and Heinen, 1977; Sauer, 1993; Ainger et al, 1995; Jones, 2003 and Kling, 2007). So is it with mobile information (Arnold, 2003; and Adams and Fitch, 2005). It is a crucial issue, and the focus of the research of this thesis on how to make use of mobile technology, so that it can resolve the negative effects, and find a reasonable model of development from perspectives of social and policy levels. Understanding the past determines our ability to understand the present and predict the future. New and flashy advanced technology is cost-prohibitive for developing countries.

Implications of these preliminary findings can guide the development of mobile IS in China. The case descriptions indicate how mobile technology enhances public service delivery. HIS would be the most complicated public IS, as it normally includes many forms of data and requires substantial stability and security. Therefore, other public service IS systems can learn much from this case. The case verifies that text messaging, as a popular and secure technology, is suitable for public needs. Adopting the right technology is crucial for IS success, rather than using the latest IT technologies, which are often expensive and ephemeral.

This chapter discusses the implications for this study, starting from a section of research limitations. The second section argues the findings of the case

study matching to the first stage of M-government development model, and the third section states challenges facing mobile public service delivery, and the solutions to the challenges.

The following sections clarify the adopted approaches, acknowledgement of their limitations and discussion of the possible effects of the study setting on the relevance of the results. The limitations are with regard to the adopted methods, and their impact on the generalisation ability and managerial implications of the results debated.

6.1 Research Limitation

Every study has its preconditions and limitations (Bryman, 2004). Moreover, limitations of a study can be with reference to the further research plan, and that can clarify what is applicable for practice, based on the findings.

This study uses case study as the research strategy to answer the research questions. Even though it is multi-cases study, the selected cases are representative, which means the findings cannot be generalised. However, generalisation is hard to apply within IS, because every specific IS has certain settings, which will interact with the technical systems, and cause some changes. Therefore, the issue of generalisation is weak but not significant in this study.

This research is an independent study, with unobtrusive observation and interviews, which is not getting involved in the IS projects in the cases. Action researchers may declare that the outcome of research should have some impacts in reality, which it requests researchers engage with the process of the project (Eden and Huxham, 1996; Ennals et al., 2002; and Ennals, 2004). Due to the organisational rules set by the community healthcare centre in the cases,

the author cannot become one of the project practitioners in MHIS. However, unobtrusive study has its own strength, which explores the phenomenon from a third party perspective, without any influence on the results of the MHIS. It keeps a natural approach to the study.

Another important limitation for this study is the time horizon. It is a cross-sectional multi-cases study in a certain period time. The project took three months for data collection. The longitudinal study has advantages in the capacity to study change and development (Adams and Schvaneveldt, 1991). Despite the interviews conducted over a short period of time, the interview questions and data cover the studied cases from design to implementation, and the resources of official document are abundant from policy makers to suppliers. The work of data collection for the study is sufficient.

The cases adopted are only in China. According to the literature review, some MHIS are operating well in USA, Australia, Brazil and Korea, etc. Those MHIS cannot be studied in this PhD project due to resource limitations. Otherwise, a comparison study can offer enrichment for the research.

The limitations sum up the limitations in the field work. However, based on the data findings, this study suggests the STS approach can be applied into MHIS as a pre hoc risk assessment, and a post hoc evaluative tool during the stages of design, implement and validation, and that contributes some important implications for the M-government.

6.2 Implication for M-Government Theory

Healthcare delivery is normally treated as a more complicated service than in other public fields such as the diversified data formation of personal healthcare records, and the complex procedures of clinical body examination,

etc. Therefore, once these can be implemented, the other mobile public service delivery, which also can be set up, will bring us together from E-government into M-government era.

Notwithstanding more and more concerns and attention on M-government (Trimi and Sheng, 2008; Misuraca, 2009; and Yamamoto et al., 2010), Kushchu and Kuscu (2003) suggest that it is necessary to set up theoretical models, based on the characteristics of M-government (2003). Antovski and Gusev (2005) stress that M-government has five principles: interoperability, security, openness, flexibility and scalability. Although these opinions are crucial, they only point out the problems which concern people. Kim et al. (2004) propose a technical platform for M-government from the perspective of technology support, but ignore the social factors, which are controversial.

Ntaliani et al. (2008) and Aloudat and Michael (2011) study M-government from agriculture and emergency management separately. Ntaliani et al. (2008) emphasise that M-government, with convenient operations and high quality service, can strengthen the economic development, in terms of agricultural industry. Aloudat and Michael (2011) stress the importance of collaboration among governments, local public service and the users, based on emergency management. However, these two articles are confined to certain industries, which cannot be treated by general rules in other industries.

As discussed in Chapter Two, many scholars believe that M-government is developed on the basis of the transformation of E-government (Trimi and Sheng, 2008; Misuraca, 2009; Kushchu and Kuscu, 2003; Ntaliani et al., 2008 and Kim et al. 2004). Therefore, the conventional theory of E-government development models can provide some references for the development of M-government (Li, 2011).

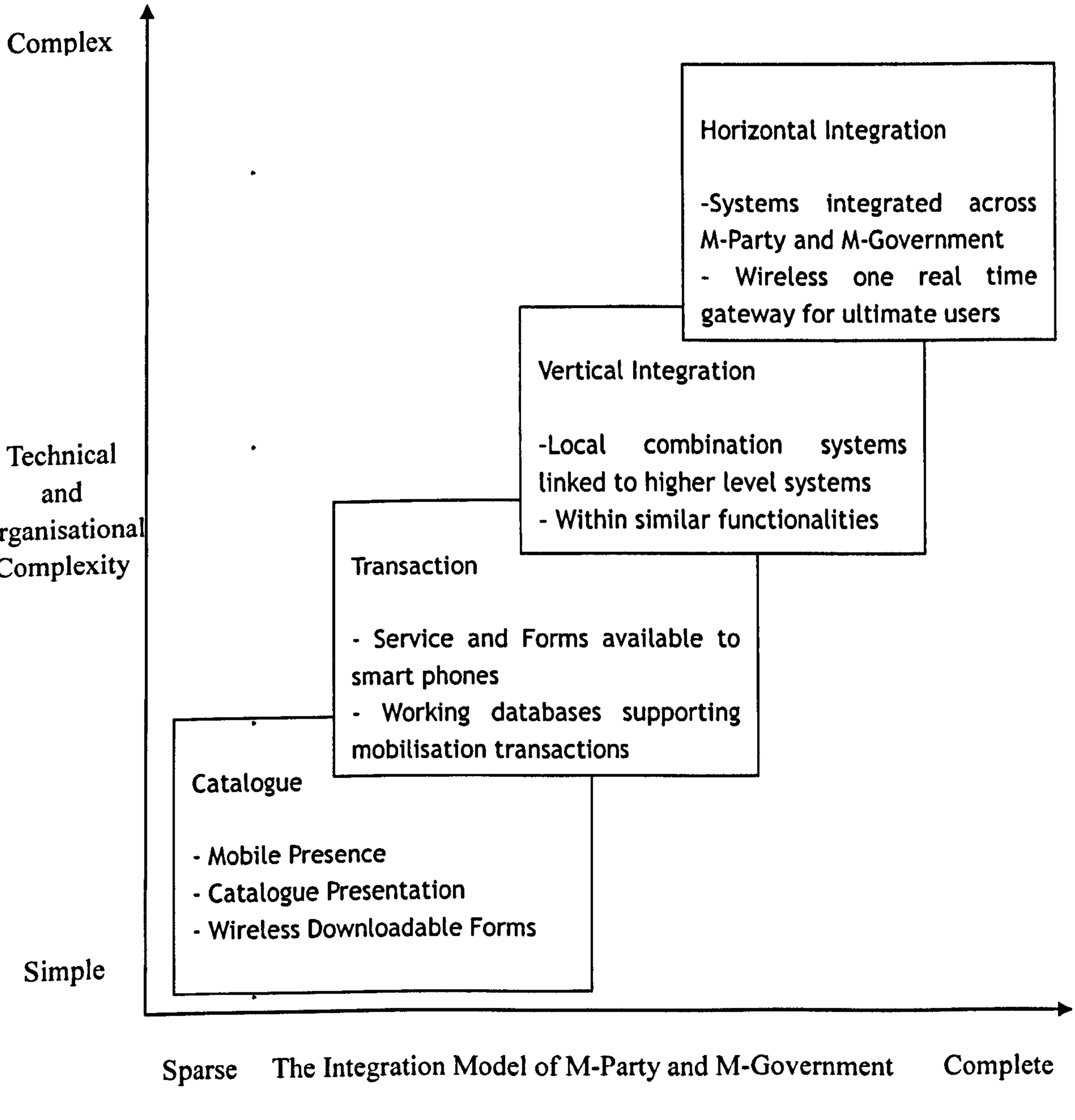
Nevertheless, Zhang et al. (2008) argue that M-government affairs in different cultures and backgrounds should have different issues, and therefore it may employ different models, although there are common technologies shared by different IS. However, a general conceptual model has its values for understanding of M-government development.

6.2.1 Developing Model

Based on the background of China, Li (2011) systematically reviews the development of M-government. In order to establish a model for M-Government, Li (2011) refers to the most cited model of E-government published by Layne and Lee (2001) to develop fully functional M-government. The model of M-government has four stages (Figure 6.1): 1. Information publishing: Catalogue; 2. Service Interaction; 3. Vertical integration and 4. Horizontal integration. Theses stages are according to the complexity and different levels of integration. Similar to the initial development of E-government (Layne and Lee, 2001), information listings only deliver information of customer service to citizen's mobile handsets, likely setting up a static web page. At present, most services of M-government stay at this primary level of simple news release (Zhang and Feng, 2010; Wang et al., 2010; and Zhao, 2006). The second stage is service interaction process (Huang, 2006), where M-government focuses on interactions with the users, such as approvals of mobile online applications, and mobile access to database supports. The third stage is connecting databases in the same industry such as healthcare sectors sharing data from health authorities, and trusts without geographical obstacles. Normally, there is a one entry mobile website, which can save costs, and standardise the operating procedures. With increasing demand from users', the users will find it would be easy to access all public services integrated within one government mobile website. Therefore, the

fourth stage will be needed at that time. For instance, applying a restaurant license might need.to submit application forms to the hygiene department and revenue department, etc. The one entry web server will send the copy of application forms to the relevant departments for approval, which saves time and resources for both of public sector and citizens.

Figure 6.1: M-Government Development Stages based on Layne and Lee E-government Model (Li, 2011)



Currently in China; the mobile informatics of community healthcare services is still settled in the first stage, heading for the second stage. Some services of it have entered into the second phase, while some services remain in the first stage. The initial of third phase is brewing, such as integrating the databases of community healthcare service centres with databases of specialist hospitals. Therefore, the study of M-government model (Li, 2011) offers some references for the development of MHIS.

6.2.2 Public Service Delivery

Mobile informatics of community healthcare service is also beneficial to community management. Ji et al. (2010) propose that a community is the basic unit of a city, conducive to a harmonious society. They point out that encouraging citizen participation with community management can integrate a variety of community common interests and concerns for the community management teams, which advises the teams to construct a safe and harmonious community society. Community Healthcare Services is one of the core interests of community residents. Mobile healthcare informatics delivers common concerning information such as prevention of infectious diseases when is necessary, which can help community citizens be aware that a community is a coherent unit of a living group. As a result, they may feel they have to contribute, and get involved in the construction of this basic unit of a society.

6.3 Challenges and Solutions for Mobile Public Management .

The purpose of a public information service is to deliver the information to target groups of people or organisations. During the processes of delivery, safety, stability and real-time transmit are the priorities. Using SMS is the

safest way currently. However, with technology development and more economic mobile broadband, in the future users will receive image data, and vivid videos. Ultimately, the governments will undergo the transformation of governments within the facilities of M-government (Li, 2006).

The M-government, however, are faced with some difficulties and challenges as well (Li, 2005; Song and Li, 2006; and Huang, 2006). Li (2011) suggests five solutions to tackle those challenges. The first solution is to enhance policy supports, including improving the security technology of data protection and the management of personal information privacy. The second one is the involvement of enterprises in the development of M-government for saving some public budgets. The third is to reinforce the education of mobile informatics for citizens, so that the populace can fully understand the importance of the implementation of M-government. The fourth is to accelerate technological innovation that will reduce the cost of wireless technology. The last one is to increase the M-government of public budget.

These five solutions are linked with each other closely. For example, Patrick et al. (2008) raised his questions on the popularisation of mobile phones. They argue whether the. high-quality coverage can reach low-income, rural and remote areas. These areas need public support, where the market may recognise the development of M-government will not have economic benefits. Therefore, the enterprises may not invest mobile IS projects. Furthermore, security of wireless transaction requires more advanced technology solutions rather than the wireless one, because the signal transmission is fully exposed and requires wireless encryption embedded. In recent years, since the proliferation of mobile phones hackings software has become pervasive, it is also necessary to propose new regulations to guard the legal information communication. Additionally, it provides a better social environment, and

technical support for the next upgrading of mobile application systems. Patrick et al. (2008) point out different brands of mobile phones, with different operating systems having technological barriers upgrading. At present, only SMS can be completely accepted by all the mobile phones. This limitation confines further development and applications.

Hence, if there is a unified technical standard for communication through different mobile Operating Systems (OS), we can solve this problem. Different OS and software become compatible with each other. With regard to the rapid development of IT, it brings more business opportunities, when standards can promote technology development. Thereby, the mobile phone developer and the network provider should learn lessons from the experience of personal computers, and establish technical standards as soon as possible under the co-operation of international technology standards organisation such as British Computer Society (BCS) and Institute of Electrical and Electronics Engineers (IEEE), etc.

6.3.1 National Healthcare Practice in China

Healthcare informatics, which reduces the price and the cost, and improves service delivery, may resolve the problems of healthcare welfare in China, which is "expensive medical bills and difficult access to quality medical services for Chinese citizens". The exorbitant prices of healthcare have been criticised by people for a long time. Mobile healthcare informatics reduces the transmission of the disease, improves people's lives, and brings profound good changes for communities and society.

6.3.2 Emergency Management Practice

In the emergency management practice, healthcare delivery is one of the core services for relief work. From the descriptions of the case study, the

interviewees confirm that mobile information delivery indeed improve the rapid responses, similarly research findings with the suggestions studied by Landgren and Nulden (2007).

Technology properly used will largely enhance the capabilities of economic competition in the context of globalisation, particularly for the impact on global health emergencies. SARS and H1N1 were the two cases. The former case, exposed in 2003, was without using mobile technology to information delivery. For the recent one, in 2009, the information was well distributed to citizens.

In the government-led emergency response to the Sichuan earthquake, clear top-down leadership was important. However, the same approach is not appropriate for community health. There are also issues concerning different health professionals such as doctors, nurses, and IT technicians, etc. The processes of making a decision in the development of MIS involve users' participation under the leadership of the head of the community healthcare centres. Some interviewers see the role of leadership and participation in Chinese e-health as having wider significance.

6.3.3 Mobile Democracy

China has currently been getting close to the state of "one person one phone", instead of "one family one landline." Mobile pervasiveness is an inevitable tendency. Phones upgrade becomes faster than ever, and the function of mobile communication devices gradually gets near to the features of Personal Computers (PC). It is necessary to maximize the function of mobile technology. Smart phones will integrate the communication technology developed over the past 10 years. That mobile healthcare IS, in order to succeed, needs to be co-owned by the population which it serves, with active

participation. The can be enabled by the more use of mobile technology, which secures the active engagement of the community.

Mobile health informatics can help remove disparities in healthcare industry (Krishna et al., 2009). HIS is just a part of M-government. The community participation in healthcare IS can be extended into the democracy of community governance. Mobile democracy is a new way of encouraging citizens to involve with the procedure of democracy using mobile phone (Hermanns, 2008). Kushchu and Kuscu (2003) expect mobile democracy will be accepted by citizens, as now mobile phones can share information real time on websites of social networks, which is for everyone to express their views, and China and some developing governments allow mobile users to get involved with the discussion and share news, which is an another progress of democracy. Citizens have valuable input into STS.

6.4 Future Research

The research findings of this thesis mainly focus on MHIS in China. Mobile health service delivery can be studied at national level. Cultural differences between China and the West restrict this research. More studies are needed in other countries. Therefore, comparative research in different regions can enhance research results about MHIS, and consolidated. Further action research is recommended, if it is possible. This could offer a very deep insight into power and control in organisations. From theories to practice, action research can provide real immediate impacts on the MHIS. Longitudinal study has its own advantages to investigate some cases in a certain period of time. This research design can be deployed again in a few years time. Some new findings of the cases may can be discovered and enrich the STS of MHIS.

The development of M-government model (Li, 2011) has to be continuously

studied for the further stage of M-government. Additionally, in each country, there can be different approaches to leadership and participation. The Leader Emphasis of leadership would be of particular interest to international readers. It should not be restricted within the field of IS. The other industries in developing countries may have the same approach of power control, and progress in encouraging employee participation in certain projects within organisations.

CHAPTER 7

Conclusion

The IS discipline is new, but is under rapid development, and exerts great influences on society by changing people's lives and increasing their working efficiency. It has gone through a history of less than 100 years, from the invention of the first computer to the arrival of the Internet, and to one gate entry website for governments, and mobile informatics of smart phones. In addition to its continuing improvement during the application of communication and computer technology, IS are also based on organisations and human participation. From a management perspective, it is essential and of practical importance to be concerned with user participation and organisational changes in the use of technology systems. To some extent, the requirements of human factors such as job satisfaction, knowledge learning, and physical and psychological needs of health security from working environment, are changing slowly. Thereby, technology changes quickly though, the social elements may not vary greatly. In the coming decades, IT may get into another new era, such as when mobile equipments contain nanometre sensors. However, the understanding and attitude of humans and society towards the world would not vary dramatically, as technologies do. Thus, the current IS theories from a social perspective have their values to be learned for further study.

Conclusions can be drawn that the development of ICT does not necessarily always deliver on the ambitious promises expected by humans. Only by the appropriate usage through proper management can people enjoy the benefits brought by IS, and the potential maximum of technical applications. Currently, the key of a successful development of IS in an organisation lies in human and

social factors, rather than technology. Technologies are already able to satisfy basic needs of people in daily life now, but it is more important and difficult to tackle management problems emerging from the integration of humans and technology.

This thesis employs multi-case studies on the application of mobile informatics, with the service of community healthcare service centres in China as the research targets. It started from mobile informatics, and bases its cases on the delivery of medical service. With concepts from STS providing theoretical guidance, this research explores the cases in China, a developing country, and anticipates the outcomes that can be learned by other countries as well. There follows a summary of the academic contributions of this study from two points of view: the theoretical contributions and contextual contributions of IS.

7.1 Theoretical Contribution

The main contribution of the study is the introduction of Leader Emphasis into the field of IS. Although it is related to top manager support and leadership, which are discussed with current theories of IS, Leader Emphasis has some differences, and the argument is developed in Section 1, Chapter 5. In Asian developing countries, leaders and senior managers have more managerial discretion in organisation governance, and more power on making decisions than those in the west. Therefore, in these certain contexts, the role of the leaders or senior managers should be given more attention in a project of IS.

If leaders or senior managers emphasise the great importance of a IS project, and request the employees to fully support it, that implies that the financial and other resource will be allocated, and the successful completion of the project may be correlated to the assessment of staff performance. In that case,

it may be the person in charge of IS department, technician or medical worker who will endeavour to improve the project, and collaborate well in different professional groups within an organisation.

With the coming of globalisation, software outsourcing mode (Contractor et al., 2010) and the global integration of company resources become more and more popular (Palmisano, 2006; and Rangan and Sengul 2009), boundaries of countries and geographic location are not obstacles for human civilisation development. Different companies and organisations are working together from different backgrounds and cultures, and that imposes a precondition, understanding each other between the east and the west, including the diversity of culture and management, that enhances co-operations and globalisation.

The finding of this study on Leader Emphasis of IS underpins the understandings of Asian working life culture, which shares a common view in collectivism from the perspective of history. It is a key step to recognise the importance of Leader Emphasis in Asian IS, leading to a successful outsourcing and co-operation in IS projects.

Besides that, the concept of Leader Emphasis also encourages further theoretical development of IS studies for the school of STS. In terms of STS, leadership, senior manager support and Leader Emphasis are relevant, but still vary from one another. As one of the management elements in IS, Leader Emphasis reinforces the inadequacy of IS theory on investigating senior management, and provides a theoretical support for further development of theories.

Community healthcare centres play an important role in current China's health

welfare system. The improvement of service quality, and the decrease of service cost in the centres, can provide huge contributions to China's health welfare. To improve the delivery of public service under the help of mobile IS facilities, it is pivotal to be concerned about the senior managers' attitude towards the IS project. That impacts the allocation of resource and the quality of technical systems, as well as the healthcare service of the centres. Leader Emphasis should not be ignored.

The participation of senior managers or leaders penetrates the development of IS, and means that is necessary to undertake research on the leaders. The Leader Emphasis plays an important role in the leadership of IS. Though the cases focus on those community healthcare centres in developed regions in China, the other Chinese industries have common characteristics in terms of IS (Cai, 2006; Ye, 2005 and Song and Li, 2006).

However, for scholars who are focused on quantitative study, Leader Emphasis needs to verify validity, which ensures it can be measured as a construct component for an IS model. Thus, in terms of quantitative research, the next stage to be solved is to prepare the items for Leader Emphasis as the construct component, which can be tested in quantity.

It is essential that more and more studies about leadership can be carried out on Leader Emphasis, and more generalisation of research findings or conceptual framework will be discussed.

7.2 Contextual Contribution

The main contextual contribution of this thesis for the field work is Participation, which is paramount to the theory of STS in IS. According to

Mumford's suggestions (1983 and 2003), Participation, user satisfaction and integration of organisational and social systems are the three aspects for STS. In this study, the importance of Participation has been approved again in the field of mobile healthcare informatics.

Participation secures implementation processes of a successful MHIS. In the chapter of literature review, most of the quantitative models do not propose an appropriate recognition of Participation. But, the field work for this study validated the user participation as important, as the other findings in the school of STS stress. Participation assures the technology can be accepted by ultimate users of IS, due to the fact that user's issues are addressed by technical developers. Moreover, technicians receive useful and practical advice with which they come to know the real needs of users, and develop the right IS to their taste because of Participation. Participation enhances the job satisfaction and the positive attitude about operating the technical systems.

The human user is the final element determining success, which eventually decides how the efficiency of technical systems. MHIS is not exceptional. Medical professionals take an active part in developing the IS by raising their concerning issues, opinions or expectation, so that not only their demands are understood, but also the knowledge of IS for themselves is obtained by stakeholders. IS are tailored projects for every particular organisation such as tailor made suits, rather than those from high street shops. IS are not common goods, which can easily find some substitutes. Through studies on various cases, the plan of Participation needs to be designed. Representatives of technical system users should be encouraged to engage in IS development, meaning that procedures involve dual learning. For the medical professionals, they gain knowledge from their engagement in the project; for the users, they learn about the IS development and difficulties of the technicians. The people

in the same group can communicate with their colleagues or friends, who may know little about technology or even being against the mobile IS. By enhancing mutual dialogues and understanding, the IS can have more support from medical professionals and citizens users, and increase the rate of successful development.

To sum up, Participation is beneficial not only to the technology developer, but also the technology user in providing an opportunity to learn and promote their technological skills. However, a debate is raised, from the perspective of human resources, which Participation should be controlled within an appropriate extent, and over engagement will result in negative effects (Truss et al., 2010; and Alfes et al., 2010). Over engagement leads to delay of the project, and may cause disappointments in meeting too many expectations from users at the same time. Thus, in order to ensure the successful implementation on time, within limited resource such as a given budget and human resource, senior managers, who are charging for the IS project, should recognise that may hamper the development, and distinguish which opinions from participants are top priorities. Even though over engagement in the IS is a new topic, and that has to be sequentially explored, currently it is more urgent and reasonable to encourage Participation, since most managers are still not yet aware of the necessity of Participation.

7.3 The relationship between Leader Emphasis and User Participation

This section illustrates the relationship between Leader Emphasis and Participation. Apart from the elements concerned by traditional theory on STS, Leader Emphasis is an element that requires attention. Furthermore, Leader Emphasis does not contradict Participation. In the theory of organisational structure, they focus on two levels respectively. Leader Emphasis is an issue

of the leaders or the head of the healthcare community centres to provide fully support in resources in the level of top management, while Participation is in the level of employee and citizen users.

However, active support from senior managers does not guarantee that users of the technical system will be content with the performance of the IS in service, since leaders or senior managers and users are concerned with different issues from different perspectives. For example, as the findings show in this study, managers in healthcare service centres give more consideration to financial issues after the introduction of IS, such as whether the earnings saved by IS can cover its financial cost, and when the IS would begin to reduce the cost of the whole centre, etc. Other issues related to management involve better governance of the organisations and effective communication among different departments. As for medical care managers, they are concerned more about working issues, like the time it takes to learn the new technology, and the influence on their current working process. In the case of users, they pay more attentions on their individual issues, such as the tariff for the mobile service, how much time saving to see a doctor, the privacy of personal information, etc. Therefore, Participation is vital in the development of IS, presenting people with working life and individual issues. It avoids unilateral considerations from leaders or managers, leaving other needs in neglect.

Thus, it can be concluded that Leader Emphasis offers support in resources and co-ordination among managers, while Participation ensures the final implement of project running. Without the former, it is hard to start the project. Without the latter, there is a lack of basis for application, and difficult to promote working efficiency and satisfaction. If there is ignorance of either of them, it can be at least partially responsible for failure in the cases studied.

Leader Emphasis and Participation are successive steps, and closely related. Senior managers should fully support the project, and be aware of the significance of Participation too. Both of these two elements are essential in developing mobile IS in the particular context of this study.

7.4 Summary

In the emerging markets, there are many burgeoning telecommunication enterprises, such as China Mobile and China Unicom. These lucrative businesses should comply with the rules of STS in the development of public mobile informatics, which will better illuminate the philosophy that mobile technology can improve people's life. In terms of STS, understanding how technology interacts with people and organisations is vital to the successful delivery of MHIS.

The idea of STS agrees with not only the establishment of IS models, but also other fields in a larger scope. With the science and technology exerting a more far-reaching influence in human's life, STS, which highlights the maximisation of technology usage, and satisfaction of employers by the integration of technology, organisations and human, will become more prevalent in the future.

In the conventional philosophy of the eastern, "harmony between the heaven and human" has long been one of the basic ideas in Chinese traditional culture over the past several thousand years. It stresses the conformity of cultivation to the laws of nature. It is within the general rules of things that man builds and leads its cultivation. To realise a steady, balanced and harmonious development, both the elements of heaven, i.e. the laws of nature, and the factors of human should be taken into account. Similar to that, the STS emphasise both technology and social elements. As strict executants of the

philosophy "harmony between the heaven and human", Social-Technical Systems will be of long standing, indeed an eternity.

This research addresses real-life practices of health service delivery enabled by Mobile IS, taking into account the relationship between people, technology and organisations. The researcher argues that the socio-technical approach can be the most appropriate way to address the research questions, and adopts the case study method to explore this inter-disciplinary topic. This study is the first to successfully apply STS to mobile IS. It draws a comprehensive thematic model of STS, describing the interactions between social and technological parts in an organisation, in which the conceptual framework can be learned by peers as the elements are flexible and changeable. Different settings can add different elements within the framework.

This MHIS study also claims that STS provides very valuable conceptual thinking for IS. Within the context of China, a novel concept of Leadership Emphasis is first introduced into the field of IS, alongside the co-operation with a refined concept of Participation. The new decision making model brings organisational changes, which not only improves the implementation of mobile IS, but also enhances work performance, and empowers the people within the organisations.

References

Aarts, J., Callen, J., Coiera, E. and Westbrook, J. (2010) Information Technology in Health Care: Socio-Technical Approaches, *International Journal of Medical Informatics, Vol 79(6)*. pp 389-390.

Adair, J. (2006) *Effective Leadership Development*. London: Chartered Institute of Personnel & Development.

Adair, J. and Reed, P. (2003) *Not Bosses But Leaders (3rd ed.)*. London: Kogan Page.

Adams, C. and Fitch, T. (2005) Mobile Support for Community Healthcare: A Janus View, in Mobile Information Systems, *IFIP International Federation for Information Processing, Vol 158*, pp 341-349.

Adams, G. and Schvaneveldt, J. (1991) *Understanding Research Methods (2nd Ed.)* New York, Longman.

Ahluwalia, P. and Varshney, U. (2009) Composite Quality of Service and Decision Making Perspectives in Wireless Networks. *Decision Support Systems, Vol 46(2)*, pp 542-551.

Ainger, A., Kaura, R. and Ennals, R. J. (1995) *Executive Guide to Business Success through Human-Centred Systems*, Berlin, London: Springer.

Alexander, D. (2002) *Principles of Emergency Planning and Management*. New York: Oxford University Press.

Alfes, K., Truss, C. and Gill, J. (2010) The HR Manager as Change Agent: Evidence from The Public Sector. *Journal of Change Management, Vol 10(1)*, pp 109-127.

Aloudat, A. and Michael, K. (2011) Toward The Regulation of Ubiquitous Mobile Government: a Case Study on Location-Based Emergency Services in Australia, *Electronic Commerce Research, Vol 11(1)*, pp 31-74.

Ammenworth, E., Buchauer, A., Bludau, B. and Haux, R. (2000) Mobile Information and Communication Tools in the Hospital, *International Journal of Medical Informatics, Vol. 57(1)*, pp 21-40.

Anderson, J. G. and Aydin, C. E. (2005) Overview: Theoretical Perspectives and Methodologies for the Evaluation of Healthcare Information Systems. in Anderson, J. G. and Aydin, C. E. (eds) *Evaluating the Organisational Impact of Healthcare Information Systems (2nd ed.)*. New York; London: Springer.

Andersen, K. V. (2006) Reengineering public sector organisations using information technology. Otenyo, E. E., and Lind. N. S. (ed). Comparative Public Administration: The Essential Readings. *Research in public policy analysis and management, Vol 15*. Emerald Group Publishing. pp 615-634.

Andersen, K. V. and Henriksen, H. Z. (2006) E-government Maturity Models: Extension of Layne and Lee model, *Government Information Quarterly, Vol 23(2)*, pp 236-248.

Antovski, L. and Gusev, M. (2005) M-Government Framework, *Proceedings of The 1st European Conference on Mobile Government*, Brighton UK.

Arbnor, I. and Bjerke, B. (1997) *Methodology for Creating Business Knowledge*. Sage: London.

Argyres, N. S. (1999) The Impact of Information Technology on Coordination: Evidence from the B-2 "Stealth" Bomber. *Organisation Science, Vol 10(2)*, pp 162–180.

Armstrong, C. P. and Sambamurthy, V. (1999) Information Technology Assimilation in Firms: The Influence of Senior Leadership and IT Infrastructures. *Information Systems Research. Vol 10(4)*, pp 304-3327.

Arnold, M. (2003) On the Phenomenology of Technology: the "Janus-Faces" of Mobile Phones, *Information and Organisation, Vol 13(4)*, pp 231-256.

Attride-Stirling, J. (2001) Thematic Networks: An Analytic Tool for Qualitative Research, *Qualitative Research, Vol 1(3)*, pp385-405.

Avgerou, C. and McGrath, K. (2007) Power, Rationality and Art of Living Through Socio-Technical Change. *Management Information Systems Quarterly, Vol 31(2)*, pp 295-315.

Backhouse, J., Liebenau, J. and Land, F. (1991) On the Discipline of Information Systems, *Information Systems Journal, Vol 1(1)*, pp 19-27.

Banks, K and Burge, R. (2004) *Mobile Phones: An Appropriate Tool for Conservation and Development?* Fauna & Flora International, Cambridge, UK

Bansler, J. (1989) Systems Development Research in Scandinavia: Three Theoretical Schools, *Scandinavian Journal of Information Systems, Vol 1(1)*, pp 3-20.

Barber, N., Cornford, T. and Klecun, E. (2007) Qualitative Evaluation of an Electronic Prescribing and Administration System. *Quality and Safety in Health Care, Vol 16(4)*, pp 271-278.

Barkhuus, L. (2005) Why Everyone Loves to Text Message: Social Management with SMS. *Proceedings of the 2005 International ACM SIGGROUP Conference on Supporting Group Work.* pp 324-325.

Bao, Y., Chen, J. and Huo, Q. (2005) *Community Health Survey Research.* Shanghai: Shanghai Scientific Technology Press.

Benbasat, I., Goldstein, D. K. and Mead, M. (1987) The Case Research Strategy in Studies of Information Systems, *Management Information Systems Quarterly, Vol 11(3)*, pp 369-386.

Benhamou, P.Y., Melki, V., Boizel, R., Perreal, F., Quesada, J. L., Bessieres-Lacombe, S., Bosson, J. L, Halimi, S. and Hanaire, H. (2007) One-year Efficacy and Safety of Webbased Follow-Up Using Cellular Phone in Type 1 Diabetic Patients under Insulin Pump Therapy: The PumpNet Study, *Diabetes Metabolism, Vol 33(3)*, pp 220–226.

Benton, T. and Craib, I. (2001) *Philosophy of Social Science: The Philosophical Foundations of Social Thought*, Palgrave.

Berg, M. (1999) Patient Care Information Systems and Health Care Work: a Sociotechnical Approach, *International Journal of Medical Informatics, Vol 55(2)*, pp 87-101.

Berg, M. (2001) Implementing Information Systems in Health Care Organisations: Myth and Challenges, *International Journal of Medical Informatics, Vol 64(2)*, pp 143-156.

Berger, P. L. and Luckmann, T. (1967) *The Social Construction of Reality: A Treatise in the Sociology of Knowledge.* Allen Lane.

Bhaskar, R. (1998) *The Possibility of Naturalism: A philosophical Critique of the Contemporary Human Sciences (3rd Ed).* London: Routledge.

Boonstra, A. and Offenbeek, M. V. (2010) Towards Consistent Modes of E-health Implementation: Structurational Analysis of a Telecare Programme's

Limited Success, *Information Systems Journal, Vol 20(6)*, pp 537-561.

Bostrom, R. P. and Heinen, J. S. (1977a) MIS Problems and Failures: A Socio-Technical Perspective Part I: The Causes. *Management Information Systems Quarterly, Vol. 1(3)*, pp. 17-32.

Bostrom, R. P. and Heinen, J. S. (1977b) MIS Problems and Failures: A Socio-Technical Perspective Part II: The Application of Socio-Technical Theory, *Management Information Systems Quarterly, Vol 1(4)*, pp 11-28.

Brendryen, H. and Kraft, P. (2008) Happy Ending: A Randomized Controlled Trial of a Digital Multi-Media Smoking Cessation Intervention, *Addiction, Vol 103(3)*, pp 478–484.

Brennan, S. (2005) *The NHS IT Project*. Redcliffe Publishing Ltd, UK.

Brodner, P. (1990) *The Shape of Future Technology: the Anthropocentric Alternative*, London: Springer-Verlag.

Brown, B. (2001) Studying the Use of Mobile Technology, in B. Brown, N. Green and R. Harper (eds) *Wireless World: Social and Interactional Aspects of the Mobile Age*, pp 3-15. London: Springer-Verlag.

Bryman, A. (2004). *Social Research Methods (2nd Ed.)*. Oxford: Oxford Univesrity Press.

Bryman, A. and Bell, E. (2003) *Business Research Methods*. Oxford University Press.

Burgess A. (1984) *In the Field*. London: Routledge.

Burn, J. and Robins, G. (2003) Moving towards E-government: a Case Study of Organizational Change Process, *Logistics Information Management, Vol 16(2)*. pp 25–35

Cabinet Office UK (2005) *Transformational Government—Enabled by Technology. HM Government*, UK (Access on 2010-9-8 http://webarchive.nationalarchives.gov.uk/+/http://www.cabinetoffice.gov.uk/cio/transformational_government/strategy.aspx)

Cai, L. (2006) *E-government in the Era of Information*. China Social Sciences Press, Beijing

Cadle, J. and Yeates, D. (2008) *Project Management for Information Systems*.

Harlow: Pearson Prentice Hall.

Canton, L. G. (2007) *Emergency Management: Concepts and Strategies for Effective Programs*. Hoboken, New Jersey: Wiley & Sons.

Carter, L. and Belanger, F. (2005) The Utilization of E-Government Services: Citizen Trust, Innovation and Acceptance Factors, *Information Systems Journal, Vol 15(1)*. pp 5-25.

Castells, M., Fernandez-Ardevol, M., Qiu, J. L. and Sey, A. (2007) *Mobile Communication and Society: A Global Perspective*, Massachuseets and England: The MIT Press.

Chatterjee, S., Chakraborty, S., Sarker, S., Sarker, S, and Lau, F. Y. (2009) Examining the Success Factors for Mobile Work in Healthcare: A Deductive Study, *Decision Support Systems, Vol 46(3)*, pp 620-633.

Checkland, P (1998) *Information, Systems and Information Systems: Making Sense of the Field*. Chichester: John Wiley & Sons

Checkland, P (1999) *Soft Systems Methodology: a 30-Year Retrospective*, Chichester: John Wiley.

Chemers M. (1997) *An Integrative Theory of Leadership*. Mahwah, New Jersey London: Lawrence Erlbaum Associations.

Chen, X. (2000) *Qualitative Research in Social Science*, China: Educational Science Publishing House

Cherns, A. B. (1987) Principles of Sociotechnical Design Revisited. *Human Relations, Vol 40(3)*, pp 153-162.

China.Org.cn (2007) *The Local Administrative System in China's Political System*
(Access on 2007-4-6 http://www.china.org.cn/english/Political/28842.htm)

China Internet Network Information Centre (2007). *The Internet Timeline of China*. The Official Website of China Internet Network Information Centre

China Internet Network Information Centre (2008). *The 22nd Survey Report*. The official website of China Internet Network Information Centre

China Mobile (2009), *Yi Xun Tong Introduction*, Unpublished Flyer.

Chinese People's Daily (2001). *Golden Tax Project Operational in Four Cities and Five Provinces*. Newspaper: Beijing.

Christopher, G. R. (2004) A Two-stage Model of E-government Growth: Theories and Empirical Evidence for US Cities, *Government Information Quarterly, Vol 21(1)*, pp 51–64.

CIA(Central Intelligence Agency) (2006) *The World Factbook*. Central Intelligence Agency

Clegg, C. W. (2000) Sociotechnical Principles for System Design, *Applied Ergonomics, Vol 31(5)*, pp 463-477.

Cocosila, M., Archer, N., Haynes, R. B. and Yuan, Y. (2008) Can Wireless Text Messaging Improve Adherence to Preventive Activities? Results of a Randomised Controlled Trial, *International Journal of Medical Informatics, Vol 78(4)*, pp 230-238.

Coiera, E. (2004) Four Rules for the Reinvention of Health Care, *British Medical Journal, Vol 328(7449)*, pp 1197-1199.

Coiera, E. (2007) Putting the Technical back into Socio-Technical Systems Research, *International Journal of medical informatics, Vol 76(S1)*, pp 98-103.

Contractor, F. J., Kumar, V., Kundu, S. K. and Pedersen, T. (2010) Reconceptualizing the Firm in a World of Outsourcing and Offshoring: The Organizational and Geographical Relocation of High-Value Company Functions, *Journal of Management Studies, Vol 47(8)*, pp 1417-1433.

Coppola, D. P. (2007) *Introduction to International Disaster Management*. Oxford: Butterworth-Heinetmann

Cornford, T. and Smithson, S. (2006) *Project Research in Information Systems: a Student's Guide. (2nd ed)*. Basingstoke: Palgrave Macmillan.

Cornford, T, Doukidis, G. I. and Forster, D. (1994) Experience with Structure, Process and Outcome Framework for Evaluating an Information System. *Omega International Journal of Management Science 22(5)*, pp 491–504.

Costa, da T. M., Salomao, P. L., Martha, A. S., Pisa, I. T. and Sigulem, D. (2010) The Impact of Short Message Service Text Messages Sent as Appointment Reminders to Patients' Cell Phones at Outpatient Clinics in São Paulo, Brazil, *International Journal of Medical Informatics, Vol 79(1)*, pp

65-70.

Creswell, J. W. (1997) *Qualitative Inquiry and Research Design: Choosing among Five Traditions*. New York: Sage.

Creswell, J. W. (2002) *Research Design: Qualitative, Quantitative, and Mixed Method Approaches (2nd Ed.)*. London: Sage.

Crotty, M. (1998) *The Foundations of Social Research: Meaning and Perspective in the Research Process*. London: Sage.

Cui, H. and Zhang, L. (2003) The Impact of E-government on the Management of Government Organisation. *Theory Circle, No. 2*, p 53.

Cuny, F. C. (1983) *Disasters and Development*. Oxford: Oxford University Press

Darke, P., Shanks, G. and Broadbent, M. (1998) Successfully Completing Case Study Research: Combining Rigour, Relevance and Pragmatism, *Information Systems Journal, Vol 8(4)*, pp 273-289.

Davis, F. D., Bagozzi, R. P. and Warshaw, P. R. (1989) User Acceptance of Computer Technology: A Comparison of Two Theoretical Models, *Management Science, Vol 35(8)*, pp 982-1003.

Day, P. (2010) A Brief Introduction to the History of Community Informatics, *AI & Society, Vol 25(3)*, pp 259-263.

DeLone, W. H. and McLean, E. R. (1992) Information Systems Success: The Quest for the Dependent Variable, *Information Systems Research, Vol 3(1)*, pp 60-95.

DeLone, W. H. and McLean, E. R. (2003) The DeLone and McLean Model of Information Systems Success: A Ten-Year Update, *Journal of Management Information Systems, Vol 19(4)*, pp 9-30.

De Vaus, D. A. (2001) *Research Design in Social Research*. London: SAGE.

Dewett, T. and Jones, G. R. (2001) The Role of Information Technology in the Organization: a Reyiew, Model, and Assessment. *Journal of Management. Vol 27(3)*. pp 313-346.

Doherty, N. F. and King, M. (2005) From Technical to Socio-Technical Change: Tackling the Human and Organisational Aspects of Systems

Development Projects, *European Journal of Information Systems, Vol 14(1)*, pp 1-5.

Drucker, P. F. (1968) *The Practice of Management*, London: Pan.

Economist (2008) The Meek Shall Inherit the Web. *The Economist Technology Quarterly*. September 6th 2008.

Eden, C. and Huxham, C. (1996) Action Research for Management Research, *British Journal of Management, Vol 7(1)*, pp 75-86.

Eifert, M. and Puschel, J. O. (2004) 'Electronic government as a Challenge for Cooperation between Different Levels of Public Administration: Lessons Learned'. In: Eifert, M. and Puschel, J. O. (eds) *National Electronic Government: Comparing Governance Structures in Multi-layer Administrations*. Routledge, London, pp 243–265

Ein-Dor, P. and Segev, E. (1978) Organizational Context and the Success of Management Information Systems, *Management Science, Vol 24(10)*, pp 1064-1077.

Eisenhardt, K. M. (1989) Building Theories from Case Study Research, *The Academy of Management Review, Vol 14(4)*, pp 532-550.

Emery, F. E. (1969) *Systems thinking*. England: Penguin.

Emery, F. E. and Trist, E. L. (1960) Socio-Technical Systems, in C. W. Churchman and M. Verhulst (eds.), *Management Science, Models and Techniques*, vol. 2, Pergamon, pp 83-97.

Ennals, R. J. (1986) A Way of forward for Advanced Information Technology: SHI – A Strategic Health Initiative, in Gill, K. S., (ed.) *Artificial intelligence for society*. Chichester: John Wiley & Sons Ltd. pp 19-30.

Ennals, R. J. (1995) *Executive Guide to Preventing Information Technology Disasters*, London: Springer-Verlag.

Ennals, R. J., Totterdill, P. and Ford, C. (2002) The Work Research Foundation: a National Coalition for Working Life and Organizational Competence. *Concepts and Transformation, Vol 6(3)*, pp. 259-273.

Ennals, R. J. (2004) Regional Workplace Forums for the Modernisation of Work. In: Fricke, W. and Totterdill, P., (eds.) *Action Research in Workplace Innovation and Regional Development*. Amsterdam: John Benjamins

Publishing Company. pp. 289-312.

Ennals, R. J. (2006) Introduction. Goranzon, B., Hammaren, M., and Ennals, R. J. (ed.) *Dialogue, Skill and Tacit Knowledge*, Chichester, England, Hoboken, NJ: J. Wiley & Sons Ltd.

Ennals, R. J. (2009) *Lecture Notes for Global IT*. Kingston Business School, Kingston University London.

Erickson, P. A. (2006) *Emergency Response Planning and Management (2nd Ed.)*. Oxford: Academic.

Farbey, B., Land, F. and Targett, D. (1999) Moving IS Evaluation Forward: Learning Themes and Research Issues, *Journal of Strategic Information Systems, Vol 8(2)*, pp 189-207.

Fiscella, K. and Geiger, H. J. (2006) Health Information Technology and Quality Improvement for Community Health Centers. *Health Affairs, Vol 25(2)*, pp 405-412.

Fitch, C. J. and Adams, C. (2006) Managing Mobile Provision for Community Healthcare Support: Issues and Challenges, *Business Process Management Journal, Vol 12(3)*, pp 299-310.

Fitzgerald, G. (1998) Evaluating Information Systems Projects: a Multidimensional Ppproach, *Journal of Information Technology, Vol 13(1)*, pp 15-27.

Fjeldsoe, B. S., Marshall, A. L. and Miller, Y. D. (2009) Behavior Change Interventions Delivered by Mobile Telephone Short-Message Service, *American Journal of Preventive Medicine, Vol 36(2)*, pp 165-173.

Gagnon, M. P., Godin, G., Gagne, C., Fortin, J. P., Lamothe, L., Reinharz, D. and Cloutier, A. (2003) An Adaptation of the Theory of Interpersonal Behaviour to the Study of Telemedicine Adoption by Physicians, *International Journal of Medical Informatics, Vol 71(2-3)*, pp 103-115.

Galliers R.D. and Land F.F. (1987) Choosing Appropriate Information Systems Research Methodologies, *Communication of ACM, Vol 30(11)*, pp 900-902.

Gibbs, W. W. (1994) Software's Chronic Crsis. *Scientific American, Vol 271(3)*, pp72-81.

Gillies, J. and Whetton, S. (2005) Electonic Health Records, in Whetton, S (eds) *Health Informatics: A Socio-Technical Perspective*, pp 167-192. Oxford: New York.

Gomez, E. A. and Passerini, K. (2007) Service-based Crisis Management: Local and Global Community Roles and Communication Options. *International Journal of Intelligent Control and Systems, Vol 12(2)*, pp 198-207.

Gomez, E. A. and Turoff, M. (2007) Interoperable Communication: An Analysis of SMS Text-Message Exchange. *The 4th Proceedings of International Conference on Information Systems for Crisis Response and Management*, pp 45-50.

Goranzon, B., Hammaren, M., and Ennals, R. J. (2006) *Dialogue, Skill and Tacit Knowledge*, Chichester, England, Hoboken, NJ: J. Wiley & Sons Ltd.

Guba, E. G. and Lincoln, Y. S. (1985). *Naturalistic Inquiry*. Sage Publications, Inc.

Haddow, G. D. and Bullock, J. A. (2004) *Introduction to Emergency Management*. Amsterdam: Butterworth-Heinemann.

Han, Y. (2007) The Relationship of Office Automation and E-government. *Heilongjiang Science Technology Information, No. 3*. p116.

Harris, L. T., Lehavot, K., Huh, D., Yard, S., Andrasik, M. P., Dunbar, P. J. and Simoni, M. (2010) Two-Way Text Messaging for Health Behavior Change Among Human Immunodeficiency Virus–Positive Individuals, *Telemedicine and e-Health, Vol 16(10)*, pp 1024-1029.

Hatch, M. J. and Cunliffe, A. L. (2006) *Organization Theory: Modern, Symbolic, and Postmodern Perspectives*. Oxford: Oxford University Press.

Haux, R. (2006) Health Information Systems – Past, Present, Future, *International Journal of Medical Informatics, Vol 75(3-4)*, pp 268-281.

He, L., Li, Y., Xu, J., Tang, G., Tao, T. and Sun, D. (2004) Information Management of Public Health Emergencies in SARS Crisis. *Chinese Journal of Evidence-Based Medicine, No. 2*, pp 122-128.

Heeks, R. (2002) Information Systems and Developing Countries: Failure, Success, and Local Improvisations, *The Information Society, Vol 18(2)*, pp 101-112.

Heeks, R. (2006) Health information systems: Failure, Success and Improvisation, *International Journal of Medical Informatics, Vol 75(2)*, pp 125-137.

Heeks, R. and Bailur, S. (2007) Analyzing E-government Research: Perspectives, Philosophies, Theories, Methods, and Practice, *Government Information Quarterly, Vol 24(2)*, pp 243-265.

Henfridsson, O. and Lindgren, R. (2010) User Involvement in Developing Mobile and Temporarily Interconnected Systems, *Information Systems Journal, Vol 20(2)*, pp 119-135.

Hermanns, H. (2008) Mobile Democracy: Mobile Phones as Democratic Tools, *Politics, Vol 28(2)*, pp 74-82.

Hesse-Biber, S. N. and Leavy, P. (2004) *Approaches to Qualitative Research: a Reader on Theory and Practice*. New York ; Oxford : Oxford University Press.

Hofstede, G, (1980) Culture and Organizations, *International Studies of Management and Organization, Vol 10(4)*, pp 15-41.

Hsu, J., Huang, C-M. and Hsu, P-Y. (2006) The Exploration of Top Management Support to the ERP Project Then Influence User Satisfaction – Use The Information, System, Service Quality as The Moderators, *Proceedings of the Fourth Workshop on Knowledge Economy and Electronic Commerce*, pp 142-154.

Huang, H. (2006) The Value, Application and Technical Analysis of Mobile Government, *Information Construction, No. 5*, pp 44-45.

Hunt, J. G (1999) Transformational/charismatic Leadership's Tranformation of the Field: An Historical Essay, *Leadership Quarterly, Vol 10(2)*, pp 129-144.

Hussey, J. and Hussey, R. (1997) *Business Research: A Practical Guide for Undergraduate and Postgraduate Students*. Palgrave Macmillan.

Iluyemi, A., Fitch, C., Parry, D. and Briggs, J. (2007) Health Information Systems for Community Based Health Workers: a Case for Mobile and Wireless Technologies. in Cunningham, P. and Cunningham, M. (Eds.), *IST-Africa Conference Proceedings*.

International Monetary Fund (2011) *World Economic Outlook Database*, Access on 2011-08-02 http://www.imf.org/external/index.htm

International Telecommunication Union (2010) *Measuring the Information Society*, Geneva Switzerland, Access on 2010.09.20 http://www.itu.int/ITU-D/ict/publications/idi/2010/Material/MIS_2010_without%20annex%204-e.pdf

Istepanian, R. S. H., Pattichis, C. S. and Laxminarayan, S. (2006) Ubiquitous M-Health Systems and The Convergence Towards 4G Mobile Technologies, in Istepanian, R. S. H., Laxminarayan, S., and Pattichis, C. S. (Ed.) *M-health: emerging mobile health systems*, Great Britain: Springer.

Istepanian, R. S. H., Jovanov, E. and Zhang, Y. T. (2004) Guest Editorial Introduction to the Special Section on M-Health: Beyond Seamless Mobility and Global Wireless Health-care Connectivity. *IEEE Transactions on Information Technology in Biomedicine*, Vol 8(4), pp 405-414.

Ji, L., Li, Z. and Song, X. (2010) Construction of Urban Community in China, *Public Administration & Law, No. 12*, pp 16-18.

Jones, M. R. (2003) "Computers Can Land People on Mars, Why Can't They Get Them to Work in a Hospital?" Implementation of an electronic patient record system in a UK hospital, *Methods of Information in Medicine, Vol 42(4)*, pp 410-415.

Joo, N-S. and Kim, B-T. (2007) Mobile Phone Short Message Service Messaging for Behaviour Modification in a Community-based Weight Control Programme in Korea, *Journal of Telemedicine and Telecare, Vol. 13(8)*, pp 416-420.

Jung, D. I., Bass, B., and Sosik, J. (1995) Bridging Leadership and Culture: A Theoretical Consideration of Transformational Leadership and Collectivistic Cultures, *Journal of Leadership Studies, Vol 2(4)*, pp 3-18.

Jung, D. I., and Avolio, B. J. (1999) Effects of Leadership Style and Followers' Cultural Orientation on Performance in Group and Individual Task Conditions, *The Academy of Management Journal, Vol 42(2)*, pp 208-218.

Kaplan, B. and Duchon, D. (1988) Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study. *Management Information Systems Quarterly, Vol 12(4)*, pp 571-586.

Katz, R. H. (1994) Adaptation and Mobility in Wireless Information Systems,

IEEE Communications Magazine, Vol 40(5), pp 102-114.

Kemmis, S. and Wilkinson, M. (1998) Participatory Action Research and the Study of Practice. In Atweh, B, Kemmis, S. and Weeks, P. (Eds) *Action Research in Practice: Partnerships for Social Justice in Education* (pp. 21-36). New York: Routledge.

Kim, C. S. and Peterson, D. K. (2003) A Comparison of the Perceived Importance of Information Systems Development Strategies by Developers from the United States and Korea, *Information Resources Management Journal, Vol 16(2)*, pp 1-18.

Kim, Y., Yoon, J., Park, S. and Han, J. (2004) Architecture for Implementing the Mobile Government Services in Korea, *Proceedings of Conceptual Modelling for Advanced Application Domains, Vol 3289*, pp 601-612.

King, W. R. (2007) IT Strategy and Innovation: The "IT Deniers" Versus a Portfolio of IT Roles, *Information Systems Management, Vol 24(2)*, pp 197-199.

Klecun, E. (2002) *Telehealth and Information Society: a Critical Study of Emerging Concepts in Policy and Practice*, PhD Thesis, London School of Economics and Political Science.

Klecun, E. and Cornford, T. (2005) A Critical Approach to Evaluation, *European Journal of Information Systems, Vol 14(3)*, pp 229-243.

Klein, H. K. and Myers, M. D. (1999) A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems, *Management Information Systems Quarterly, Vol 23(1)*, pp 67-94.

Kling, R. (2007) What Is Social Informatics and Why Does It Matter? *The Information Society, Vol 23(4)*, pp 205-220.

Kling, R., Lamb, R. (2000), "IT and Organisational Change in Digital Economies: a Sociotechnical Approach", in Brynjolfsson, E., Kahin, B. (Eds),*Understanding the Digital Economy*, MIT Press, Cambridge, MA, pp.295-324.

Koshy, E., Car, J. and Majeed, A. (2008) Effectiveness of Mobile-phone Short Message Service (SMS) Reminders for Ophthalmology Outpatient Appointments: Observational study. *BMC Ophthalmology, Vol 8(9)*, pp

Krishna, S. Boren, S. A. and Balas, E. A. (2009) Healthcare via Cell Phones: A

Systematic Review. *Telemedicine and e-Health, Vol 15(3)*, pp 231-240.

Kushchu, I. and Kuscu, M. H. (2003) From e-Government to m-Government: Facing the Inevitable, *the Proceedings of the 3rd European Conference on e-Government*, pp 253–260.

Land, F. F. (1982) Socio-Technical Approach to Systems Analysis and Design, in *Systems Development Conference, No. 10*, Butler Cox Foundation.

Land, F. F. (2000) Evaluation in a Socio-Technical Context. *Proceedings of the IFIP TC9 WG9.3 International Conference on Home Oriented Informatics and Telematics, Vol 173*. pp 115-126.

Land, F. F. (2010) The Use of History in IS Research: an Opportunity Missed? *Journal of Information Technology, Vol 25(4)*, pp 385-394.

Landgren, J. (2007) *Designing Information Technology for Emergency Response*. Doctorial Dissertation. Goteborg University, Sweden.

Landgren, J. and Nulden, U. (2007) A Study of Emergency Response Work: Patterns of Mobile Phone Interaction. *Proceedings of the SIGCHI conference on Human factors in computing systems*. Conference on Human Factors in Computing Systems. San Jose, California, USA. pp 1323-1332.

Layne, K. and Lee, J. (2001) Developing Fully Functional E-government: A Four Stage. *Government Information Quarterly, Vol 18(2)*. pp122-136.

Levy, Y. and Ellis, T. J. (2006) A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research, *Informing Science: International Journal of an Emerging Transdiscipline, Vol 9*, pp 181-212.

Li, M. (2005) Mobile Government: Extension of Public Service, *China Computer Users, No. 13*, pp 45-46.

Li, N. (2006) Mobile Government: A New Way to Provide Public Service, *New West, No.12*, p 193 and 199.

Li, X. (2003) E-government and Oganizational Reform. *Reform and Strategy, No. 11*, pp 71–72

Li, Z. (2007) IEEE P2407 Standard for Personalised Health Informatics, *PHI First Workshop Report*. IEEEP2407: Personalized Health Informatics.

Li, Z. (2009a) How E-government Affects the Organisational Structure of Chinese Government. *AI & Society, Vol 23(1)*. pp123-130.

Li, Z. (2009b) Exploring Management Information System in Community Health Service for a Developing Country. *Paper for advanced stream of 18th EDAMBA Summer Academy*. Soreze, France.

Li, Z. (2011) A New Era of Mobile Informatics - The Integration of M-Party and M-Government, *Proceedings of UK-China PhD Forum 2011*, University College London, UK.

Li, Z. and Song, X. (2009) Government Informatics and China Earthquake Rescue: A Case Study in Emergency Management. *IADIS International e-Society 2009, Conference Proceedings Vol II*, pp167-171.

Liang, H. and Xue, Y. (2004) Investigating Public Health Emergency Response Information System Initiatives in China. *International Journal of Medical Informatics*, Vol 73(9), pp 675-685.

Liebenau, J. and Smithson, S. (1991) Editorial, *European Journal of Information Systems, Vol 1(1)*, pp 1-2.

Lincoln Y. S. and Denzin N. K. (2000). *Handbook of Qualitative Research.* Sage Publications, Inc.

Lincoln, Y. S. and Guba, E. G. (2000). Paradigmatic Controversies, Contradictions, and Emerging Confluences. In N. K. Denzin and Y. S. Lincoln (Eds.), *Handbook of Qualitative Research (2nd ed)*, pp. 163-188, Thousand Oaks, CA: Sage.

Liu, X. and Li, Y. (2006) The Reform of the Hierarchical Structure of Chinese Local Governments. *Review of Economic Research, No.6*.

Lodge, L. (1989) From Software Engineering to Information Systems Engineering, in K. Knight (ed.), *Participation in Systems Development: UNICOM Applied IT Reports*, Kogan Page, London.

Lopez, J. and Potter, G. (2001) *After Postmodernism: An Introduction to Critical Realism*. London: The Athlone Press.

Luo, A. and Li, K. (2007) *Health Informatics Management (2nd Ed)*. Beijing: People's medical publishing House.

Lu, Y., Xiao, Y., Sears, A. and Jacko, J. A. (2005) Review and a Framework of

Handheld Computer Adoption in Healthcare, *International Journal of Medical Informatics, Vol. 74(5)*, pp 409-422.

Luna-Reyes, L. F., Zhang, J., Gil-Garcia, J. R. and Cresswell, A. M. (2005) Information Systems Development as Emergent Socio-Technical Change: a Practice Approach, *European Journal of Information Systems, Vol 14(1)*, pp 93-105.

Lyytinen, K. and Hirschheim, R. (1987) Information systems failures: A Survey and Classification of the Empirical Literature. *Oxford Surveys in Information Technology, Vol 4*, pp 257-309.

Malik, K. (2005) *Launch of the China Human Development Report 2005*. United Nations Development Programme.

Mannheim, K. (1997) *Structures of Thinking*. London: Routledge & Kegan Paul.

Markus, M. L. (1983) Power, Politics, and MIS Implementation, *Communication of the ACM, Vol 26(6)*, pp 430-444.

Markus, M. L. and Benjamin, R. I. (1997) The Magic Bullet Theory in IT-Enabled Transformation, *Sloan Management Review, Vol 38(2)*, pp 55-68.

Martinsons, M. G. and Chong, P. K. C. (1999) The Influence of Human Factors and Specialist Involvement on Information Systems Success, *Human Relations, Vol 52(1)*, pp 123-152.

May, P. (2001) *Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business*, Cambridge: Cambridge University Press.

Melone, N. P. (1990) A Theoretical Assessment of the User-Satisfaction Construct in Information Systems Research, *Management Science, Vol 13(1)*, pp 76-91.

Meng, Q. and Yi, B. (2006) *The Theory and Practice of E-government*. Tsinghua University Press, Beijing.

Malik K (2005) *Launch of the China Human Development Report 2005*. United Nations Development Programme (Accessed on 2007-4-10 http://www.undp.org.cn/modules.php?op=modload&name=News&file=article&catid=13&topic=40&sid=236&mode=thread&order=0&thold=0)

Mertens, D. M. (1998) *Research Methods in Education and Psychology: Integrating Diversity with Quantitative and Qualitative Approaches.* Thousand Oaks, CA: Sage.

Miles, M. B. and Huberman, M. (1994) *Qualitative Data Analysis: an Expanded Sourcebook (2nd ed.)*, London: Sage.

Mintzberg, H. (1983) *Structure in Fives: Designing Effective Organisations.* Prentice Hall.

Misuraca, G. C. (2009) e-Government 2015: Exploring M-government Scenarios, between ICT-driven Experiments and Citizen-centric Implications, *Technology Analysis & Strategic Management, Vol. 21(3)*, pp 407–424.

Mumford, E. (1983) *Designing Human Systems for New Technology: the ETHICS method*, Manchester Business School.

Mumford, E. (2000) A Socio-Technical Approach to Systems Design, *Requirements Engineering, Vol 5(2)*. pp 125-133.

Mumford, E. (2003) *Redesigning Human Systems*, Idea Group, Inc.

Mumford, E. (2006) The Story of Socio-Technical Design: Reflections on its Successes, Failures and Potential, *Information Systems Journal, Vol 16(4)*, pp 317-342.

Murphy, E., Dingwall, R., Greatbatch, D., Parker, S. and Watson, P. (1998) Qualitative Research Methods in Health Technology Assessment: a Review of the Literature, *Health Technology Assessment, Vol 2(16)*.

Newman, W. L. (2000) *Social Research Methods: Qualitative and Quantitative Approaches (4th Ed.)*. Boston: Allyn and Bacon.

Newman, I. and Benz, C. R. (1998) *Qualitative-quantitative Research Methodology: Exploring the Interactive Continuum.* Carbondale: Southern Illinois University Press.

Normann, R. (2007). *Democracy in Development – a Critical View on Regional Governance*. Theses at NTNU, 88. Trondheim: Norwegian University of Science and Technology.

Ntaliani, M., Costopoulou, C. and Karetsos, S. (2008) Mobile Government: A Challenge for Agriculture, *Government Information Quarterly, Vol 25(4)*, pp 699-716.

Nyiri, K. (ed.) (2003) *Mobile Learning: Essays on Philosophy, Psychology and Education*, Vienna: Passagen.

Orlikowski, W. J. (1992) The Duality of Technology: Rethinking the Concept of Technology in Organizations, *Organization Science, Vol 3(3)*, pp 398-427.

Orlikowski, W. J. and Barley, S. R. (2001) Technology and Institutions: What Can Research on Information Technology and Research on Organizations Learn from Each Other? *Management Information Systems Quarterly, Vol 25(2)*, pp 145-165.

Orlikowski, W. J. and Iacono, S. (2001) Research Commentary: Desperately Seeking the 'IT' in IT Research – A Call to Theorize the IT Artefact. *Information Systems Research, Vol 12(2)*, pp 121-134.

Palen, L. and Liu, S. B. (2007) Citizen Communication in Crisis: Anticipating a Future of ICT-Supported Public Participation. *Proceedings of the SIGCHI conference on Human factors in computing systems*, San Jose, California, USA, pp 727-736.

Palmisano, S. F. (2006) The Globally Integrated Enterprise, *Foreign Affairs, Vol 85(3)*, pp 127-136.

Patrick, K., Griswold, W. G., Raab, F. and Intille, S. S. (2008) Health and the Mobile Phone, *American Journal of Preventive Medicine, Vol 35(2)*, pp 177-181.

Patton, Q. M. (1987) *How to use Qualitative Methods in Evaluation*, Newsbury Park, London, New Dehli: Sage Publications Inc.

Patton, M. Q. (1990) *Qualitative Evaluation and Research Methods (2nd ed.)*. Newbury Park, CA: Sage

Pernici, B. (2006) *Mobile Information Systems: Infrastructure and Design for Adaptively and Flexibility*, Berlin, Heidelberg: Springer-Verlag Berlin Heidelberg.

Person, A. K., Blain, M. L.M., Jiang, H., Rasmussen, P. W. and Stout, J. E. (2011) Text Messaging for Enhancement of Testing and Treatment for Tuberculosis, Human Immunodeficiency Virus, and Syphilis: A Survey of Attitudes Toward Cellular Phones and Healthcare, *Telemedicine and e-Health, Vol 17(3)*, pp 189-195.

Petter, S., DeLone, W. H. and McLean, E. R. (2008) Measuring Information Systems Success: Models, Dimensions, Measures, and Interrelationships, *European Journal of Information Systems, Vol 17(3)*, pp 236-263.

Petter, S. and McLean, E. R. (2009) A Meta-analytic Assessment of the DeLone and McLean IS Success Model: An Examination of IS Success at the Individual Level, *Information and Management, Vol 46(3)*, pp 159-166.

Phillips, D. C. and Burbules, N. C. (2000) *Postpositivism and Educational Research*. Rowman & Littlefield Publishers, Inc.

Qu, Y. and Wang, .W. (2007) The Reasons and the Treatment of Poverty in Countryside. *Anhui Agric Science Bull, No. 3*, pp 15–20.

Rangan, S. and Sengul, M. (2009) Information Technology and Transnational Integration: Theory and Evidence on the Evolution of the Modern Multinational Enterprise, *Journal of International Business Studies, Vol 40(9)*, pp 1496-1514.

Ravichandran, T. and Rai, A. (2000) Quality Management in Systems Development, an Organisational System Perspective, *Management Information Systems Quarterly, Vol 24(3)*, pp 381-415.

Rettie, R. (2003) A Comparison of Four New Communication Technologies. In: Jacko, Julie A., Stephanidis, Constantine and Harris, Don, (eds.) *Human-Computer Interaction: Theory and Practice (Part I)*. Mahwah, New Jersey, USA; London, UK: Lawrence Erlbaum Associates. pp. 686-690.

Rettie, R. (2009) Mobile Phone Communication: Extending Goffman to Mediated Interaction. Sociology, *The Journal of British Sociological Association, Vol 43(3)*, pp 421-438.

Ritchie, J. and Lewis, J. (2003) *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. London: Sage.

Richie, J. and Spencer, L. (1994) Qualitative Data Analysis for Applied Policy Research. Bryman, A. and Burgess, G. R. (Ed.) *Analyzing qualitative data*. London, Routledge.

Robbins, P. S. (2005) *Organisational Behaviour, 11th ed*. Pearson Education, Inc., pp 452-468.

Rodrigues, H. Ariza, C. and Pascoe, J. (2005) On the Development of an Open Platform for M-government Service. Mobile Information Systems II, *IFIP*

International Federation for Information Processing, Vol 191, pp 79-90.

Rogers, E. M. (2003) *The Diffusion of Innovation (5th Ed.)*, New York: Free Press.

Rosenberg, D. and Holden, T. (1998) Interactions, Technology and Organisational Change, *Journal in Complexity Management, Vol 2(2)*, based on the presentation at "Managing the Complex" conference, Toronto 1-4 April.

Rossman, G. B. and Wilson, B. L. (1985) Numbers and Words: Combining Quantitative and Qualitative Methods in a Single Large-scale Evaluation Study. *Evaluation Review, Vol 9(5)*, pp 627-643.

Saarinen, T. (1996) An Expanded Instrument for Evaluating Information System Success, *Information and Management, Vol 31(2)*, pp 103-118.

Sabherwal, R., Jeyaraj, A. and Chowa, C. (2006) Information System Success: Individual and Organizational Determinants, *Management Science, Vol 52(12)*, pp 1849-1864.

Sadeh, N. (2001) *M-commerce: Technologies, Service, and Business Models*, New York, Chichester: Wiley.

Sauer, C. (1993) *Why Information Systems Fail: a Case Study Approach*. Henley-on-Thames: Alfred Waller.

Saunders, M. N. K., Lewis, P. and Thornhill, A. (2009) *Research Methods for Business Students (5th ed.)*. FT Prentice Hall.

Sclove, R. (1995) *Democracy and Technology*, New York: The Guilford Press

Shamir, B., Zakay, E., Breinin, E., Popper, M. (1998) Correlates of Charismatic Leader Behavior in Military Units: Subordinates' Attitudes, Unit Characteristics, and Superiors' Appraisals of Leader Performance, *The Academy of Management Journal, Vol 41(4)*, pp 387-409.

Shamir, B., Zakay, E., Brainin, E. and Popper, M. (2000) Leadership and Social Identification in Military Units: Direct and Indirect Relationships, *Journal of Applied Social Psychology, Vol. 30 (3)*, pp. 612-40.

Shavelson, R. J. and Towne, L. (Eds) (2002) *Scientific Research in Education*, Washington, D.C.: National Academy Press.

Sheng, H., Nah, F. H. F., Siau, K. (2005) Strategic Implications of Mobile

Technology: a Case Study Using Value-focused Thinking, *The Journal of Strategic Information Systems, Vol 14(3)*, pp 269-290.

Siau, K. (2003) Health Care Informatics, *IEEE Transactions Information Technology in Biomedicine, Vol. 7 (1)*, pp 1-7.

Siau, K. and Rossi, M. (2007) Evaluation Techniques for Systems Analysis and Design Modelling Methods – a Review and Comparative Analysis, *Information Systems Journal, Vol 21(3)*, pp 249-268.

Silverman, D. (1993) *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction*. London, Thousand Oaks and New Delhi: Sage Publications.

Silverman, D. (2000) *Doing Qualitative Research: A Practical Handbook.* London: Sage.

Silverman, D. (2006) *Interpreting Qualitative Data (3rd ed.)*, London: Sage.

Smith, A. (1997) *Human Computer Factors: A Study of Users and Information Systems*. McGraw Hill, New York.

Smithies, J. and Webster, G. (1998) *Community Involvement in Health: from Passive Recipients to Active Participants*. Arena-Ashgate Publishing Ltd.

Smithson, S. and Hirschheim, R. (1998) Analysing Information Systems Evaluation: Another Look at an Old Problem, *European Journal of Information Systems, Vol 7(3)*, pp 158-174.

Sommerville, I. (2007) *Chapter Two: Socio-Technical Systems, in Software Engineering (8th ed.)*, Harlow: Addison-Wesley, pp 20-42.

Song, G. and Cornford, T. (2006) Mobile Government: Towards a Service Paradigm. *The Proceedings of the 2nd International Conference on e-Government*, University of Pittsburgh, Pittsburgh, USA. pp. 208-218.

Song, G. and Li, M. (2006) Reinventing Public Management by Mobile Government, *Office Automation, No. 11*, pp 10-13.

Song, Y. (2004). The Issues Between Office Automation (OA) and E-government. *Heilongjiang Meteorol, No. 1*. pp 45–46.

Stahl, B. C. (2007) ETHICS, Morality and Critique: An Essay on Enid Mumford's Socio-Technical Approach, *Journal of the Association for*

Information Systems, Vol 8(9), pp 479-490.

Stake, R. E. (1995) *The art of case study research*, London: SAGE.

Stamoulis, D., Gouscos, D., Georgiadis, P. and Martakos, D. (2001) Revisiting Public Information Management for Effective E-government Services. *Information Management and Computer Security, Vol 9(4)*, pp146-153.

Stockdale, R. and Standing, C. (2006) An Interpretive Approach to Evaluating Information Systems: A Content, Context, Process Framework, *European Journal of Operational Research, Vol 173(3)*, pp 1090-1102.

Sun, D., Li, Y., Feng, X., Huang, K., Zhong, L., Gan, J., Zhou, R., Wang, X., Zheng, J. Yi, F., Zeng, Z., Shui, H., Liu, T. and Yi, G. (2004) A Comparative Study on National Public Health Emergency Response Systems Regarding Their Performance in SARS Prevention and Control. *Chinese Journal of Evidence-Based Medicine, Vol 4(6)*, pp 402-409.

Sundberg, P. H. and Sandberg, W. K. (2006) Towards E-government: a Survey of Problems in Organisational Processes. *Business Process Management Journal, Vol 12(2)*, pp 149–161.

Symons, V. J. (1991) A Review of Information Systems Evaluation: Content, Context and Process, *European Journal of Information Systems, Vol 1(3)*, pp 205–212.

Tannenbaum, R. and Schmidt, W. H. (1973) How to Choose a Leadership Pattern. *Harvard Business Review, Vol 51(3)*. pp .162-180.

Tashakkori, A. and Teddlie, C. (1998) *Mixed methodology: Combining Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage.

Teo, T. S. H. and Ang, J. S. K. (1999) Critical Success Factors in The Alignment of IS Plans with Business Plans, *International Journal of Information Management, Vol 19(2)*, pp 173-185.

The World Bank (2010) *World Development Indicators database*. Access on 2011-07-20.
http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP.pdf

Thomas, R. (1995) Introduction of Differing Perspectives, in Heap, N., Thomas, R., Einon, G, Mason, R. and Mackay, H. (ed.), *Information Technology and Society: A Reader*, London: Sage, in association with the Open University, pp11-13.

Trimi, S. and Sheng, H. (2008) Emerging Trends in M-government, *Communication of the ACM, Vol 51(5)*, pp 53-58.

Trist, E. and Murray H. (1993) *The Social Engagement of Social Science, Volume II: The Socio-Technical Perspective.* Philadelphia: University of Pennsylvania Press.

Truss, K., Soane, E., Alfes, K., Rees, C. and Gatenby, M. (2010) Engaging the 'Pole Vaulters' on Your Staff, *Harvard Business Review, Vol. 88(2)*, p 24.

Turoff, M., Chumer, M., Walle, B. V. and Yao, X. (2004) The Design of a Dynamic Emergency Response Management Information System (ERMIS). *Journal of information technology theory and application, Vol. 5(4)*, pp1-35.

Turoff, M. and Hiltz, S. R. (2008) Assessing the Health Information Needs of the Emergency Preparedness and Management Community. *Information Service & Use, Vol 28(3-4).* pp 269-280.

United Nations Statistics Division (2008) *World Statistics Pocketbook.* United Nations: New York

Varshney, U. (2003) Pervasive Healthcare, *Computer, Vol. 36(2)*, pp 138-140.

Varshney, U. (2005) Pervasive Helthcare: Applications, Challenges and Wireless Solutions, *Communication of the Association for Information Systesms, Vol 16(1)*, pp 57-72.

Varshney, U. (2007) Pervasive Healthcare and Wireless Health Monitoring, *Mobile Networks and Applications, Vol 12(2-3)*, pp 113-127.

Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D. (2003) User Acceptance of Information Technology: Toward a Unified View. *Management Information Systems Quarterly, Vol 27(3)*, pp 425-478.

VOA News (2010) *Physician Uses Cell Phones to Bring Health Care to the Poor*, access on 2010-05-10
http://www.voanews.com/english/news/science-technology/Physician-Uses-Cell-Phones-to-Bring-Health-Care-to-the-Poor-82403437.html.

Vogel, D. R. and Wetherbe, J. C. (1984) MIS Research: a Profile of Leading Journals and Universities, *ACM SIGMIS Database, Vol.16(1)*, pp3-14.

Walsham, G (1993) *Interpreting Information Systems in Organizations.*

Chichester, New York, Brisbane, Toronto, and Singapore: John Wiley & Sons.

Walsham, G (1995) Interpretive Case Studies in IS Research: Nature and Method. *European journal of information systems, Vol 4(2)*. pp 74-81.

Wang, B., Zhang, J. and Huang, H. (2010) The Application of 3G Mobile Phones in Publicity of Government Information, *E-government, No(4)*, pp 114-117.

Wang, G. and Gong, Y. (2004) *Harmony Society: Developing Strategies for Community Health Service*. Shanghai: Fudan Press.

Wang, Y (2007) E-government Should be Based on the Service Delivery and Public Service, *China Tendering, Vol 12*, pp 25–26.

Wang, Y., Ji, J. and Lin, Z. (2002) The Discussion on E-government and its Strategy of Development for China, *Science Research Management, Vol 23(5)*, pp 42–49.

Wang, Y. and Liao, Y. (2008) Assessing eGovernment Systems Success: A Validation of the DeLone and McLean Model of Information Systems Success, *Government Information Quarterly, Vol 25(4)*, pp 717-733.

Watts, Jo. (2009) *China Pledges to Set up a Clinic in Each of its 700,000 Villages*. Guardian Newspaper. 9th Apr, 2009.

Weber, R. (2004) Editors Comments: The Rhetoric of Positivism versus Interpretivism: A Personal View, *Management Information Systems Quarterly Vol. 28(1)*: pp.iii-xiii.

Webster, J. and Watson, R. T. (2002) Analyzing the Past to Prepare for the Future: Writing a Literature Review, *Management Information Systems Quarterly, Vol. 26(2)*. pp xiii-xxiii.

West, D. M. (2004) E-government and the Transformation of Service Delivery and Citizen Attitudes, *Public Administration Review, Vol 64(1)*, pp 15-27.

Williams, R. and Edge, D. (1996) The Social Shaping of Technology, *Research Policy, Vol 25(6)*, pp 865-899.

Wixom, B. H. and Todd, P. A. (2005) A Theoretical Integration of User Satisfaction and Technology Acceptance, *Information Systems Research, Vol 16(1)*, pp 85-102.

Wu, J. (2003) Setting up a Proper Organisational Structure to Improve the E-government Development. *Information Construction, No. 3*, pp17–18.

Wu, J. and Wang, Y. (2006) Measuring KMS success: A Respecification of the DeLone and McLean's Model, *Information and Management, Vol 43(6)*, pp 728-739.

Wu, J., Wang, S. and Lin, L. (2007) Mobile Computing Acceptance Factors in the Healthcare Industry: A Structural Equation Model, *International Journal of Medical Informatics, Vol 76(1)*, pp 66-67.

Wu, P. F., Qu, Y., Fleischmann, K., Golbaeck, J., Jaeger, P., Preece, J. and Shneiderman, B. (2009) Designing Community-based Emergency Communication System: A Preliminary Study. *Proceedings of the American Society for Information Science and Technology, Vol 45(1)*. pp 1-3.

Xinhua (2008) *Reconstruction After Earthquake*, Chinese National Authority News Agency, July.

Yamamoto, G. T., Gucer, M. and Memis E. (2010) E-government and M-government Integration, *Proceedings of the 5th European Conference on Mobile Government*, Brighton UK.

Yao, G. and Lin, P. (2005) *International E-government Case Studies*. Peking University Press, Beijing.

Ye, Y. (2005) An Investigation Report of Constructing Public Health Emergency System in Jieyang, *Chinese Health Economics, Vol 24(5)*, pp 41-43.

Ye, N. (2007) E-government and E-democracy. *China Manage Inf, No. 2*. pp70–73

Yin, R. K. (2009) *Case Study Research: Design and Methods (4th Ed.)*. London ; Sage.

Zhang, B. and Feng, X. (2010) The Use of Short Message in Politics in Suiyang, *Guizhou Today, No. 7*, pp 60-61.

Zhang, K. (2010) *Information Management in Community Health Service*, Southeast University Press.

Zhang, N., Guo, X., Chen, G. and Song, G. (2008) The Cultural Perspective of Mobile Government Terminal Acceptance – An Exploratory Study in China,

Proceedings of Pacific Asia Conference on Information Systems, pp 1368-1376.

Zhang, P. and Wang, Y. (2007). Study On the Organization Management Model in E-government. *Journal Liaoning Normal University, No.1*.

Zhang, Q. (2003) The Main Operating Conditions Obstacles in Chinese E-government Affairs and the Countermeasures. *Study Int Technol Econ, No. 2*, pp 21–27.

Zhang, Y., Xu, Y., Shang, L. and Rao, K. (2007) An Investigation into Health Informatics and Related Standards in China. *International Journal of Medical Informatics, Vol 76(8)*. pp 614-620.

Zhao, W. (2006) Establishment of Mobile Government of Changchun. Information Port, *China Information Times, No. 13*, pp 25-26.

Zhou, H. (2007) The Problems Existing in the Development of Chinese E-government and Countermeasures. *Sci-Tech Information Development and Economy, No. 3*, pp243–246.

Appendix A

General Philosophical Considerations for This Research

Creswell (2002) maintains that the fundamental issue for the philosophy of knowledge is the requirement for researchers to decide how to gain new knowledge, how to set up assumptions, or how to evaluate theories, etc. The decisions made by researchers rely on their philosophical assumptions, epistemology or ontology (Lincoln and Guba, 2000; Mertens, 1998; and Crotty, 1998). Thereby, research philosophy is relative to the methodologies we choose for every research project.

Furthermore, Creswell (2002) summarises the views of knowledge in four major categories, namely: Post-positivism, Constructivism, Advocacy or Participatory and Pragmatism. Post-positivism assumes that a hypothesis is supposed to be true or untrue, and that it also can be tested. Post- positivists assume that causes can affect results, while the causes can be found out by experiments during research. This research method is commonly recognised as a quantitative research method. Society is dominated by fixed theories or rules, so that they can be measured or quantified. The conclusions of the post-positivism research concern whether to accept or reject the hypothesis. The experiments are about contributing amendments or improvements.

Social constructivism claims that theory can be established from the working life in which they live, while subjective cognition influences individuals' learning (Lincoln and Guba, 2000; and Crotty, 1998). This complicated recognition from constructivists does not only help to simply classify new

knowledge, but also to explore the complexity of social phenomena. Therefore, researchers should consider the environment surrounding the study, and the proposed research question should not be too detailed (Newman, 2000). In order to understand the research context, open-ended questions can be better to construct new knowledge, such as how culture or the settings affect the interpretation of knowledge. This kind of research usually involves introducing a new theory or inducting a development of existing theories, rather than testing a hypothesis based on a model or a framework (Crotty, 1998; and Creswell, 2002).

Advocacy or participatory research explains that knowledge should be gained through debate, or researchers getting involved in the research (Newman, 2000). Taking participation carried out by action research, that can contribute some changes for the environment of the study, this is believed to be more meaningful to theories and practice for both of the researchers and the people related to the study, and that may eventually cause social improvement (Kemmis and Wilkinson, 1998).

Pragmatism focuses on what is useful, and seeks solutions of research problems, which are different from others (Patton, 1990). Research problems and solutions are the most important part, while methodologies are just instruments for understanding the problem and gaining new knowledge, pragmatists believe (Rossman and Wilson, 1985). They suggest employing a variety of research methods to pursue research such as mixed methods (Patton, 1990; and Tashakkori and Teddlie, 1998). Pragmatic researchers normally use qualitative and quantitative data, through different data collection and analysis methods. Choosing appropriate methods, techniques and procedures should be consistent with the requirements and objectives of the research (Creswell, 2002). This study reflects on various research philosophies and methodologies,

and formulates the research approaches and strategies.

Research Philosophy

This section focuses on the philosophical implications. The philosophical framework of social researchers affects their understanding and perceptions of all social phenomena and behaviour. For instance, philosophy affects research topics, designing and methodology (Saunders et al., 2009). Researchers make a number of philosophical assumptions when they choose their topic and approaches. Creswell (2002) identifies four classical main components of a philosophical perspective. The first one is alternative claims about what exists, namely, ontology. It clarifies that researchers believe phenomena which they study exist independently, or their existence depends on whether human beings believe in them. The second one is epistemology, which argues that researchers cannot obtain observation of phenomenon directly. Axiology and methodology are the other two choices of methods.

Bryman and Bell (2003) pointed out that the epistemological and ontological considerations and their associated methods, are the most essential issues for social research. Positivism and interpretivism are two main epistemological positions that advocate the application of the methods in the study of social reality (Benton and Craib, 2001). On the other hand, objectivism and constructionism are two important ontological positions that assert that social phenomena and their meanings have an existence, which is independent of social actors (Bryman and Bell, 2003).

Positivism reflection

Positivist sociologists state that the behaviour of human beings can be objectively measured (Hussey and Hussey, 1997). Phillips and Burbules (2000)

argued that people cannot be "positive" about claims of knowledge, when studying the behaviour and actions of humans. We can discover that the most significant theme of positivism is the separation of facts and value. It aims to work within a neutral attitude. Moreover, positivism is most often treated as supporting quantitative methods (Bryman and Bell, 2003). By contrast, qualitative research methods are less used in positivism, which does not involve value judgments. Normally, the positivist approach does not require an understanding of the cultural background of the research either.

The disadvantage of positivism is that it is constricted by its nature, and it is only concerned with phenomena, which can be observed and measure. It does not examine underlying causal mechanisms. In order to understand these mechanisms, researchers need to know how to grasp the underlying value (Bryman and Bell, 2003).

Interpretativism reflection

Interpretativism assumes that the world is constructed by the participants. Individuals explore the world where they live and work. They develop subjective meanings of their experiences with certain objects. This has an early formulation mentioned by Mannheim (1997), which was largely reinvented and applied to working life in 1960s (Berger and Luckmann, 1967). Later on, Guba and Lincoln (1985) enriched this research. Currently, it has been becoming more and more popular to support qualitative methods with understanding of human society. Interpretativism is appropriate as social facts, where this prevailing view is held by the majority of society.

The disadvantage of interpretativism is that it relies heavily on subjective explanation. We must be aware of this flaw, resulting in bias and simplification. Otherwise, it would lead to relativism, since there are multiple

perspectives leading to conflicting view as to what is "really" happening (Bryman and Bell, 2003). Positivism and interpretivism can be distinguished in numbers of different ways. The summary table was drawn by Weber (2004) currently accepted widely.

Differences between Positivism and Interpretivism (Weber, 2004, p iv)

(Source from lecturer notes provided by Jorgen Sandberg)

Metatheoretical Assumptions About	Positivism	Interpretivism
Ontology	Person (researcher) and reality are separate.	Person (researcher) and reality are inseparable (life-world).
Epistemology	Objective reality exists beyond the human mind.	Knowledge of the world is intentionally constituted through a person's lived experience.
Research Object	Research object has inherent qualities that exist independently of the researcher.	Research object is interpreted in light of meaning structure of person's (researcher's) lived experience.
Method	Statistics, content analysis.	Hermeneutics, phenomenology, etc.
Theory of Truth	Correspondence theory of truth. one-to-one mapping between research statements and reality.	Truth as intentional fulfillment: interpretations of research object match lived experience of object.
Validity	Certainty: data truly measures reality.	Defensible knowledge claims.
Reliability	Replicability. research results can be reproduced.	Interpretive awareness: researchers recognize and address implications of their subjectivity.

Qualitative research can often offer more deep thorough research findings, while relationships between variables in quantitative research are expected to test the research assumptions with the numerical data for the interpretation of the results. Newman and Benz (1998) point out that more and more research is difficult to define as merely qualitative or quantitative, and that becomes mixed methods in the form of a combination.

Critical realism reflection

Critical realism is an alternative philosophical perspective and another possible research design, which involves taking a realistic approach to social research, but adopting a critical or activist principle. The critical realists accept an ontology that includes observable entities and underlying structures, which are similar to positivists and interpretativists (Bhaskar, 1998). It encourages a dialectical approach to social research, and leaves open the choice of methodology to the practitioner. This, however, does not often insist upon any particular methodological approach (Lopez and Potter, 2001). Either the quantitative approach or the qualitative might be suitable, depending on research topics.

Different research philosophies and methodologies have different strengths and weaknesses from various points of view. The positivist approach is suitable when the subject matter involves less subjectivity. The interpretativist approach is suitable when there is a "shared reality". Hence, the chosen perspective also relies on the research objectives, research questions and expected outcomes. The choice of subject, how it is investigated, and the way in which the results are presented, are all matters in which value judgements are made.

Appendix B

Publication Attached

I have published two papers from two sections of this thesis in advance of the PhD examination:

Li, Z. (2009) How E-government Affects the Organisational Structure of Chinese Government. *AI & Society, Vol 23(1)*. pp123-130.

Li, Z. and Song, X. (2009) Government Informatics and China Earthquake Rescue: A Case Study in Emergency Management. *IADIS International e-Society 2009, Conference Proceedings Vol II*, pp167-171.

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