Developing a Stage Reference Model for Managing the NHII

Fu-Chung Wang

National Chengchi University of Taiwan,

64, Sec. 2, Zhi-nan Rd., Wenshan, Taipei, 116 Tel: 886-2-932262366

92356502@nccu.edu.tw

ABSTRACT

The Health Information Network and the Health Smart Card program in Taiwan were used to help the national health care. However, there were so many arguments and criticisms as they carried out. One of the most important reasons was that different opinions among the patients, the medical communities and the government always existed. How to "manage" or "monitor" those inter-organizational systems (IOS) projects are very interest and essential. By understanding the issues among the IOS, we developed a reference model to manage the NHII project or other IOS projects. Our suggestion is a stage reference model which includes 4 stages' IOS for developing and managing such projects. Form this model, the practice can be careful to avoid those mistakes in the IOS project and when the information infrastructure as a whole will be major challenges for policy makers in Taiwan, our research could be a useful solution for helping the enablers.

1. INTRODUCTION

When the information technology becomes easy and available to all, it is also changed in the speed and efficiency of the connection among organizations. The Department of Health (DOH) of Taiwan started the Health Information Network (HIN) program from 1988, and then operated under a single public run organization – Bureau of National Health Insurance (BNHI), the program, which started on Mar. 1st, 1995 has a original goal of universal coverage, equitable access to quality health care and at affordable cost. The National Health Insurance (NHI) of Taiwan covers 23 million people with annual outlay of some 13.5 billion U.S. Dollars. One key factor to the success of the program is the adoption of information system from its inception. Every citizen and foreigner who is eligible for the National Health Insurance program has received a smart card now (Bureau of National Health Insurance, 2004a). In the mean time, there still have many arguments in those programs, for example, the security and privacy issues. However, the DOH of Taiwan just announced a 260 million

U.S. dollars investment for the next 4 years in the National Health Information Infrastructure (NHII) project.

As public policies, the interest parties involved will conflict each others for their objectives or benefits. Moreover, the information infrastructure generally delivers a widespread change (Carr, 2003). If it's true, there are many different opinions among the people, the medical communities and the government because each of them is an individualist. A very important problem is how can we "manage" or "monitor" such projects like the NHII and compromise the different opinions? When we referred to the inter-organizational systems (IOS) literature, there was a good example to examine the characteristics of inter-organization interdependency in inter-firm relationships. Therefore, we decide to propose a stage reference model that includes 4 stages IOS for development and management of such projects. In this paper, to identify clearly the key issues in IOS and understand better the effect of IOS on the organizations of medical industry, this useful reference model not only could manage the NHII project, but improve the IOS theory by observing and discussing the interaction in implement this model.

2. THE NATURE OF IOS

Literature from IOSs started in the 1980s with a technical view. Cash and Konsynski (1985) gave a simple but useful definition of an IOS as "an automated information system shared by two or more companies". They think the system is useful for the participants to promote their productivity, flexibility and competitiveness. Johnston and Vitale (1988) later enhanced it as "an IOS built around information technology, that is, around computer and communication technology, that facilitates the creation, storage, transformation and transmission of information". IOSs are information and communication technology-based systems that transcend legal enterprise boundaries (Kumar and van Dissel, 1996).
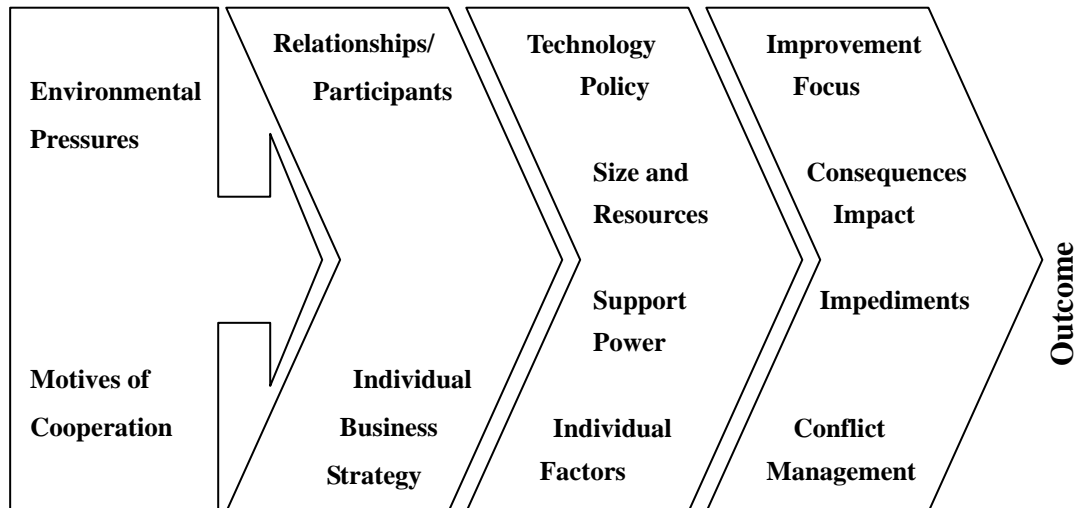
IOSs are implemented in many ways include: e-mail, electronic data interchange (EDI), exchange of product design information (like CAD etc.) and database accessed directly from other organizations. Technically, the most common ways to implement IOS are either through on-line connections or message exchange. For example, Holland (1995) illustrates an IOS used in a process role with a computer aided design (CAD) system being created to shorten the manufacturing design cycle and provide better service to the customer. Bakos (1991) mentioned that three characteristics are associated with IOS. First, it decreases the costs of exchanging and acquiring information by participating firms. Second, the benefits for the IOS innovator increase as the number of firms joining the network increases. Third, considerable switching costs occur when a firm shifts from one IOS to another. Christianse and

Venkatraman (2002) test the SMARTS in electronic channels showing the necessity of extending the theoretical perspectives on IT-induced interorganizational relationships from an efficiency perspective to an expertise point of view.

In fact, the essential characteristics of an IOS are multifaceted, after the technical-economic and socio-political perspective, the trust and relationship perspective was also mentioned (Kumar and Dissel, 1998). For this reason, there is a shift in the role of Information Technology (IT)—from a competition weapon to a cooperation enabler among businesses (Hong, 2002). IT is now used to enable cooperation more than competition among firms. Participants in IOS not only include suppliers, customers, dealers but also competitors (Johnston and Vitale, 1988; Hong 2002). It is necessary to view IOS in a broader context. IOS can be considered as planned and managed cooperative ventures between otherwise independent agents (Kumar and van Dissel, 1996). However, as an IOS is extended from a competition-based role to a collaboration-based role, except competitive advantage, the amount of trust or conflict management issues in the system will also increase.

3. A STAGE REFERENCE MODEL FOR IOS

The importance of developing a stage model is in order to better understand the role of IOS in organizations. The stages steering cycle clearly shows the "policy values" aspect (Rochet, 2004). Because a practical roadmap for identifying problems and implementing timely corrective actions to improve projects' success is advocated (Czuchry and Yasin, 2003) and lessons learned from two high-tech firms to implementing corporate intranets step by step is useful (Wagner, Chung, and Baratz, 2002). By the Based on these past contributions, we propose a theoretical model of IOS that relates these set of concepts and constructs. Our overarching model is presented as a temporal model for accomplishing interorganizational system. Elements of four stages of IOS are depicted: initial adoption, assessment, development and implementation and change (see Figure 1). The detail terms about each issue are collected in the appendix.

| Initial | Assessment | Development | Implementation |
| Adoption | | | and Change |

Figure 1: Stage Framework for IOS

3.1 Initial Adoption

The initial adoption stage can be better understood by separating two driving sources. First, drivers from outside is already mentioned by many articles. Those environment pressures come from not only globalization (Kumar and van Dissel, 1996) but customer power (Grover, 1995). The institutional theory is a good method to understand those pressures when investigating IOS adoption. Second, driver from inside basically is following the information technology enable theories, like competition, risk sharing, reducing uncertainty and adaptable innovations (detail see Table 1). However, companies who want to adopt IOS only when the result could conform to their entomic benefits (Kumar and Crook, 1999).

3.2 Assessment

The academic literature that discusses IOSs is massive and applies many theoretical perspectives to view and analyze issues regarding the use of IOSs within inter-organizational relationships. Recognizing those relationships as an assessment can help us to draw upon the linkage of roles played joining the IOS. The organizations involved approach IOS with different and often conflicting goal, and they pursue their own self-interest (Bakos 1991). Therefore it is difficult to achieve full cooperation in the beginning. Decision and analysis should start form individual businesses strategy, and these initiatives are necessary for full realization of the policy of IT in next stage. Strategies can be classified into three broad

subcategories: coercion, support, and building long-term relationships (Kumar and Crook, 1998).

3.3 Development

First, technology policy focuses on either improving the service provided to the existing business, or transforming the business through new technological capabilities (Olga, Chan, and Newson, 1999). However, the technology policy is multi-disciplinary. For example, security is also collaboration issues since trading partners have the same degree of concern for security and must agree on methods of enforcing security. Security is also an organizational issue since mangers and auditors need to be comfortable with security procedures (Kumar and Crook, 1999). Second, larger organizations tended to be more complex to develop IOS (Kumar and Crook, 1999). Size and resources often become control variables to avoid their influence on IOS research (Teo, Wei and Benbasat, 2003). Third, successful design and development need leadership at stage of development (Olga, Chan, and Newson, 1999). The readership had description of two types of support role: a top-management and a project championship. It is different with the term of support level in our paper because the support level means the technical support level of business information system infrastructure. Last, individual factors are also included. Factors that relate to an individual's perception and use of an IOS must be considered (Kumar and Crook, 1999).

3.4 Implementation and Change

After the IOS implemented, a continuous refining process is necessary in order to make sure of sustainability. The participants must care not only the improvement focus but the consequences impact. The factor of impediments to IOS affect not only in adoption (Grover, 1995) but in implementation. It's useful that in the implementation stage to consider this factor (we will discuss in later). In this stage, Kumar and van Dissel (1996) highlight the conflicts and risks that could emerge in the context of IOS and emphasize the need to manage these risks. Factors such as power and training between partners have also been identified as influencing the usage of IOSs (Kumar and Crook, 1999). Understanding the negative consequence can help mediate distress to the satisfaction of all concerned parties and promote the opportunity of IOSs success.

Those issues in each stage will be competitive and complementary; it's mean that each stage continues not only all issues solved but several issues intensified. As the positivist case study (Sarker and Lee, 2002) provided support for the sociotechnical theory-in-use of business process redesign, the stage framework for IOS also gives equal consideration to the technical and social dimensions, and the interactions between the social and the technological.

4. CONTEXT ANALYSIS TO ILLUSTRATE THE PROPOSED MODEL

The Department of Health (DOH) of Taiwan already spent about 2 billion U.S. dollars to build the Health Information Network (HIN) from 1988 to 2004. It's surprising that this project include several IOS system: the infection case announce system, the serious disease bed check, the long-term care system as so on (Chang, 2003), but all not work. Even when SARS come, the HIN still not enhanced or glorified. On the other hand, in 2002, the Bureau of National Health Insurance (BNHI), started the Smart Card (IC Cards) program, and implemented in Jan 1 2004. The technology is from Germany, the same company which prints the Euro. It is now used only as a health ID; however, it has the potential of storing some medical information in it. The IOS of this program based on XML was created and implemented by the government and the TECO. At this moment the government is still debating what information is suitable to put in the smart card to facilitate data exchange among health care providers and access to patients. However, the successful implementation of this Smart Card program, a 3-year, 1 billion U.S. dollars investment has already achieved its first goal of connecting all health care providers under one network (Bureau of National Health Insurance, 2004b). The impediment to the implementation of any e-health program is mostly from the fear of infringement to privacy and security issues.

In the initial adoption stage, the environment pressures and motive of cooperation are described clearly in both cases. Formation of cooperative alliances is easy to understand. In the assessment stage, in spite of different innovator, IOS still can proceed in both cases. The reason is not only because both cases have the same organizational strategy but the participants in IOS believe that those information and communication technology-based services are useful. Then in the stage of development, both cases design the IOS already including of integration, flexibility, standards and trust-based system. The support power in both cases is also obvious. However, it is a very interesting why outcome is so different in the last stage. Kumar, van Dissel and Bielli (1998) developed an additional theoretical perspective in order to better explain this question. The success in the Smart Card Program is only because the participators collaborated in each stage. Even there are some problems, the participators believe the testimony to the importance of social consensus, which is critical if we want to achieve the original goal of sharing health records electronically. For those reason, the NHII project will develop by the virtual private network of the Smart Card Program.

5. ISSUES FOR RESEARCH AND MANAGERIAL IMPLICATION

Because current inter-organizational systems literature focuses on the case study, to explain the reason why they success or failure are important. Usually, the research will show a

comprehensive reason to convince readers. For example, two IOS famous case: the Prato case (Kumar, van Dissel and Bielli, 1998) and the Japan Airline case (Chatfield and Bjorn-Andersen, 1997). Compare these cases study; it's hardly to explain why their outcomes are so different. Form our perspective, which is because the issues in the each stage are competitive and complementary. Even "technology policy", "size and resources", "support power" was also well prepare, just because not considered the importance of the individual factors, the Prato case was fail. On the contrary, the Japan Airline case was success not because they solved all problems in the each stage but because they had a very stronger Information Intensity (in the Implementation and Change stage, see the appendix). It also is true in the case we mentioned in the front section.

5.1 Beyond the Model

Johnston and Vitale (1988) categorize IOS based on business purpose, participants, information function and improvements focus. Other scholars proceed with different topology (Kumar and van Dissel, 1996; Kumar and Crook, 1999; Hong, 2002). Our research summarizes their research and suggests that the development and implementation go through various stages during the major focus is helpful. However, the management of IOS's by organizations has proved to be difficult and complicated, this stage reference model is still can be refined and quantity analysis will follow.

5.2 IOS Leverage

A key concept for future research is IOS leverage. Kumar and Crook (1998) already described the consequences impact in the individual, organization and industry. The result in the Chatfield and Bjorn-Andersen (1997) research illustrate a business process change enabled by IOS. The infrastructure technology will be more powerful by more sharing and using (Carr, 2003). However, from the context analysis, issues in each stage not always coordinated. Future research may develop a context for understanding points of leverage and their creation provides a perspective of reconciliation for organizations and managers in the midst of escalating IOS issues and radical change.

5.3 Implications for Practice

The management of IOS's IC Card project has proved to be difficult and complicated. Our stage model also conduces to the practice to focus their vigor on each issue. And the development and implementation of IOS will go through various stages and will be helpful during each stage. Beside, Kumar and Crook (1998) already described the consequences that

will impact the individual, organization and industry. Compared with other industries, most health care providers in Taiwan had adequate flexibility to renew their H.I.S. or intranets services. According the conceptual model of supply chain flexibility (Ducios, Vokurka, and Lummus, 2003), their flexibility include not only operations system but logistics, supply, organizational and information systems. For this purpose, the NHII project's enablers must try to reduce the impact among the different participators. As an IOS is extended from a transaction role to a knowledge based role, the issues of trust between the business partners must be increased. This requires sufficient time periods to move from deterrence-based trust to the identification-based trust stage. The NHII project enablers should take some efforts in updating information more efficiently. Basing on the reference model, data can be collected to assess the quality of the project and adjust the policy as soon as possible. It's useful for project planning and method selection.

6. CONCLUSION

It is interesting to note that in places where health care delivery system are still developing as most Asian economies are, their chances of building e-health delivery system could be higher than countries with mature health care systems. The informed and e-ready is already there and the number is growing rapidly. There is no time to contemplate on one strategy after another without delivering the real output – the promised National Health Information Infrastructure or whatever name under which the modern e-health system could be based upon. By the stage reference model, the practice could be careful to avoid those mistakes in the NHII project. However, the quality of government IT projects was hardly evaluated. The impact of IOS is not only technical but social and economical (Hsieh and Lin, 2004), we think this is a chance to build a managing or monitoring agency to help those projects.

APPENDIX: SUMMARY ISSUES OF THE FOUR STAGES

Initial Adoption		
Environmental Pressures	Globalization	Kumar and van Dissel, 1996
	Customer power	Grover, 1995
	Mimetic、Coercive、Normative pressures	Teo, Wei and Benbasat, 2003; Kumar and Crook, 1999
Motives of Cooperation	Reaction to competition	Johnston and Vitale, 1988; Grover, 1995; Kumar and Crook, 1998;
	Risk Sharing and Reducing uncertainty	Kumar and van Dissel, 1996
	Adaptable innovations	Grover, 1995
	Economic factors	Kumar and Crook, 1999
Assessment		
Relationships/ Participants	Innovator	Kumar and Crook, 1998; Hong 2002
	Participants (Customer, Dealers, Suppliers, Competitors)	Johnston and Vitale, 1988; Hong 2002
Individual Business Strategy	Awareness of competition and market conditions	Johnston and Vitale, 1988; Grover, 1995
	Customer services	Johnston and Vitale, 1988
	Switching costs	Johnston and Vitale, 1988
	Coercion, Support, Collation	Kumar and Crook, 1998
Development		
Technology policy	Integration	Kumar and Crook, 1998; Kumar and Crook, 1999
	Support level	Hong, 2002
	Internal use	Johnston and Vitale, 1988; Kumar and Crook, 1998
	Standards	Kumar and Crook, 1999
	Security	Kumar and Crook, 1999
Size and Resources	Availability of resources	Kumar and Crook, 1999;
	Skilled the technical workforce	Kumar and Crook, 1999
	Size of the organization	Grover, 1995; Kumar and Crook, 1999
Support power	Top-management	Grover, 1995; Kumar and Crook, 1999; Olga, Chan, and Newson, 1999;
	Project championship	Grover, 1995; Kumar and Crook, 1999; Olga, Chan, and Newson, 1999;
	Senior management commitment	Kumar and Crook, 1998
	Existence of communication channel	Kumar and Crook, 1999
Individual Factors	TAM, et al.	Kumar and Crook, 1999
Implementation and Change		
Improvement Focus	Transaction cost	Johnston and Vitale, 1988; Kumar and van Dissel, 1996
	Efficiency	Johnston and Vitale, 1988; Kumar and van Dissel, 1996
	Trust	Kumar and van Dissel, 1996
Consequences Impact	Industry, Organization, Individual	Kumar and Crook, 1998
Impediments	Information intensity	Grover, 1995
	Complexity	Grover, 1995
	Incompatibility	Grover, 1995
Conflict Management	Power, Training, et al.	Kumar and Crook, 1999

REFERENCES

Bakos, J. Y. (1991). "A strategic analysis of electronic marketplaces," **MIS Quarterly**, 15, 1991, pp. 295-310.

Bureau of National Health Insurance, (2004a). "National Health Insurance Profile 2004," Bureau of National Health Insurance, Taiwan.

Bureau of National Health Insurance, (2004b). "NHI IC Card," http://www.nhi.gov.tw/00english/e_index.htm, Taiwan.

Carr G. Nicholas, (2003). "IT Doesn't Matter," **Harvard Business Review,** May 1, 2003, pp. 42~52.

Cash, J. and Konsynski, B. R. (1985). "IS redraws competitive boundaries," **Harvard Business Review**, March-April 1985, pp.134-142.

Chang, I. (2003). "Strategic Planning Research for Interorganizational Information Systems in the Healthcare Industry," Doctoral Dissertation of National Cheng Kung University, Taiwan, Jan. 2003.

Chatfield, A. T. and Bjorn-Andersen, N. (1997). "The Impact of IOS-Enabled Business Process Change on Business Outcomes: Transformation of the Value Chain of Japan Airlines," **Journal of Management Information Systems**, Summer 1997, 14(1); pp. 13-40.

Christiaanse, E. and Venkatraman N. (2002). "Beyond Sabre: An Empirical Test of Expertise Exploitation in Electronic Channels," **MIS Quarterly**, March 2002, Vol. 26, No.1; pp. 15-38.

Czuchry, A.J. and Yasin, M.M. (2003), "Managing the project management process," **Industrial Management & Data Systems**, Vol. 103, No. 1, pp. 39-46.

Ducios, L.K., Vokurka, R.J. and Lummus, R.R. (2003), "A Conceptual model of supply chain flexibility," **Industrial Management & Data Systems**, Vol. 103, No. 6, pp. 446-456.

Grover V. (1999). "An Empirically Derived Model for the Adoption of Customer-Based Interorganizational Systems," **Decision Sciences**, Volume 24, No. 3; pp. 603-640.

Hsieh, C. and Lin, B. (2004), "Impact of standardization on EDI in B2B development," **Industrial Management & Data Systems**, Vol. 104, No. 1, pp. 68-77.

Holland, C. P. (1995). "Cooperative Supply Chain Management: the Impact of Interorganizational Information Systems," **Journal of Strategic Information Systems**, June 1995, Volume: 4, Iss. 2; pp. 117-133.

Hong, I. B. (2002). "A New Framework for Interorganizational Systems Based on the Linkage of Participants' Roles," **Information & Management,** Feb 2002, Vol. 39; pp. 261-270.

Johnston, H. R. and Vitale, M. R. (1998). "Creating Competitive Advantage with Interorganizational Information Systems," **MIS Quarterly**, June 1988, pp. 153-165.

Kumar, L. and Crook, C. W. (1998). "Electronic Data Interchange: a Multi-Industry Investigation Using Grounded Theory," **Information & Management,** Feb 1998, Vol. 34; pp. 75-89.

Kumar, L. and Crook, C. W. (1999). "A Multi-Disciplinary Framework of the Management of Interorganizational Systems," **Database for Advances in Information Systems,** Winter 1999, Vol. 30, Iss. 1; pp. 22-37.

Kumar, K., Dissel, H. G. and Bielli, P. (1998). "The Merchant of Prato-Revisited: Toward a Third Rationality of Information Systems," **MIS Quarterly**, June 1998,   pp. 199-226.

Kumar, K. and Dissel, H. G. (1996). "Sustainable Collaboration: Managing Conflict and Cooperation in Interorganizational Systems," **MIS Quarterly**, September 1996, pp. 279-300.

Olga, V., Chan, Y. E., and Newson, E. F. P. (1999). "Leading the Development and Implementation of Collaborative Interorganizational Systems," **Information & Management,** Feb 1999, Vol. 35, Iss. 2; p. 63-75.

Rochet, C. (2004), "Rethinking the management of information in the strategic monitoring of public policies by agencies," **Industrial Management & Data Systems**, Vol. 104, No. 3, pp. 201-208.

Sarker, S., and Lee A. S. (2002), "Using a Postivist Case Research Methodology to Test

Three Competing Theories-in-Use of Business Process Redesign," **Journal of the Association for Information Systems**, Vol. 2, Article 7, Jan. 2002.

Teo, H. H., Wei K.K. and Benbasat I. (2003). "Predicting Intention to Adopt Interorganizational Linkages: and Institutional Perspective," **MIS Quarterly**, March 2003, Vol. 27 No. 1; pp. 19-49.

Wagner, W. P., Chung, Q.B. and Baratz, T. (2002), "Implementing corporate intranets: lessons learned from tow high-tech firms," **Industrial Management & Data Systems**, Vol. 102, No. 3, pp. 140-145.