

Towards a Framework for Analyzing Governance of IT Mechanisms in Inter-organizational Networks – Experiences from Two eHealth Cases

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Abstract. Inter-organizational information system (IOS) related networks have been studied from different disciplines, but no study which would combine the results has emerged. Our objective in this article is to create a framework which provides a tool for information systems researchers and managers to understand and analyze governance of complex IOS networks. The framework will be empirically substantiated by mapping how health care IOS networks may be governed by individual organizations, the network they form and the surrounding society.

Keywords: Inter-organizational information systems, network, IOS, framework

1 Introduction

Several countries in the western world are facing enormous pressures due to development in technology and medicine, demographic shifts in their population and consequential demand for health care. Policy makers and health care researchers are looking for means to limit the soaring costs of health care ^[1, 2]. To face these issues most countries have started national plans for interoperable health care information networks.

Information technology (IT) has been a central enabler for increase in productivity in many areas and expectations are high also in health care. The complexity of the cooperation, alliances, agreements, and decentralized decision-making would have been simply impossible to manage without the development of computer networks ^[3]. Despite of the critical role of computers in inter-organizational arrangements, coordination of IT decisions within these networks is a fairly unexplored area, both in research and in practice. The processes through which the orchestration of IT in networks takes place are largely hidden.

The relationship between organizations in the field of IS research has been traditionally bilateral ^[4]. The importance of aggregating network level analyses has been rising lately. Mickey ^[5] argues that dyadic interorganizational arrangements

typical of IOS research in the 80s require updating in order to reflect shared electronics market and internet based Information systems.

In a recent literature review on network research, Provan and Kenis conclude that more research is needed on network level governance, as opposed to dyadic or single organization perspectives^[6]. For instance, Finnegan et al. argue that there is growing need for inter-organizational SISP research^[7]. This argument is further developed by Salmela and Spil^[8].

Provan and Milward divide in their public and nonprofit sectors network oriented conceptual study the network in into three different categories, namely: *Community* (Macro) level; *Network (Meso)* level; and *Organization (Micro)* level^[9]. While these three levels – organization, network and society – are related, each has their own characteristics which should be considered.

In addition to Provan and Milward's conception of network categorization, Damsgaard and Lyytinen have observed the need to study organizational IT diffusion in different levels of analysis. To better understand EDI diffusion in Finland, they identified three types of diffusion patterns, namely local dyadic patterns, industry-wide patterns and macro level patterns^[10]. *Local dyadic relationships comprise one organization and its immediate partners, whereas industry networks cover an entire sector or industry. Macro level patterns embody the overall diffusion space. These patterns are interwoven and take place simultaneously within a specific diffusion unit.*

Transaction cost economy has traditionally seen two possible ways for managing exchange: *hierarchy* and *market*. *Market exchanges* are transactions between separate entities whereas *hierarchical relationships* are coordinated through unitary organizational structures^[11]. Ouchi has expanded Williamson's model by adding *clan* as one form of exchange and has renamed hierarchy to *bureaucracy*^[12]. According to Rodríguez et al. all three kind of governance mechanism play different but essential role in stimulating effective inter-organizational collaboration^[13].

IOS-related networks have been studied from different disciplines, but no study which would combine the results has emerged. *Our objective in this article is to create a framework which provides a tool for information systems researchers and managers to understand and analyze governance of complex networks.* The framework will be empirically substantiated by mapping how health care IOS may be governed by individual organizations, the network they form and the surrounding society.

The empirical research was conducted in the IOS field of the Finnish health care in which organized system integration emerges from a national strategy set back in 1996. During the years strategy has lead into implementation of national information systems architecture. Analysis of Finnish health care IOS are divided into plans before and after national architecture act. In addition the National Programme for IT in the National Health Service in United Kingdom (NPfIT) was reviewed from the literature.

Both Provan and Millward and Damsgaard and Lyytinen argue that network itself is too small unit of analysis and networks should be study not only on network level on the contrary micro and macro level too. Our framework therefore uses three tiers to analyze IOS networks' governance, namely organizational, network and society levels.

We combine Ouchi's governance model to Provan and Milward three level public networks analysis model ^[9] and Damsgaard and Lyytinen three level diffusion analysis model ^[10]. With this framework we will study how the Finnish and British study cases are governed. The analysis is made in three levels: how single organization, how the network and lastly how the society or community tries to steer the governance of healthcare information systems.

This article is structured as follows. First we will outline the theoretical background of developed framework. Then we will introduce the two studied cases. Finally, in order to understand information systems governance in the context of IOS a further review of the cases has been made against the framework.

2 Theoretical Background

2.1 Three Levels of Networks

In their public and nonprofit sectors network oriented conceptual study Provan and Milward ^[9] divide the network in into three different categories: *Community* (Macro) Level; *Network (Meso)* level; and *Organization (Micro)* level. This framework is very useful in understanding and evaluating IOS networks. At the most wide-ranging community level the networks should be judged on by the contribution they make to the communities they are trying to serve. On the network level analysis focuses on how individual organizations form a functioning network of sovereign actors. Finally, on the organization/participant level analysis is needed as organizations always are partly motivated by self-interest. Despite the broader value that may go to clients and the community in general as a result of the integrated delivery of services through a network, its members still strive to ensure the survival of their own organizations.

In addition to Provan and Milward's conception of network categorization, Damsgaard and Lyytinen ^[10] have observed the need to study organizational IT diffusion in different levels of analysis. To better understand EDI diffusion in Finland, they identified three types of diffusion patterns, namely local dyadic patterns, industry-wide patterns and macro level patterns. Local dyadic relationships comprise one organization and its immediate partners, whereas industry networks cover an entire sector or industry. Macro level patterns embody the overall diffusion space. These patterns are interwoven and take place simultaneously within a specific diffusion unit.

Moreover, Damsgaard and Lyytinen state that different diffusion processes can not be understood if the interference of the other processes is not taken into account. In their study of EDI diffusion patterns, they observed that the main reason for adopting EDI in dyadic cases was the 'herd' effect rather than direct benefits or other intangibles accrued through EDI use. On industry-wide networks, the adoption decisions were more complicated: some organizations were looking for business opportunities through strategic alliances, but there were also cases where the largest player of the industry took the challenge, and played a significant role in clearing the cooperative arena for the EDI diffusion. In the scope of national level, Damsgaard and

Lyytinen found that initiatives were driven by a desire to develop a supporting electronic infrastructure and realizing a vision of an electronic society

In the industries where the markets aren't adequately developed can one purpose of network be to strengthen the current market position of rivals and hinder the access of a new competitor to the market. The stakeholders who act on macro or national level and for instance, fund the healthcare system can have different conception which direction the network should developed. Earlier studies of IOS such as in air industry and air traffic reservation have pointed out how the structure of whole industry has changed ^[14, 15].

Both Provan & Millward and Damsgaard & Lyytinen argue that network itself is too small unit of analysis and networks should be study not only on network level on the contrary micro and macro level too. We will call this macro or society level as national level. Our framework therefore uses three tiers to analyze eHealth networks, namely national, network and national levels.

2.2 Network coordination mechanisms

Transaction economy has traditionally seen two possible ways for managing exchange: *hierarchy* and *market*. *Market exchanges* are transactions between separate entities whereas *hierarchical relationships* are coordinated through unitary organizational structures ^[11] Ouchi has expanded model by adding *clan* as one form of exchange and has renamed hierarchy to *bureaucracy* ^[12]. According to Rodríguez et al. these three kinds of governance mechanism play different but essential role in stimulating effective inter-organizational collaboration. ^[13] In *Figure 1* we describe these mechanisms and key motivations behind it.

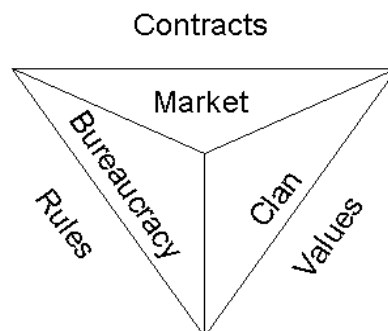


Figure 1: Coordination mechanism and key motivators.

To study inter-organizational information systems we will present a framework based on work of Damsgaard and Lyytinen in the area IOS diffusion and Provan and Millward inter-organizational cooperation in public administration. We join to these three level frameworks to Ouchi's three governance mechanisms. With this framework we will then analyze inter-organizational cooperation in our study cases.

The framework is described in *Figure 2*. Our framework has three levels namely organization, network and nation. Each level has a governance mechanism having elements of bureaucracies, hierarchies and clans. The key motivations behind those are rules, values and contracts. In this paper we will analyze the governance of IOS primarily on network and national levels. IOS and its governance inside a single organization have been studied by many researchers. ^[13,16]



Figure 2: The framework to analyze governance in IOS.

3.3 Critical success factors in networks

Variables which explain behavior of network have been addressed both in IS and non-IS network literature. Provan and Kenis suggest that four contingencies, namely trust, number of participants, goal consensus and need for network level competencies, are most affected contingencies in the adoption of a particular governance form. They argue that as trust becomes less dense in the network, as the number of participants increases, as network goal consensus declines, and as the need for network level competencies increases, brokered forms of network governance are likely to become more effective than shared governance networks. ^[6]

There is a considerable number of trust based research in Inter-organizational relations (IOR) literature. Ranganathan and Phan identify three type of trust in different stage of inter-organizational cooperation: competence, predictability and goodwill. ^[17] In the process perspective, trust gradually develops from one stage to another. In the first stage competence trust is a weak form of trust and emphasizes reliance on network partner's soft capabilities like skills and honesty. Next semi strong form of trust, predictive trust emphasizes belief in partners' consistent behaviors that provide adequate knowledge for other members in network to make predictions and judgments based on prior experience. The most development form of

trust goodwill trust emphasizes reliance on mutual care, concerns, honesty, and benevolence.

The conception of goals of cooperation varies inside single organization, but in addition to organizational goals, also network-level goals guide organizational action. It has been argued, that goal consensus allows organizational participants to perform better. The argument has important implications for understanding network behavior, because network members have to be responsive to the goals of both their organization and their network.^[6]

In IOS related cooperation, networks should have capabilities related to network level coordination and management^[6]. Especially if network's task requires significant interdependence among its members, there is a great need for network-level coordinating skills and task-specific competencies.

The role of senior level management in the initial phases of network and nurturing championship are critical for the success of IOS project^[18]. To win resistance of change, organizations need a champion who is committed to change existing working processes and information systems^[19]. Champions are especially important in lower organizational levels. They courage and inspire stakeholders in different organizations through transformational leadership behavior. In addition to champions, also sponsors are needed, because top or upper level managers can support and encourage organization's members in their inter-organizational collaboration^[18]. In similar vein, Kumar and Crook state the importance of collaboration between members at different organizational levels^[19].

Many researchers in IOS diffusion and IOS management fields argue that IS related knowledge should be paid attention when implementing IOS^[19, 20]. The knowledge is not necessary to be possessed by every organization in a network for succeed in IOS adaptation because it can be transferred from one organization to other. This can happen for instance by training or utilizing a consultant.^[21]

Especially non-profit organizations and networks in the area of public administration have a strong tie to society. Stakeholders on community level have an influence to the network. They can be financial sponsors, groups or organizations which have political power. In principal, governmental agencies can steer network level coordination with three governance mechanisms, namely by rules, contract and values. The benefits of the collaboration are also an important interest issue. Networks often attain outcomes that could not normally be achieved by individual organizational participants acting independently.^[6]

2 Methods

The methodology in this study is based on comparative case research approach. In order to empirically substantiate the research two empirical cases of national e-Health network initiatives were selected and compared.

The first case describes the Finnish strategy in orchestrating a variety of regional patient records systems into a national entity. This work began in 1996 and was later replaced by a new strategy formed during the years 2003-2004. Second case describes National Programme of IT for National Health Service (Npfit) in the United Kingdom.

The data for Finnish case was gathered during the years 2006-2007 using in-depth semi-structured interviews in total of 11 stakeholder organizations. The interviews took place at the interviewee's office lasting in average one hour. All interviews were recorded and transcribed. The themes covered by the interviews were coordination, resources and schedules of the national development. The results were analyzed by these themes. In addition a comprehensive review on literature was conducted including the supporting documents, reports and official strategies on the development.

The case of National Health Service relies heavily on literature. A troubled program has been scrutinized in a public hearing ^[22] and by the National Audit Office ^[23, 24]. In addition vast amount of scientific research has been previously conducted ^[25-29].

2.1 The Finnish Health Care System and National IS Strategy

Municipalities have by the law the primary responsibility to arrange social and health care services for their inhabitants. Services are provided by municipalities themselves or in cooperation with other municipalities. In many cases the services are purchased from private or public providers. Specialized care is carried out by the hospital districts. These administrative entities are federations of the municipalities.

Each municipality belongs to a one of 20 hospital districts. In addition, the autonomous island of Åland forms its own district. Every district contains a central hospital of which five are university hospitals that provide specialized tertiary levels of treatment.

Private health care in Finland comprises mainly of out-patient care. There are only a few private hospitals, providing less than 5% of the bed days in the country. The majority of doctors working in the private sector specialists, whose full time job is at a public hospital or at a health care centre.

The first Finnish national strategy for the utilization of information and communication technologies in welfare and health was first established by the Ministry of Social Affairs and Health in May 1996. Existing social policy strategy demanded citizen-centered, seamless service structures and horizontal integration of services. Information technology was seen as an enabler for this vision.

Before the strategy was updated in 1998, partnership between service providers and industry was encouraged, paving the way towards providing regional level service. After the adjustments to this strategy a specific emphasis was placed on a nation-wide interoperability of information systems.

The decision-in-principle by the Finnish Government on securing the future of health care was given on 2002. The document states that "nationwide electronic patient records will be introduced by the end of the year 2007". The government agreed on the end of the year 2006 on a draft bill regulating the use of electronic social and healthcare client and patient information. At the same time, legislation on the use of electronic prescriptions was proposed. The new legislation on handling electronic patient information covers archive services, encryption and certification services, and the patient's access to the data came into effect during the year 2007.

2.2 The National Health Service – National Programme for IT

The National Health Service is the world's largest publicly funded health system. The system was born after the Second World War out of a thought that good healthcare should be available to all, regardless of wealth. With the exception of charges for some prescriptions and optical and dental services, the NHS remains free at the point of use for anyone who is resident in the area of United Kingdom – more than 60m people.

A feature of the NHS, distinguishing it from other public healthcare systems in Continental Europe is that it employs a large number of staff that provide them. The NHS employs more than 1.5m people. Only the Chinese People's Liberation Army, the Wal-Mart supermarket chain and the Indian Railways directly employ more.

The National Programme for Information Technology in the NHS (NPfIT) is a ten year programme which presents an unprecedented opportunity to use Information Technology (IT) to reform the way the NHS in England uses information, and hence to improve services and the quality of patient care. Program is the largest civilian IT programme in the world.

In the past, individual NHS organisations procuring and maintaining their own IT systems and the procurement and development of IT within the NHS has been haphazard. The Department of Health did not consider this approach to have been successful, and one of the aims of the Program has been to provide strong central direction of IT development, and increase the rate of take up of advanced IT.

The core of the Program will be the NHS Care Records Service, which will make relevant parts of a patient's clinical record available to whoever needs it to care for the patient. The Programme also includes many other elements, new networking servicing providing broadband (called N3), electronic transmission of prescriptions, and electronic booking of first outpatient appointments.

The Program was launched by Ministers in June 2002. Following the announcement of the Program, the Department of Health (the Department) established a unit to procure and deliver the IT systems, headed since October 2002 by its first Director General for NHS IT. In April 2005 this unit became an agency of the Department called NHS Connecting for Health. Since 2007 responsibility for delivery has been shared with the local NHS, with the Chief Executives of the ten Strategic Health Authorities responsible for implementation and benefits realization in their part of the program.

Implementation of the program has been hampered by local financial deficits, delays in implementing systems that are compliant with the program and poor communication. According to National Audit Office the program will take some four years more than originally than planned and the final releases of the care records software are scheduled to be deployed from 2009-10 to 2014-2015.

3 Discussion

Both the original Finnish national IT strategy and NPfIT can be seen as moderate failures as they were unable to deliver the expected benefits for the industry in schedule. As we review our cases through the developed framework to analyze governance in IOS. We are able to explain some of the difficulties that they have faced. For the revised national strategy bringing out the national architecture of IT, it is still too early to determine its success level, but some implications and critical factors do emerge.

Hierarchy and Clan mechanisms are prevalent in the field of health care as personnel possess strong solidarity while apparent hierarchy exists in organizations and their processes. We suggest that in any level of IOS governance there should be elements from all steering mechanisms.

NPfIT is based heavily on hierarchy and in strong central management by the Government. Although, some of leading IT enterprises in the world are involved in development and tied by overwhelming £1bn contracts the program has, in fact, narrowed competition. Studies indicate lack of shared values. Adjustments to the program, denoting decentralization and strengthening market and clan mechanisms has lately been made.

According to our studies, whereas NPfIT failed on implementing proper Market and Clan mechanisms, had original Finnish strategy difficulties in the levels Clan and Hierarchy areas of governance. As shared vision of nation-wide implementation and common rules was missing, the original strategy failed at national level.

Does the revised strategy succeed in delivering the promised benefits to the industry, remains to be seen. There are strong implications on all areas of network governance. However their power in practice is yet to be proven and will be determined by their variables.

Table 1 Levels of Governance Mechanisms in Researched Cases

Governance Mechanism	Hierarchy/ Rules	Market/ Contracts	Clan/ Values
National Health Service	+++	-	+
Original Finnish strategy	+	+++	-
Revised Finnish strategy	++	++	++

Based on research in the field of IOR and IOS, we will present the variables in our framework. Some of those are independent and others dependent variables. Our purpose is not to show relationships between variables but rather to illustrate what kind of issues should be taken care in IOS implementations.

On the lowest, single organization level, we see that most influential factors are goal consensus, sponsorship, championship and stakeholders from different organizational levels. On the network level we have placed trust, number of participants, goal consensus, network level competencies, governance form, IS

formulation and IS related knowledge. Last level in our framework is the community level. There we have placed financial sponsors and stakeholders with political power. In all the three levels, benefits of the collaboration are an important issue. The variables of the framework are presented in Table 2.

Table 2 Variables of IOS Framework

Organization	<ul style="list-style-type: none"> • goal consensus (Provan & Kenis, 2007) • sponsorship (Wassenaar & Gregor, 2001) • championship (Wassenaar & Gregor, 2001) • stakeholders from different organizational levels (Kumar & Crook, 1999) • benefit (Provan & Kenis, 2007)
Network	<ul style="list-style-type: none"> • trust (Ranganathan, 2003) • number of participants (Provan & Kenis, 2007) • goal consensus (Provan & Kenis, 2007) • network level competencies (Provan & Kenis, 2007) • governance form (Provan & Kenis, 2007) • IS formulation (Earl, 1993) • IS related knowledge (Kumar & Crook, 1999) (Quaddus & Hofmeyer, 2007) • benefit (Provan & Kenis, 2007)
National	<ul style="list-style-type: none"> • financial sponsor (Provan & Kenis, 2007) • stakeholders with political power (Provan & Kenis, 2007) • Benefit (Provan & Kenis, 2007)

4 Conclusions

Previous IOS-related research has studied IS management and governance mostly on dyadic network relationships, where agreements are made between two organizations. However, some researchers have realized the increasing need for network level research in the area of IOS. Therefore we have incorporated separate studies from separate disciplines to better understand inter-organizational networks.

First we presented different variables based on previous studies on IS-network and non IS-networked studies. Then we combined these variables into a framework which studies different variables from three levels of analysis, namely organization, network

and community. Provan and Kenis' three level analysis was more conceptual, whereas Damsgaard and Lyytinen's analysis is based on empirical research. However, they both observed that inter-organizational networks cannot be analyzed properly without understanding the three levels.

The framework was then illustrated by two cases. The framework is still in its infancy and needs further research. None of the variables we used in our framework is uniquely new, as all of them have been discussed in previous literature. Therefore, the approach we used here does not offer a specific list of variables and therefore should not take literally; our framework is more a proposal of the issues that need to be considered when analyzing inter-organizational networks. However, some preliminary thoughts can be presented based on these three cases. Despite the fact that the reliability and validity of our framework need more study, it still indicates that the most interpretative variable was the network capabilities on network-level of analysis. However, the results are limitedly generalized, because our study was conducted in with minor sample and the illustrated cases are related to health care.

For IS researchers, the framework provides guidelines for describing the characteristics of networks in a comprehensive manner. Managers can use it for analyzing variables that may prohibit or strengthen commitment to IT collaboration within their partnership networks.

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