



Electronic Data Flows in Health Care - Some Obstacles in the Implementation of EDI Systems

Lauri Salmivalli

Turku School of Economics and Business Administration, Turku Centre for Computer Science, Address: Lemminkäisenkatu 14 A, FIN-20520, Turku, Finland, Fax: +358-2-2410154, Email: lauri.salmivalli@tukkk.fi

Reima Suomi

Turku School of Economics and Business Administration, Turku Centre for Computer Science, Address: Lemminkäisenkatu 14 A, FIN-20520, Turku, Finland, Fax: +358-2-2410154, Email: reima.suomi@tukkk.fi

ABSTRACT

Modern information and communication technology is used too little in health care organizations. This is true at least in Finland, which in many other aspects enjoys the status of a symbol for an advanced information society. Our study searches reasons for this state of affairs through an industry survey. Our hypothesis is that the lack of informal network building tradition has been a hindrance for the development of electronic data interchange in the Finnish health care. To build a basis for this, we discuss the importance of informal networks in industries. As expected, lack of working informal networks in the industry turns out to be one of the reasons - but just one - for the modest application of modern information technology. In general, we come to the conclusion that the health care industry is still far away from other "normal" industries, and misses many typical characteristics of an advanced industry branch.

INTRODUCTION

Health care is one of the most potential users of different forms of electronic data interchange between different units in the care taking chain. Practitioners, academics as well as hospital managers and politicians locating funds are mostly well aware of this potential, and a multitude of projects in the area are running. However, so far we have only seen modest success in the application of modern IT in health care; Processes in health care are still too often ineffective. (Nykänen 2000)

Ragupathi (1997) claims that information systems in health care lag 10 to 15 years behind other areas of business, such as banking, airlines or manufacturing. One of the biggest challenges that health care will face in the future is how organizations can facilitate firstly their *internal* data transmission efficiency and secondly their *external* data transfer efficiency. (Raghupathi 1997). See also: (Christiaanse and Huigen 1997); (Hart and Saunders 1997); (Mercer 2001).

Except economic factors, numerous other motives are in favor of rationalizing the care taking chain. According to different studies e.g. (Rouvinen, Saranummi et al. 1995) the biggest challenge the Finnish health care sector will face in the future is the ageing of the population. The share of the elderly population will rise sharply around year 2010 as the post-war 'baby-boom' generation reaches the age of retirement. Some estimates state that the number of people aged 65 or over will grow by about 400,000 (over 50%) in the next 20 years. (EU 1996), (1999), (Järvelin 2002)

The Finnish health care sector is fragmented into several different actors which all possess slightly divergent objectives and means to reach their objectives. The actors in this study were divided into three different categories according to their *institutional background*: *Public Sector*, *Private Sector*, and an *Interposed Sector* or *Semi-Public Sector* possess-

ing features from the two earlier mentioned categories. (More on institutional fields and organizational collaboration see (Phillips, Lawrence et al. 2000).

This paper reports an empirical study around electronic data flows in Finnish Health Care. The research method of the study has been that of a survey consisting of literature review and of semi-structured interviews in eleven organizations active in the field.

Our research question is: *What is the current state of electronic data interchange in the health care industry in Finland, and what are the major obstacles in the exploitation of Electronic Data Interchange in health care?*

Our paper is anchored to the theoretical discussion on the importance of informal networks in any cooperative effort. Our hypothesis is that the lack of informal network building tradition has been a hindrance for the development of electronic data interchange in the Finnish health care.

THE ROLE OF INFORMAL NETWORKS AND NETWORKING TRADITION IN ELECTRONIC DATA INTERCHANGE PROJECTS

During the last ten years substantial attention has been paid to informal networks in business life (Stalder 1998; Li and Williams 1999; Shapiro and Varian 1999). These networks are interpersonal social constructions, and are not to be mixed with computer networks. However, these networks perform similar tasks as computer networks, and are many times more effective in communication speed and accuracy (MacDonald and Williams 1992).

Informal communication networks can be seen both within and in-between organizations. Organization's internal communication networks mainly contribute to work productivity and spreading of innovations (Besselman 1994). External informal networks help in the building of different alliances and different kinds of other joint ventures (Wolff 1994; Wampler, Frank et al. 1996; Wildeman 1998).

Through peer-to-peer computing (Lind and Zmud 1995; Oram 2001), *the free networking* has also entered the realm of computer networks. The idea is that communication in various forms can and should happen without any central control and planning.

Informal networks are built at all levels of organizations. Top level networks are of great importance, but other levels may be in many cases in a lead role (Schradler 1995): "Prophets of the 'networked company' have focused on top managers and big grand-concept level alliances. But many of the most effective networks are being woven by unsung middlemen."

Informal communication networks are a part of an organization's social and intellectual capital (Edvinson and Malone 1997; Bassi and Van Buren 1999; Widén-Wulff and Suomi 2003). Through these networks, the organization performs better in knowledge sharing, and finally is in a better position to achieve competitive advantage.

Cross (Cross, Nohria et al. 2002) has identified six myths about information networks, assertions that also are not true:

- To build a better network, we will have to communicate more
- Everyone should be connected to everyone else
- We can't do much to aid informal networks
- How people fit into networks is a matter of personality
- Central people who have become bottlenecks should make themselves more accessible
- Everybody knows what is going on in the networks.

The 3^d model by (Kellogg 2000) nicely gives framework to any communication act in any network. A communication act can be modeled along four dimensions:

- Time (long, medium, short)
- Information richness (low, medium, high)
- Direction of information flow (customer to server, server to customer, bilateral)
- Value of the exchange (low, medium, high)

Informal communication networks seem to work best in cases where the time of communication is long, information richness high, communication flow bilateral and value of exchange high – also in the high-end of communication activities.

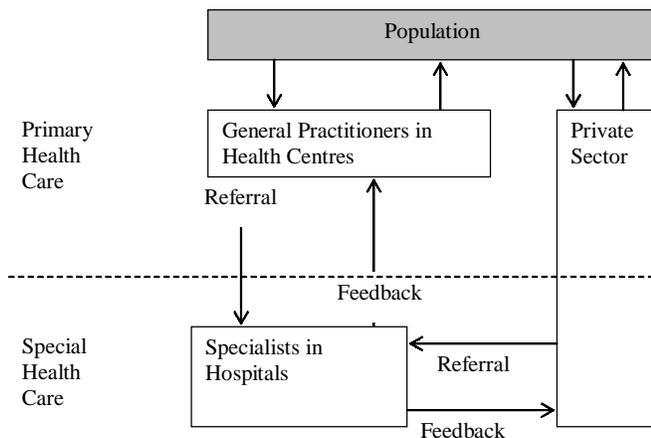
Electronic data interchange usually aims at structured, continuous data flows. However, in the early phases of system feasibility study and design, informal contacts are of key importance. The data interchange partners find it easier to enter to a co-operative effort as they already know each other. (Suomi 1991)

THE HEALTH CARE SYSTEM IN FINLAND:

The population of Finland was in 2000 roughly 5.2 million. The percentage of those under 15 is 18 per cent of the total population, and of those over 65 year, 15 per cent. The life expectancy of babies born in 2000 was 74 years for boys and 81 years for girls. Cardiovascular and cerebrovascular diseases are the most common causes of death in Finland and cancer is the second most common cause of death. (1999), (Järvelin 2002)

As in many other Western countries, also in Finland the health care expenditures are under current public debate. As a consequence of a deep recession in Finland, the overall expenditure of health care fell by over 10 per cent in real terms in the early years of the 1990s, and the Finnish

Figure 1: The Structure of Finnish Health Care System (adapt. from (Kumpusalo, Ellonen et al. 1991))



health care sector was struggling on a shoestring budget. In 2000, Finland's total health care expenditure equaled approximately 8,628 million euros, 6.6 per cent of the GDP, which is slightly below the average for the OECD and EU countries. (1999), (2002)

Public health services are mainly funded by taxation revenue, partly by local taxation and partly by central government grants. Private sources, consisting mainly of households, shoulder approximately 24 per cent of the total health care costs. Maximum fees for public health care services are defined by law, as well as services free of charge (e.g. preventive health care including maternity and child clinic services). (Järvelin 2002)

Figure 2. presents the traditional division of Finnish health services into private and public sector care and, on the other hand, into primary and specialist health care. Access to specialist medical care requires referral by a physician, except in cases of emergency. The aim is for the patient to receive information on the timing of examination and the commencement of treatment within two weeks from the arrival of the referral at the hospital. (Kumpusalo, Ellonen et al. 1991)

Public Sector Actors

The main duty to organize health care lies on the shoulders of 448 *Local Authority Municipalities* around Finland. The local authorities are *inter alia* responsible for organizing *Specialist Medical Care* for residents of the municipality. To this end, the country is divided into 20 *Hospital Districts* and each municipality must belong to one of the hospital districts. Each hospital district has a *Central Hospital*, five of which are university hospitals. (Järvelin 2002)

Private Sector Actors

Finnish public health care is supplemented by private health care actors, especially in the larger municipalities. Private health care units offer private medical and dental services, and also physiotherapy and occupational health care services. (Järvelin 2002)

Semi-Public Sector Actors

The concept of Semi-Public Sector Actors is still unsettled in Finnish health care field. In this study privately owned non-profit foundations represented Semi-Public Health Care Actors. The foundations quintessentially possess a societal assignment such as rehabilitation of disabled people. Furthermore, Semi-Public Actors provide complementary services to municipalities, healthcare districts, private hospitals, the Social Insurance Institution, insurance companies, universities and private individuals.

OBSTACLES FOR ELECTRONIC DATA INTERCHANGE IN THE FINNISH HEALTH CARE SECTOR

The empirical part of this study was conducted via qualitative case study with its emphasis on open-end interviews (Yin 1994). Eleven organizations were interviewed for this study during the spring 2002. This research paper is a part of a made to order research for a major Scandinavian insurance company, interested in creation of viable electronic communication channels with its partners in the Finnish health care sector.

Five organizations interviewed represented private health care clinics; public sector was represented by the three largest hospital districts, and the Finnish Institute of Occupational Health (FIOH). Finally, two foundations represented the so called semi-public sector. Interview framework was sent in advance to each respondent; interviews on location took approximately one and a half hours. The responses were recorded, transcribed, classified and extracted.

The starting points differed substantially in each organization; Organizations possessed different technical development phases, and the size and structure of organizations varied considerably. Regardless of different premises there seemed to be a broad concurrence about the obstacles of electronic data interchange. We identified four different areas of obstacles based on the interviews. (See also. (Boonstra 2003), (Mercer 2001), (van Raak, Paulus et al. 1999), (Suomi and Pekkola 1998))

Regulative Environment Factors: i.e. legislation and authorities: All of the respondents pointed out that the current legislation lags significantly behind the existing technical potential. Five of the organizations possessed *de facto* the technology to transfer data, but the legislation did not allow this. In the worst case the patient was compelled to fill on a paper form to allow electronic transmission of information thus increasing the bureaucracy instead of diminishing it. Coordination and co-operation of the authorities was also seen quite modest. Common impression was that authorities did not share the mutual understanding of the implementation of electronic data interchange. In general, lack of trust seems to be one problem in the area: authorities do not trust practical actors in the field and practical actors do not trust the authorities.

Financial Factors: Financial factors affected private and public sector actors differently. Finnish public sector health care is still struggling with budget deficit and respondents saw it difficult to justify the expensive IT-projects to political decision makers if the personnel are under redundancy threat at the same time. In the case of private and semi-public organizations the biggest obstacle seemed to be the evaluation of benefits versus costs. Organizations interviewed had not made precise estimations about the costs of data transmission systems or calculations about the savings systems would enable.

Technological Factors: Biggest obstacle in terms of technology seems undoubtedly to be the lack of standards. At the moment there is no nationwide *modus operandi* in order to reach a technological standard for the data transmission. Reasons for this can be found in the lack of governmental instruction and in organizational factors. Some organizations were following the HL-7 standards (<http://www.hl7.org/>) whereas some other organizations were waiting for directions of the authorities. Data security in technological terms was not seen as an insoluble obstacle, but the storage of information in electronic form was acknowledged as a challenge; in Finland the patient records must be contained for at least 20 years after patient's death and in some cases for research purposes the information must be stored for undefined time period. In the reflection to our theoretical informal network discussion, formal message network is under construction, but starting with this is difficult as the industry still does not have the tradition even for exchanging informal messages.

Organizational factors: organizational factors can be divided into intra-organizational and inter-organizational factors. Obstacles within an organization concern mainly resistance and acceptance of new technology and resistance seemed to strengthen as organization size increases. Generally, respondents considered medical personnel very resistant to changes, and their education extremely demanding. Inter-organizational obstacles consist mainly of lack of coordination and power struggles.

Hospital districts had some cooperation among themselves, and some private sector organizations had informal regional advisory boards, but at present no such liaison body exists that would include all the interested private-, public- and semi-public sector actors. Finally, organizations were evidently having an ongoing power struggle: Public sector considered that the possible nationwide data interchange system is to be developed in line with public sector requirements, whereas private sector representatives stated that the public sector deliberately thrusts private actors away from the negotiating table. The industry is lacking working informal networks and a co-operative culture.

CONCLUSIONS AND SUGGESTIONS FOR FUTURE ACTIVITIES

Our study indicates that application of information technology in the health care sector is lagging behind the needs. However, it seems that the bottleneck is not technology itself, but the ability and skill to use it. Application abilities are harmed by many factors, all of which are mainly internal to the health care industry. Government inattention to the regulative and financial needs of the industry are of course partly external factors.

What comes to finances, health care units are, however, quite free to devise their budgets as they wish and to concentrate funds on IT if

Table 1: Summary of major obstacles for application of modern IT in the Finnish health care industry

-
- Regulative environment lagging behind
 - Lack of funds, especially in the public sector
 - Lacking methods of assessing IT costs and benefits
 - Missing data exchange standards
 - Resistance to IT by medical staff
 - Missing cooperative culture and informal networks in the whole industry
 - Power and market share struggles between the private and public sector
-

they so feel. Lack of regulation is also a two-edged sword. In many industries – say telecommunications, the regulative lead idea is not to interfere – authorities should step in only if something goes severely wrong. In the health care industry there is obviously a tradition of a closer guidance by authorities, but somehow it might be that this lack of regulations is used as a pretext for own inadequate action.

Our suggestion is that the industry should adopt the cultures of co-operation and self-steering more. Health care organizations should co-operate, too, but not only in the field of information systems – more on the basis of their own will and not on the basis of someone telling them to do that. Regulators should see themselves more as enablers than controllers. In general, also the health care industry should become a normal industry, which is characterized by low regulation, innovation – seen in the application of modern information technology too – flexibility and change in industry structures, strict quality control and high protection of the customer. In the current situation, we can see big shortcomings in all of these aspects.

REFERENCES

- (1999). GUIDELINES ON HEALTH CARE IN FINLAND, Ministry of Health and Social Affairs.
- (2002). Stakes taskutieto. Helsinki, the National Research and Development Centre for Welfare and Health.
- Bassi, L. J. and M. E. Van Buren (1999). "Valuing investments in intellectual capital." *International Journal of Technology Management* 18(5-8): 414-432.
- Besselman, J. (1994). Position statement on software process innovations and informal organizational networks. *Diffusion, transfer and implementation of information technology*. L. Levine. Amsterdam, Elsevier Science BV: 321-325.
- Boonstra, A. (2003). "Interpretive Perspectives on the Acceptance of an Electronic Prescription System." *Journal of Information Technology Cases and Applications* 5(2): 27-49.
- Christiaanse, E. and J. Huigen (1997). "Institutional Dimensions in Information Technology Implementation in Complex Network Settings." *European Journal of Information Systems* 6(2): 77-85.
- Cross, R., N. Nohria, et al. (2002). "Six Myths About Informal Networks - an How to Overcome Them." *Sloan Management Review*(Spring): 67-75.
- Edvinson, L. and M. S. Malone (1997). *Intellectual Capital*. Harper Collins Business.
- EU (1996). The State of Health in the European Community. Brussels, European Union, Office for Official Publications of the European Communities.
- Hart, P. and C. Saunders (1997). "Power and Trust: Critical Factors in the Adoption and Use of Electronic Data Interchange." *Organisation Science* 8(1): 23-42.
- Järvelin, J. (2002). *Health Care Systems in Transition - Finland*. European Observatory on Health Care Systems- WHO Regional Office for Europe.
- Kellogg, D. L. (2000). "A customer contact measurement model: an extension." *International Journal of Service Industry Management* 11(1): 26-44.
- Kumpusalo, E., M. Ellonen, et al., Eds. (1991). *Yleislääketiede*. Vammala, Kustannus Oy Duodecim.
- Li, F. and H. Williams (1999). "Interfirm collaboration through interfirm networks." *Information Systems Journal* 9(2): 103-115.

- Lind, M. R. and R. W. Zmud (1995). "Improving Interorganizational Effectiveness through Voice Mail Facilitation of Peer-to-Peer Relationships." Organization Science 6(4): 445-461.
- MacDonald, S. and C. Williams (1992). "The Informal Information Network in an Age of Advanced Telecommunications." Human Systems Management 11: 77-87.
- Mercer, K. (2001). "Examining the impact of health information networks on health system integration in Canada." Leadership in health services 3(14): i-xxx.
- Nykänen, P. (2000). Decision support systems from health informatics perspective. Tampere, Department of computer and information sciences, University of Tampere.
- Oram, A. (2001). Peer-to-Peer: Harnessing the Power of Disruptive Technologies, O'Reilly.
- Phillips, N., T. B. Lawrence, et al. (2000). "Inter-Organizational Collaboration and the Dynamics of Institutional Fields." Journal of Management Studies 37(1 January): 23-43.
- Raghupathi, W. (1997). "Health Care Information Systems." Communications of the ACM 40(8): 81-82.
- Rouvinen, P., N. Saranummi, et al. (1995). Terveystietokoneverkko -hyvinvointiklusterin kilpailukyky. Helsinki, The Research Institute of the Finnish Economy.
- Schrader, S. (1995). "Gaining Advantage by "Leaking" Information: Informal Information Trading." European Management Journal 13(2): 156-163.
- Shapiro, C. and H. R. Varian (1999). Information rules: a strategic guide to the network economy. Boston, Mass., Harvard Business School Press.
- Stalder, F. (1998). "The rise of the network society, the information age: Economy, society and culture, vol I." Information Society 14(4): 301-308.
- Suomi, R. (1991). "Alliance or alone - how to build inter-organizational information systems." Technology Analysis & Strategic Management 3(3): 211-233.
- Suomi, R. and J. Pekkola (1998). "Inhibitors and motivators for telework: some Finnish experiences." European Journal of Information Systems 7(221-231).
- Wampler, J., D. Frank, et al. (1996). "Strategic alliances: An integrated health system alternative." Frontiers of Health Services Management 13(1): 53-56.
- van Raak, A., A. Paulus, et al. (1999). "Integrated care management: applying control theory to networks." Journal of Management In Medicine 13(6): 390-404.
- Widén-Wulff, G. and R. Suomi (2003). Building a Knowledge Sharing Company - Evidence from the Finnish Insurance Industry. The 36th Hawaii International Conference on System Sciences (HICSS-36), Big Island, Hawaii, IEEE Computer Society Press. The Institute of Electrical and Electronics Engineers, Inc.
- Wildeman, L. (1998). "Alliances and networks: The next generation." International Journal of Technology Management 15(1,2): 96-108.
- Wolff, M. F. (1994). "Building trust in alliances." Research-Technology Management 37(3): 12-15.
- Yin, R. K. (1994). Case Study Research: Design and Methods. Newbury Park, Sage Publications.

0 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/proceeding-paper/electronic-data-flows-health-care/32440

Related Content

Design of Graphic Design Assistant System Based on Artificial Intelligence

Yanqi Liu (2023). *International Journal of Information Technologies and Systems Approach* (pp. 1-13).

www.irma-international.org/article/design-of-graphic-design-assistant-system-based-on-artificial-intelligence/324761

An Arabic Dialects Dictionary Using Word Embeddings

Azroumahli Chaimae, Yacine El Younoussi, Otman Moussaouiand Youssra Zahidi (2019). *International Journal of Rough Sets and Data Analysis* (pp. 18-31).

www.irma-international.org/article/an-arabic-dialects-dictionary-using-word-embeddings/251899

Meta Data based Conceptualization and Temporal Semantics in Hybrid Recommender

M. Venu Gopalachariand Porika Sammulal (2017). *International Journal of Rough Sets and Data Analysis* (pp. 48-65).

www.irma-international.org/article/meta-data-based-conceptualization-and-temporal-semantics-in-hybrid-recommender/186858

Towards Higher Software Quality in Very Small Entities: ISO/IEC 29110 Software Basic Profile Mapping to Testing Standards

Alena Buchalcevova (2021). *International Journal of Information Technologies and Systems Approach* (pp. 79-96).

www.irma-international.org/article/towards-higher-software-quality-in-very-small-entities/272760

The Role of Robotic Telepresence in the Academic Library

Emy Nelson Decker (2015). *Encyclopedia of Information Science and Technology, Third Edition* (pp. 6648-6655).

www.irma-international.org/chapter/the-role-of-robotic-telepresence-in-the-academic-library/113125