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Published in:
Proceedings of the 17th Bled eCommerce Conference - eGlobal

Publication date:
2004

Document Version
Også kaldet Forlagets PDF

Citation for published version (APA):
Andersen, K. V., & Juul, N. C. (2004). Digital wheel barrows in local government. I Y.-H. Tan, & D. R. Vogel (red.), *Proceedings of the 17th Bled eCommerce Conference - eGlobal: Research Volume* (CD-ROM udg., s. 1-11). Moderna organizacija.

17th Bled eCommerce Conference

eGlobal

Bled, Slovenia, June 21 - 23, 2004

Digital Wheel Barrows In Local Government

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Abstract

This paper finds through a vertical and horizontal study of local municipalities and health data network, that government has excelled in acquiring and re-using data in a digital format. The continuously and successful reliance on transaction and process improvements is contrasted by no or only marginal use of data to improve the core of services. The study suggests that most data are available in the least end-user oriented processes and that government appears to be reinforcing, rather than leveling, this imbalance.

1 Introduction

Despite the rapid IT uptake in organizations, the research on the relationship between organizations and IT has not or only marginal undergone changes during the past ten years (Myers, Paré and Urquhart 2000). Throughout the 1970s, 1980s and 1990s researchers pointed to that digitalization should be approached from not only the technology domain arguing that changes in technical opportunities are mediated by a rather complex interaction between technology and organizational structures, actors (Leavitt 1970; Marcus 1983; Zuboff 1988).

Although we have witnessed a transition towards the networked and imaginary organization in the IT-literature (Hedberg, Dahlgren, Hansson et al. 1998), the two cases explored in this paper demonstrate a high focus on transactions and re-use of digital data (Coase 1937; Coase 1960; Williamson 1975; North 1981). Government appears to be keen on using IT as a technology to substitute activities and people rather than using IT to assist in analyzing the activities and the possible improvement of these. By large, IT has

been diffused along existing structures and within areas least involved with customer interactions.

This paper examines governments'

i) ability to use data for transactional purposes within their own domain,

ii) capability to exchange data across organizational boundaries, and

iii) use of data to enhance their services.

All three areas are within what technically could be expected to have evolved after the widespread adoption of computers and connectivity network capacity being installed.

In the paper we identify a continuously and successful reliance on transaction and process improvements and no or only marginal use of data to improve the core of services. The obsession on getting yet bigger and more digital wheelbarrows, digital storage containers as well as digital waste dump sites outweighs the attention on how governmental services can be improved and transformed. Thus, whereas the figures on the overall uptake of IT in government are encouraging, the uptake of Intranet is discouraging since this holds the potential to cement and create barriers of accessibility and transparency.

Furthermore, the paper reveals that even when process and transactional improvements occur, institutional arrangements and governmental payment and reimbursement schemes can make actors and institutions reluctant to report such impacts facing that budget costs etc. might be the consequence of such reporting.

The paper relies on data from a quantitative, survey study on IT-uptake in municipalities and a qualitative study on the uptake of the Danish national health data network, MedCom.

2 The Uptake Of Computing

Studies have pointed to the emerge of a digital infrastructure in the local government during the 1980s and early 1990s with document management systems as the key application area (Northrop, Kraemer, Dunkle et al. 1990; Kaneda 1994; Hertzum 1995). Reading the studies from the 1980s and early to mid 1990s, one could expect that the use of data has shifted from a transaction focus to a more analytical focus and thereby had enabled analysis on for example the quality of the services and using information systems to help detect fraud with public services.

A turning point for the adoption of IT surfaced in the mid 1990s. Within three years from 1993 almost every agency began utilizing electronic archives, management, or mail systems with 1995 being the peak for introducing these technologies. By 1996, about one-third (35 percent) of the national government, 51 percent of the municipalities and 64 percent of the counties reported electronic handling of incoming mail and electronic case handling.

Although the uptake of IT by government has progressed since the mid 1990s, government still transmit document between governments rather than with the citizens and companies. Thus, in 2003 about 30 percent of the public sector institutions received more than 25 percent of the documents in digital format from other public organizations, whereas only 14 percent of the public sector received more than 25 percent of documents in digital format exchanged with citizens and 18 percent with companies (Table 1).

***Table** 1: Percentage Of Public Sector Organizations Receiving More Than 25 Percent Of Document In Digital Format From Citizens, Companies And Other Public Organizations, 2002 (Percentage)*

	Percentage of public sector organizations receiving more than 25 percent of document in digital format
Citizens	14
Companies	18
Other public organizations	30

Source. *Statistics-Denmark (2003)*

3 Transactional Use Of Data

In 2002, 79 percent of the Danish municipalities had an Intranet (defined as more than one department having access to the content), whereas 63 percent of the municipalities had an Intranet in 2001. Also, eight of ten municipalities had an Intranet that encompasses both central administrative offices/ city halls and individual governmental institutions. The primary institutions using the Intranets are in this case eldercare institutions (74 percent), schools (73 percent), public libraries (69 percent) and childcare institutions (68 percent) (Statistics-Denmark 2002, 2003). The high penetration of Intranet is below explored with respect to availability of data and whether larger municipalities less frequent have to re-key data.

3.1 Availability Of Data

In our survey data from 2002, 88 percent of the respondents state that they have access to shared data bases. Only 26 percent of our respondents reported that they to a larger degree/ often re-key the same data. Shared data bases/ programs encompass accounting/ financial data and document management. Onwards, 70 percent reports that data are available at the desired time and place. Thus, the respondents do not find that they have to spend long time searching for the data when they need them.

Our survey also found that the central offices more frequent than institutions have access to data stored outside their own organization. Thus, the alignment of the data structure is towards the city hall administration, rather than the activities performed at institutional level.

Even more troubling is that we found that the physical planning departments are in the top range of data exchange and data availability whereas schools, childcare, and eldercare institutions are the least frequent to report that data are available across institutions. Thus, most data are available in the least customer oriented processes. On the positive side though is that all areas have availability higher than 50 percent implying that the respondent is likely to find the needed data from institutions at the right time and place.

3.2 The Issue Of Scale And Scope

Due to more IT resources and more staff trained in process improvement, statistics, etc., we expected that the larger organizations would less frequent re-key data that they receive in digital format. This argument of return to scale holds firm belief in the economic literature on (dynamic) economics of scale and scope.

The scale arguments have been rooted in (more) effective use of indivisible production factors, switching costs, geometric properties and reserve machinery/ maintenance in a static or dynamic learning (decrease in marginal costs). The *scope argument* argues for the economic rationality in having different activities under the same roof (decrease in total cost). Along the same line, one could expect that the larger organizations have greater returns to scale in areas as social security (Ingelstam and Palmlund 1991; Scheepers 1994) (Scheepers 1994) and police (Northrop, Dunkle, Kraemer et al. 1994).

Yet, with a γ-value at 0.23 and a p-value at .0321 we found a weak but *positive correlation between size of the municipality and the re-keying of data*. Although the majority of the municipalities report that they do not or only rarely re-key the same data twice, the statistical test suggests that the larger municipalities are more likely to re-key the same data. Close to one-third (29 percent) of the larger municipalities report that they re-key the same data. More than two-thirds of the respondents in the municipalities with less than 10,000 citizens responded that they never or only to a limited degree have to re-key data.

***Table** 2: Re-Keying Of Data Correlation With Number Of Citizens*

Number of citizens	Are the same data entered more than once?				
	At no or only limited degree	Some times	Often or to a large degree	Total (N)	γ P
<10,000	69 %	10 %	21%	100% (48)	0.23
10,000-20,000	59 %	14 %	27%	100% (44)	0.0321
>20,000	46 %	26 %	29%	99% (35)	

Note. *The answers are transformed from a seven point Lickert Scale*

Various explanations could aid our understanding of the picture formed by the data displayed in Table 2. Large municipalities are likely to have *more divisions* and institutions and therefore are likely more frequent to be in need for transmitting data. As a result of the large frequency, they will be more likely to experience to re-key data.

Onwards, larger municipalities might have *more IT applications* that fail to exchange data automatically. For example, the case worker extract data from one application and have to enter the very same data in possible two other application such as e-mail client and case handling application.

4 Analysis Of Data

The previous section demonstrated the use of digital wheelbarrows to transport the data from one institution to another. IT enables transportation of data from individual

institutions to central functions within the city hall/ municipality central administrative functions. The areas that are least likely to have direct customer involvement/ relevance are the ones with the most reported data availability.

The second overall area we address in this paper is whether the use digital wheel barrows is accompanied by analytical processes where the data are used as input to gain insight in the quality improvement of the services. Only about half the respondents reported that data were used for other purposes than transactions. There is no difference on this dimension with respect to size of the municipalities. Thus, after the transportation process are encapsulated in digital containers or forwarded through intranets and network drives as if they were waste dump sites. There are limited practices on how to move from the transactional mode to the analytical phase.

Resounding the concerns expressed above that data availability was highest in the non-customer oriented processes, the field of data analysis show similar results. The physical planning are the most frequent to use data to gain new insight and redesign the quality of their services. 52 percent report this whereas only 41 percent and 42 percent respectively of the cultural and daycare institutions report analytical use of data.

Despite the low frequency of analytical mode of data usage, 61 percentages of the respondents do not identify major inhibitors for this to start. 21 percent find substantial barriers for analysis of data. The barriers we have found most critical are

- The cost of the technical applications and implementation
- The overall readiness to start analysis
- The lack of technical appropriate software

The importance of technical barriers for progressing with collection and analysis of data varies with the size of the municipality. The larger the municipality, the less important are technical barriers. Analyzing the correlation between size (number of citizens or total expenditures), we found a negative correlation (-0.26, -0.25) for number of citizens respective total budget as explanatory variables for the variance in the respondents' perception of the importance of technical barriers. The overall correlation is about the same whether measuring size by number of citizens or budget. Yet, there is significant different distribution for the mid-size municipalities' perception. If taken the number of citizens as an indicator, 62 percent found technical barriers not to play an important role.

***Table** 3: Number Of Citizens Correlated With Perception Of Technical Barriers For Data Collection And Analysis*

Number of citizens	How important are inadequate technical solutions as a barrier for the municipality's collection and analysis of data?				
	No or only limited importance	Some	To a large extent	Total (N)	γ P
<10,000	48 %	19 %	32%	(31)	-0.26
10,000-20,000	62 %	7 %	31%	(29)	0.0443
>20,000	68 %	21 %	11%	(19)	

Note. The answers are transformed from a seven point Lickert Scale

Using the budget as an explanatory variable, confirm the negative correlation (γ=-.25) between size of the municipality and their view of inadequate technical solutions as a

barrier for the municipality's collection and analysis of data. For the mid-range municipalities, however, 42 percent view these as important when correlating the expenditures and technical solutions, whereas 31 percent of the mid-range municipalities measured by population size agreed to this.

***Table** 4: Total Expenditures Correlated With Perception Of Technical Barriers For Data Collection And Analysis*

Total expenditures (Million USD)	How important are inadequate technical solutions as a barrier for the municipality's collection and analysis of data?				
	At no or only limited extend	Sometimes	To a large extent or often	Total (N)	γ P
<50	50 %	25 %	25%	100% (24)	-0.25
50-113	52 %	6 %	42%	100% (31)	0.0380
> 113	74 %	17 %	9%	100% (23)	

Note. *The answers are transformed from a seven point Lickert Scale*

5 Exchange Between Governmental Units And Between Government And Private Sector

With between two-thirds and three-quarters of all letters of discharge (68 percent), laboratory test results (74 percent), and prescription letters (77 percent) in December 2003 (MedCom 2004), the Danish national health network has been successful in linking the private general practitioners (GP) and pharmacies with the governmental run hospitals, laboratories, and state-run health insurances. Yet, the governmental actors are the least successful actors with only 21 percent of the messages to and from the municipalities and 59 percent of the reimbursement notifications from the health insurance being included.

With an annual flow of more than two millions messages the network has gained transactional success using the EDI-technology. During the late 1980s and early 1990s extensive literature on EDI in health sector surfaced. The literature did not so much address the technical problems per se or the problems with computers. Rather the focus was shifted on how to use EDI inter- and intraorganizationally. Since then, a massive development in the application and communication channels and improved user ability has emerged. EDI is now regarded as the simple form of communication between organizations and individuals. The has also been published several studies suggesting that negative lock-in impacts could occur with regards to costs of service and reduced ability to innovate the communication.

In 1992, Fuen County initiated the development of the Fuen health data network. Communication was established via an electronic mailbox wiring hospitals, general practitioners (GPs), pharmacies, and the regional health insurance. The health data network involves communication with letters of discharge from hospitals to GPs, laboratory and radiology reports to the GPs, prescriptions from GPs to pharmacies, current information on the occupancies of the hospital departments, waiting lists, treatment procedures etc. from the hospitals to the GPs, reimbursement forms from the GPs and pharmacies to the regional health insurance, and medical information from the wholesale suppliers to the pharmacies/ doctors. The communication follows the

Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT) developed by the UN and approved by the International Standards Organization (IOS) and Comite European de Normalisation (CEN).

Figures 1 displays the number of messages per month from the very start of the health data network, whereas Figure 2 displays the relative diffusion of the messages as compared to the total number of messages.

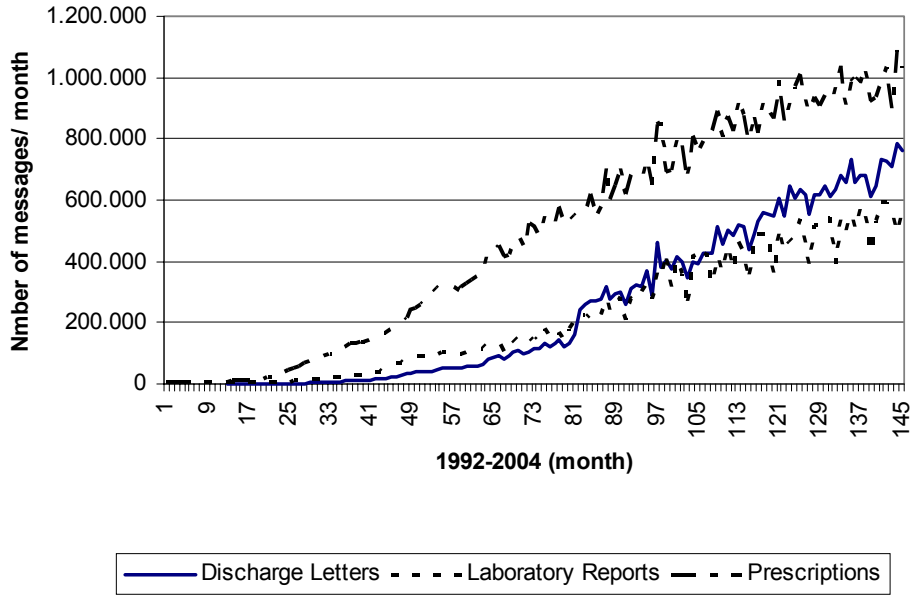

***Figure** 1: Number Of Messages, 1992-2004*

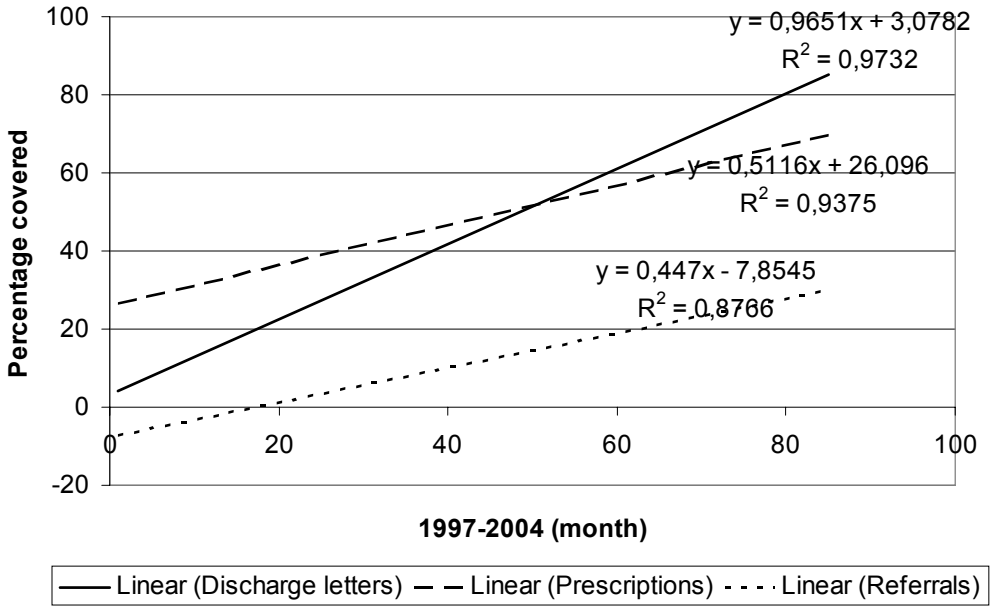

***Figure 2:** Discharge Letters, Prescriptions And Referrals, 1997-2004*

Quick laboratory response is critical for increasing or expanding the number of patients treated, such as the case for adjusting the medication for diabetics. Though our data show mixed impacts on the networks' impact on timely laboratory response, it must also be kept in mind, that the incentive to report major impact on faster treatment etc. can be underestimated due to financial motives.

Doctors' practices receive payment from the general health insurance. If they were to report major time reductions, the standard fees for the treatment of each patient might be reduced accordingly. A clearer impact can be identified when the question is rephrased and asks about time reduction in handling laboratory responses and letters of discharge. Here we witness time reductions up to an average of five minutes for receiving letters of discharge.

The net-benefit for the hospital and others has been low or even counter-productive due to the double-administration. In addition, the reason for not using computers in the doctors' practice was during the later part of the 1990s often explained by economic and professional arguments, rather than technical or unfamiliarity issues. Though the economic resources for developing the network is claimed to be sufficient, funding for transferring from one system to another might have slowed down the implementation process.

Before the network was established, the status of the computer facilities at the doctors' practices, the clinical departments at the hospitals and the laboratories were surveyed. Within the doctors' practices, about half of the respondents reported that they have used computers in their correspondence with national health insurance less than six months prior to the time that the connection to the network was established. The other half used it for more than six months. Yet, about two-thirds of the doctors have had electronic patient records more than six months prior to using the health data network.

While there has been a substantial pressure from the county administration and at the national level, the intended users' need for the network varies. In general however, the need is sufficient to establish an interest and a commitment. About half of the respondents reported to have no discussions or plans for which educational requirements or challenges to the organization of the workplace could be posed by the network. With a general commitment to improve the treatment of patients, most of the initiatives are made, however, behind the curtain, i.e. administrative procedures. At the pharmacies, for example, more than three-quarters of the prescriptions is received through the network. The rest is either called in by phone or sent by fax. Furthermore, all prescriptions are computed in their internal computer-system allowing them to expedite billing to the national health insurance and print labels for the drugs.

By contrast, in the pharmacies' communication with the administration in the municipality, the records at the pharmacies are printed and then sent by s-mail to the municipalities. In the municipality, the records are entered again. Here, we point to an obvious need for the network. Yet, this seems to indicate that most of the participants, public or private organizations still think of networking as an internal matter, rather than as an interorganizational data network. One of the reasons for thinking this way is the relative limited resources for the network, especially in municipalities and hospitals. Another reason is --as suggested earlier-- economic motives. The limited personnel resources and economic resources are in most cases linked very closely.

As revealed in the previous section, the health data network had considerable success if measured by the *number of users*, their *satisfaction with the interface*, *time-reduction* in receive/ recording responses from pharmacy or letter of discharge, transmission of prescription, and retrieval of information. However, the network had *little or no impact on treatment*, *communication pattern, and organizational issues*.

In developing and implementing the network, multiple actors have been involved. The increased policy attention received from international, national and local levels of government as well as from the private sector, also contributed to its recognized success. Besides, at the national and international level, multiple political and corporate actors have been advocating for the establishment of a network allowing the participating sectors to communicate faster and with increased accuracy.

There is a multitude of institutions and actors involved in the network, each with a different need for being informated. For example, while the GPs' need to be informated might be high, they might not want to expose possible cost reductions as a consequence of their investment in IT, since the reimbursement per patient from health insurance will likely be reduced. Similarly, through computerization the hospitals can possibly save a part of their administration costs, though it is very difficult to estimate who and how much is saved by investing and participating in IOS, such as EDI.

For example, in a publication the Danish Ministry of Technology and Research estimated that about 30 percent of the manpower resources at the hospitals are used for documentation and administration. They expected similar resources to be used at the GPs (DMITAR 1994). It is no surprise that this conclusion elicited a feverish response from the professional organizations and the hospitals. The 30 percent were taken from an American survey, which, they argued, was not applicable on the Danish health policy area. The quarrel ended with the Ministry withdrawing the estimate.

In sum, the health data network is successful but primarily and early on in the private sector and scattered in regions. This success has not led to initiatives from the health insurance to cut overall costs. This is partly due to that administrative costs at the GPs is a fraction of the total costs and in the hospitals where the administrative costs amount to about 30 percent, the adoption of the MedCom has been scattered and it is yet to be demonstrated that the overall impacts had led to actual saving.

6 Conclusions

This paper has demonstrated that local government has excelled in acquiring and using the digital wheel barrows in the areas of municipalities' internal communication and among the actors involved in the national health data network.

The transaction oriented health data network could imply that *local and corporate autonomy* is essential to foster and stimulate innovations. The GPs and pharmacies being wired are the engines behind the diffusion of the data network. The relatively small scale of the network makes changes and quick feedback possible. National systems might come too late, address misleading or wrong issues, and hard to change. We found a bottom-up organizational process for such systems much more attractive. Thus, network should emerge at the lowest level possible (in this case at the county levels) initiated by local actors and interests, although this could challenge the control and autonomy of the Ministry of Health. Bureaucratic and professional resistance and issues of privacy are likely to be substantial barriers for not only the completion of such a network and for development of similar network.

The paper has highlighted the centralization with the city hall office being more likely to receive and access data from the individual branches of local government than vice versa. Onwards, we pointed to that the areas far away from the customers are the more successful areas for data exchange. The health data network is an example of this and in the municipality we identified the area of physical planning as the most frequent area of data exchange.

Although the health data network has progressed beyond solely using digital containers and digital waste dump sites, we found limited analytical use of the data in municipalities. These highly alerting findings are propelled even further by the fact that the physical planning is leading the pack of the analysis efforts, whereas the areas with most and most frequent customer interaction give in.

Acknowledgement

The work underlying this paper has been financed by the Danish Development Center for E-Business and in part also by the IT-University in Copenhagen. We are in debt to Ib Johansen from the National Health Data Network who has provided quantitative data on the diffusion of the network. Sara Korzen-Bohr and Lea Holdesen have assisted in collection and statistical analysis of survey data.

References

Andersen, K. V. and Juul, N. C. (2002). Integration af data i de danske kommuner. Working paper. København, Institut for Informatik ved Handelshøjskolen i København.

Andersen, K. V. and Nicolajsen, H. W. (2001). Digital Strategies for Organizational Change. European Conference on Information Systems (ECIS), Bled, Slovenia.

Coase, R. H. (1937). "The Nature of the Firm." Economica **16**: 386-405.

Coase, R. H. (1960). "The Problem of Social Cost." Journal of Law and Economics **3**: 1-44.

DMITAR (1994). Infosociety 2000. Copenhagen, Danish Ministry of Information Technology and Research.

Hedberg, B., Dahlgren, G., Hansson, J., et al. (1998). Virtual Organizations and Beyond: Discover Imaginary Systems. New York, Wiley Series in Practical Strategy.

Hertzum, M. (1995). "Computer Support for Document Management in the Danish Central Government." Information Infrastructure & Policy **4**(2): 107-129.

Ingelstam, L. and Palmlund, I. (1991). "Computers and People in the Welfare State: Information Technology and Social Security in Sweden." Informatization and the Public Sector. **1**(2): 5-20.

Kaneda, T. (1994). "Informatization Experience of Japanese City Governments During the 1980s: The Period When the Widespread Use of Personal Computers Forced City Governments to Change Their Information Processing." Informatization and the Public Sector. **3**(2): 149-161.

Leavitt, H. (1970). Applied Organizational Change in Industry: Structural, Technological and Human Approaches. Management and Motivation. V. H. Vroom and E. L. Deci. Middlesex, Pinguin.

Marcus, L. (1983). "Power, Politics, and Mis Implementation." Communications of the ACM **26**(6): 430-444.

Myers, M., Paré, G. and Urquhart, C. (2000). Three Perspectives: If Markus' 1983 Classic Study, "Power, Politics, and Implementation" Were Being Reviewed Today. International Conference on Information Systems, Brisbane.

North, D. C. (1981). Structure and Change in Economic History. New York, Norton.

Northrop, A., Dunkle, D. E., Kraemer, K. L., et al. (1994). "Computers, Police, and the Fight against Crime." Information and the Public Sector **3**(1): 21-45.

Northrop, A., Kraemer, K. L., Dunkle, D. E., et al. (1990). "Payoffs from Computerization: Lessons over Time." Public Administration Review **50**(5): 505-514.

PLS-Rambøll-Management (2000. 2001, 2002). It I Praksis. Accessed May 10 2003 2003 at www.pls.dk

Scheepers, A. W. A. (1994). "Informatization in Street-Level Bureaucracies: Bureaucratic Competence and Discretion in Dutch Municipal Social Service Departments." Informatization and the Public Sector. **3**(1): 47-61.

Scheepers, A. W. A. (1994). "Informatization in Street-Level Bureaucracies: Bureaucratic Competence and Discretion in Dutch Municipal Social Services Departments." Information and the Public Sector **3**(1): 47-61.

Statistics-Denmark (2002, 2003). Danske Kommuners Brug Af It. Accessed May 29 2003 at www.dst.dk

Williamson, O. E. (1975). Markets and Hierarchies: Analysis and Antitrust Implications. New York, Free Press.

Zuboff, S. (1988). In the Age of the Smart Machine. New York, Basic Books.