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Abstract

This thesis is about document systems used in public case processing work.

It explores the subject of documents in document production and handling systems. Through a case study, I explore the role of the genre of a specific type of document, and how these affect the computer systems used in conjunction with these. These are not the only influences, and I investigate how organisational arrangements *and* existing computer systems also influence the design and limitations of new computer systems. It also covers the subject of formalised work, and asks the question if it is possible to make computer systems supporting the practical action of such work. Tradition and change are two important factors influencing these.

If you are reading this on paper, a fixed electronic document can be found at
<http://www.ifi.uio.no/ftp/publications/cand-scient-theses/JKRosenvold.ps>

Foreword

This is my Cand. Scient thesis in Systems Development. Working with research like this has created knowledge on many different levels for me. The knowledge extracted from empirical studies and other research material has been interesting to the extent that stopping has been hard.

Most things must have an ending, and being at the end of this project, there are a number of people that must be mentioned. Thanks should go to my excellent tutor, Pål Sørgaard, for being an inspiration and always as source of many good ideas. I must thank him for letting me find my own way through this process. It has been a frustrating pleasure to disregard his advice, go my own way and only at a later time understand what he really meant. Most of all, I would like to say that I am *still* amazed by the number of perspectives, ideas and suggestions he has had for most situations we have discussed, and that I certainly wish time had been sufficient to follow up on half of them.

The process of working with this thesis has been a great personal challenge to me. Through earlier studies I have grown accustomed to working in projects, sharing thoughts and ideas, good times and bad. By deliberately setting out on a highly individual mission, I have learned to cherish the joys of group work and sharing. In this respect I must thank my fellow students Arve, Bent, Geir, Morten and Ola for their comments and the constructive arguments we had. Without them I would truly have been unable to complete this work.

Thanks should also go to Erling S. Andersen, who has been much helpful with comments on drafts of this thesis.

Last, but not least I would like to thank all the people at City Hall. They have all been very helpful and cooperative, some going way beyond what I asked of them to help me. They have made my empirical studies a very memorable part of this work.

Oslo 7th November 1996

J. Kristian Rosenvold

Chapter 1

Introduction

Organisations produce large amounts of documents, and have interests in the efficient handling of these. Computer technology has provided us with a reasonably efficient means of creating documents, and producing paper. The conception of the “paperless office” from the 1980’s [10] has certainly not materialised to any extent. While some organisations turn to document handling systems in an attempt to increase productivity, others may simply not have any alternative means of storing and indexing documents. The sheer volume of documents may make other forms of storage, indexing and retrieval impossible in terms of resource usage.

The electronic documents envisioned in the “paperless office” were high-technology solutions. Scanning and electronic document interchange are important technologies, documents are transmitted electronically and those with origins outside the “paperless offices” are scanned. There are both technical and organisational issues involved in such arrangements. Veryard [31] suggests that it is possible to speak of technological *maturity* independently of organisational usage of technology. The maturity of electronic document technology is relatively low, most of this technology is quite new.

Within research on documents and the use of this, it has been common to classify documents in genres [33]. This classification lets us identify different classes of documents, such as Office Memo, Official Letter or Post-IT notes. For some classes of documents, the current document technology may be appropriate, for others there may be technological immaturities that make the use of these problematic. Issues of security, authenticity and longevity are examples of factors that can make it hard to use such systems.

In terms of documents and information distribution, public institutions are in many ways in a special situation. The most significant differences are perhaps the large number of laws governing public access to information, proper case handling procedures and regulations on the use and handling of documents

in public institutions. Most private companies only store information for 50 years or more if it is deemed beneficial or necessary, public institutions do so because they are required by law. Most private companies provide information because it is seen in the interest of the company, public institutions may be required by law to supply certain types of information, often for a long time.

The growth of the internet and the World Wide Web has to sent quite a few organisations off towards the internet and another type of electronic publishing. For organisations wishing to *provide* information on the World Wide Web, the relationship with what *content* one wishes to provide can certainly have implications for internal organisation of work. Some have chosen to use the Web as a place for marketing and providing “static” information about a company. Hiring an advertising agency to handle this type of Web publications typically creates a low impact on internal matters. In its most detached form, this type of electronic publishing need not create any further implications than the exchange of funding, all matters of technology and content creation *can* be left to others.

Organisations wishing to provide “better” content than just static one-shot World Wide Web pages may be faced with the question of “how to bring the information out of the closet”. Internet publishing is seen as a new way of providing information to customers or potential customers. Whereas this process previously may have been handled by personal contact, the situation arises where information may need to be constructed for an unknown, generic customer. Although this provision of information may be adapted to individuals, some of the flexibility provided by personal contact is lost — in some cases the needs of an imaginary “customer” may not be very clear. Adaptations previously performed by people from the internal domain of the organisation to a possibly vague idea of a customers needs may not be possible. Dahlbom & Mathiassen [6] define this as the problem of turning knowledge into information, information into data and vice versa.

Although internet publishing is not the direct subject of this thesis, the desire to start such publishing has strong influences on the internal systems in use. In terms of all the issues that influence system use and development, it is a relatively new factor. Wishing to do simultaneous extraction of information from internal systems means adding at least one new step in a document production sequence. It also has possible consequences in other directions, because it involves using data stored in systems for other purposes than what it initially was created for.

Issues of information technology, standardisation and control have been a topic of discussion for some time. Issues of centralised or decentralised IT management and maintenance within organisations have been discussed [1]. According to Allen & Boynton, the distributed approach has the potential of providing local flexibility and rapid adaptation[1] to new needs. One of the main problems with this strategy is that companies may “awake to a mess of incompat-

ible technologies, systems, procedures, and data that simply won't support the new business requirements"[1, p. 440] — when faced with change. At the other side of the control perspective is what they call the “high road” — centralised responsibility for development and maintenance of systems. This is equally troubled by expense, ability to change and the strong need for continuous management commitment.

Information technology implementation efforts in public sector have been getting a considerable amount of attention in Norwegian media the last few years [25]. Huge projects have been complete failures, while others have been successes. Due to the laws governing access to public information, IT development and implementation failures in public administrations may have a higher visibility than in some other places. In terms of strategies for implementing systems, Allen & Boynton suggest that standards are important.

The need or desire to perform meaningful exchange of documents and information in organisations is a good reason for wanting standards. Format incompatibilities and different application programs can effectively block attempts at exchanging information. The use of standards of some sort is necessary. It is not uncommon to see this connected to the proliferation of such standards — their usefulness is thought to increase as usage increases. For the exchange of information, the involved parties need to speak the same language.

This leads to infrastructural thinking about standards — exchange of information is helped if everyone uses the appropriate standard. The use of standards can be seen as a fundamental part in creating infrastructure.

1.1 Problem area

The problem *area* of study in this thesis is centred around the following definition:

Transitional issues of establishing local infrastructure for electronic document production and handling

Infrastructure in this context refers to the technical systems and the organisational routines to handle these. I am thinking about technological systems that will span large parts of an organisation, and that will serve as a common basis for further evolution. With respect to technology, there is matters of choosing appropriate standards and implementing these. Infrastructure must also have an organisational foothold, both for maintenance and evolution. Establishing the use of local standards, whether based on proprietary or “official”

standards¹, can be seen as a part of an attempt at establishing local technical infrastructure.

What is the relationship between documents, technological systems handling these and the organisations involved?

Transitional issues are examined because the implementation of such local technical infrastructures seems to be bound to happen at an uneven pace across organisations of some size. Monetary and personnel resources may perhaps be the single most important reason for this, very few organisations feel they can afford to have a supporting technical staff large enough to handle simultaneous introductions throughout the organisation. There is also a certain *risk* when implementing widely — if the organisational system depends on the technical system, the need for continuous operation may dictate incremental implementation strategies. With his “spiral model of software development”, Boehm [2] introduced the concept of risk evaluation and handling to software development. Organisational implementation is one of the later stages of an implementation project. Local periodic glitches may well be handled at the expense of extra efforts, system-wide breakdowns may cause total stoppages.

As a consequence of this, information systems infrastructure will in many cases be implemented at an uneven rate, and will cause special transitional issues. Transitional issues of infrastructure implementation can include a large amount of different situations. I will focus on the role of documents and traditions in this context.

The potential availability of such documents for electronic publishing may not be all it seems. Direct electronic publication may place new demands on documents created for a specific intent. This in turn may raise questions as to what processes have shaped these documents to be the way they are in the first place. What has shaped the source data?

Examining the constraints between existing data and new usage has underlying assumptions about that the existing data. Studying these constraints requires knowledge about these assumptions.

In terms of document production and handling, the generalised version of this question is *What is a document?* This question by itself is more of a research field than a single question. This thesis focuses on one particular sub-question, which is to determine to what extent work traditions are embedded into the creation and use of local document standards.

There is also an infrastructural aspect of extracting information used in one context into another. Are additional requirements imposed by such arrange-

¹The definition of “official standards” might include ISO & IEEE standards and the Internet RFC’s. This is opposed to “company standards”, such as selecting a single word processor for universal use within the company

ments? Does dependency on technology increase? What constraints does existing data put on new usage? What constraints does new usage place on existing data? If one includes organisational routines in the total *technological system*, what are the organisational impacts?

Hanseth et.al [14], talking about standards, suggests that these tensions are caused by *interdependencies* between the different standards. Because they are interrelated in complex ways, infrastructural interdependencies can be seen as posing constraints for change.

This is the problem *area* of study in this thesis. The actual research questions asked will be presented in the beginning of the research methodology chapter (chapter 4).

1.2 How to approach this situation?

Some of these questions are issues that past experience tells us are problematic. How does one proceed to find answers to these questions? The general problem of using old data in a new context has at least in Norway been considered as being problematic enough to warrant special laws governing these matters².

These questions are of exploratory nature: *What* causes a certain phenomenon? Since the questions themselves are open, determining the appropriate details to be studied and the further questions to be asked is a major goal of this thesis. Due to the overall constraints of this thesis, the inductive and exploratory effort was decided to be done in the form of a case study.

Finding answers to these questions is important because document technology is still new technology. From these answers it can be possible to recommend strategies and practical action. I find it important to stress that attempting to identify the characteristics of this situation may be seen as a separate problem from assessing what measures are needed to create systems that can operate in these environments.

The empirical part of this thesis is based on a case study of document handling within the central administration in the City of Oslo. This administration uses the DocuLive system³ as a basis platform for creating and handling documents electronically. The DocuLive system stores information about documents in a central database. The actual documents are created in a commercially available word processor and stored in the same database. This gives electronic availability of document text and information, electronic documents.

²“Act No. 48 of 9th June 1978 Relating To Personal Data Registers Etc.” is one example of such a regulation

³A system from Siemens Nixdorf Information systems

This situation is interesting for several reasons. First, it has an uneven rate of implementation. The DocuLive solution is planned to be used by a number of organisational units that during this study were not yet connected. They are required to interact with the new systems, under the premises set by their older technology. These premises may to some extent affect the usage of the DocuLive system. The tension between the existing installed base and a new standard system is the first subject of this thesis.

This tension can be expressed or observed in many different ways. Conflict of routines and data content and usage of this content are only a few. Since the common infrastructure is *new* there are adjustment problems for those wishing to enter this infrastructure.

The second tension is the same problem, in a different guise. The documents stored in the DocuLive system represent fully electronically stored documents and document information. It is potentially available for direct electronic publishing, both internally in the organisation and externally towards customers. What constraints does the existing data impose on new use?

Another perspective on this situation that has not been directly under study in this thesis is that *the non-DocuLive* users requirements are not explicitly implemented in the current DocuLive solution. A potential replacement system for the non-DocuLive users will have *two* types of installed bases to consider — their own existing system and the existing DocuLive standard.

1.3 Why study this situation?

The large amount of failure stories in computer system implementation efforts are attributed to a number of reasons. To some extent these systems are supposed to support cooperative work. Coleman [5] and Grudin [12] have pointed out different reasons for such failures: There is little doubt that the organisational job of introducing such a system is tremendous, and this is perhaps one of the most important parts of making and introducing new computer systems. If this fails, the likelihood of total implementation failure is great. Involving users in the actual design of the computer system is another. The proponents of participatory design claim this makes the systems better, and have a tighter link to the problem domain at hand.

Some interdependencies are often known to potential system users. This knowledge is often internalised, and may have become a part of the operational patterns in which the organisation works. These interdependencies can be seen as supplying constraints for new efforts within an area.

Non-working or badly utilised computer supported cooperative work arrange-

ments may have a number of possible explanations. One reason for this may be because the formalised description of work procedures does not actually match the actual work situation. While there are undoubtedly a number of reasons for this, I will in this thesis set out with the hypothesis that this may be because of unidentified or mis-understood dependencies in work relations. I do not claim that this is the only reason why things sometimes go wrong.

1.4 Intended audience

The intended audience of this thesis is primarily students and to a certain extent researchers. My work with this thesis has shown me that there is very little work done in this area. While a lot of the questions I'm examining come up in a lot of research work, there is very little practical empirical work related directly to it. Although details can be seen in a number of studies, most of these have been aimed at other questions or other theories.

Other readers of this thesis can include people working within the field of systems development. The questions asked in thesis are relevant for systems development, it could be of interest for practical systems development.

System recipients at the site of my empiric studies may find some of this thesis interesting as I deal with problems where theory is very closely linked to practice. Although I do not expect these to be an audience of the thesis as a whole, I expect they will recognise the situations discussed and the problems they contain. Some of the suggested solutions may also be of interest.

1.5 The Structure of this thesis

This thesis is divided into eight chapters, and in this section I give a presentation of the structure of this thesis.

This thesis discusses matters of documents, organisation and technology. This is also reflected in the internal structure of the chapters. The chapters on theory, empirical work, the discussion and the conclusion all follow the same structure. Documents are presented first, organisation second and technology last. In practice, this is not a distinction that is always possible to make. I have attempted to keep this structure, but I have let the interest of clarity and continuity take precedence where this was necessary. The distinction between documents, the organisation creating these and the technology they use is gradual and overlapping, not absolute.

Chapter 2 covers background necessary for understanding of my empirical

work. This chapter contains a presentation of the organisational units involved. Since the case study is performed within public administration, it also contains some background information that may be necessary to understand differences between this type of organisation as compared to others, for instance in private sector.

Chapter 3, provides some initial theory. This contains material which is necessary for a full understanding of the problem area and the problem definitions, and provide good background for understanding the perspectives of the remaining chapters in this thesis.

Research methodology is the topic of *chapter 4*, discussing the implications and limitations of studying these situations in a case study.

Chapter 5 presents some selected findings from my empirical work. Five different situations are presented, all within the area of documents, organisational routines and the technology used. These can be read independently, but will for most readers require some background information presented in chapter 2 on the organisational background.

Chapter 6 examines the use of documents, their connection to organisational matters and some of their implications for the technological systems. It discusses the routines surrounding document production work, and the different states of documents within the organisation studied.

Chapter 7 examines aspects of technology and organisation of technological efforts in document production and handling. This chapter also contains a discussion on the use of standards, an important part of information technology infrastructure.

Chapter 8 presents the conclusion of this thesis, and also suggestions for further work.

1.6 Summary

In this chapter, I have introduced the problem domain under study in this thesis. I have provided some motivation for how and why to study this situation, and the intended audience of this thesis. In the next chapter I will present some background information for my empirical work.

Chapter 2

Background of empirical work

In this chapter I will provide some background information for the understanding of my case study.

In this chapter I will describe a part of a hierarchical organisation. I have tried to make the structure of this chapter hierarchical as well, trying to map my descriptions to the actual structure of the organisation. Initially I will describe some of the surroundings (section 2.1), some of this background includes information on administrative tradition and the high-level organisation of the City of Oslo, some of which contains context necessary to understand the details. Thereafter (section 2.2) I will give a description of the most relevant parts of the city administration and briefly discuss the relationship between these. This selection is task-oriented in the sense that the selected units all are involved in the document production/case handling in some way. Section 2.3 describes some aspects of culture and tradition in an organisation like this, which may be interesting reading also for those familiar with the Norwegian municipal system. This subject will be further covered in the detailed empiric presentation (section 5.1), and the information provided here is mostly non-overlapping background information. Finally, I describe the DocuLive system and the KOARK standard, which are important factors on the technological side.

2.1 The Central Administration in Oslo

The City Of Oslo, with a population of approximately 482000 (1996 figure), is the nation's capital and the largest city in Norway,

In this section I will give a brief presentation of some aspects of the political system of the City of Oslo. My basic assumption is that the reader has a

certain familiarity with the governmental system in Norwegian cities¹. Such a presentation is necessary, my work has shown that in some cases even people actually working within the system have problems understanding it. Most importantly though, this information is necessary as background to understand the details related to this system.

In 1985, The City of Oslo acquired an exemption from the law governing municipal governmental form to try a different form of governmental system. This experimental governmental form was to be known as municipal parliamentarism, and was strongly based on the parliamentary system used in Norwegian state government. Webster's 7th edition dictionary has the following definition of a parliamentary government:

parliamentary government (n) n, a system of government having the real executive power vested in a cabinet composed of members of the legislature who are individually and collectively responsible to the legislature

A Norwegian dictionary [17] gives a slightly different interpretation, which is more flavoured by the local form of parliamentary system:

a system of government where the majority-holding party or coalition of parties from the parliament, form or designate a government, which must resign if it no longer has the confidence of the majority.

These definitions are not in opposition, the Norwegian definition can be viewed as an elaboration of the one in Webster's Dictionary. The combination of these two represent the parliamentary system in use in the City of Oslo.

The current organisation of the City of Oslo places the City Council (no. Bystyret) in the role of parliament and the Executive Board (no. Byrådet) in the role of the cabinet. This is exactly parallel to the system used in the Norwegian state government. During the reform in 1985, the state government was used as a model for the Executive Board. The first Executive Board was instated on the 5th of February 1986. The Executive Board is the political leadership of the administration. The individual members of the Executive Board are the political leaders of their respective (non-political) administrations in the departments. Further reading about this system can be found in Bernt H. Lund's Norwegian book about the governmental system of Oslo [20] or the English language pamphlet "Oslo City Government — A General Presentation" [23].

¹Readers wishing such background information may consider consulting [23]

The central administration in Oslo is divided into eight departments, called municipal departments. Six of these are responsible for external municipal sectors, and are the highest non-political administrative units for the individual units of city government. The two remaining departments are “Department of Finance and Planning” (FOP) and “Office of the Chairman of the Municipal Executive Board” (BLA). These are primarily administrative departments, working with tasks related to the administration of the administration and all matters of economy. These two last departments have a larger amount of inter-department communication than the other six departments.

Each department has a politically appointed leader, that are also members of the executive board. All of the departments are split into sections related to the main work-tasks performed in the department. The sections have a common leadership, and common administrative (secretarial) functions.

All departments also have underlying *agencies* (no. etater). Each agency belongs to a certain department and may act as the effectuating units in matters related to the agency’s area of responsibility.

2.1.1 Terminology

Within the municipal parliamentary model, most functions have a direct parallel to the system used on government-level. The different departments have quite a few names and synonyms that initially can seem quite confusing. In this section I will try to give a brief explanation of the different terms in use. These are primarily based on the definitions in “Oslo City Government: A General Presentation” [23].

The City Council (no. Bystyret) is the city’s highest political authority. This is a municipal council like in any other Norwegian city, but with a different name. Within the city parliamentary model it represents the parliament. All representatives are chosen by elections.

A municipal department (no. Byrådsavdeling) corresponds to a ministry in Norwegian state government. These are the case-preparing and the effectuating apparatus for the individual sectors of the City, and they are the highest administrative units within each sector. Each department has a politically appointed leader. The collection of the municipal departments were called *the Central Administration* before the 1993 reform.

The Municipal Executive Board (no. Byrådet) is chosen by the City Council and each member also has the leadership of one of the eight municipal departments. This is parallel to the arrangements in Norwegian government administration. This is the political administrative leadership of the city, appointed by election in the City Council.

The *Executive Board's Office* (no. Byrådet's kontor) is an anteroom to the Municipal Executive Board. The Executive Board's Office is administratively placed in the municipal department called "Office of the Chairman of the Municipal Executive Board".

Due to the length of some of these names I will generally drop the "Municipal" prefix where names still remain unique.

I will also use the term *city government* to describe the collection of the municipal departments and the Municipal Executive board.

Some of the abbreviations in use in this thesis are the following:

BLA - "Office of the Chairman of the Municipal Executive Board"

FOP - "Department of Finance and Planning"

2.2 Organisational units

In this section I will present what I feel are the most relevant organisational units related to the production process within the municipal departments. The selection of a certain production process has resulted in a specific selection of organisational units. This is one of many possible delimitations, this one has the advantage of being contained within a quite small number of organisational units.

Formally, all units in this study except the City Council are defined to be located in one organisation. There are a number of reasons for this, perhaps the most notable being the fact that defining all of these as one organisation involves fewer restrictions on inter-department communications. This is different from the system at governmental level, where each ministry is defined as a separate organisational unit. But, at the government level there are also special laws governing communication between ministries. The ministries of the government have a long administrative tradition of working in a system like this, and it was not seen as appropriate to make special regulations for an experimental system. It has been quite clear in my work that there is an obvious need for confidential communication in a system like this, matters of finance and for instance property sales to private sector is one very clear area. The scope and volume of this need for confidentiality is mostly a legal and a political question, and outside the scope of this thesis.

Even though they are *technically* the same organisation there is no doubt that they are in *practice* different organisational *units*, with little or no common managerial interaction or coordination. In terms of *organisational units* I will

refer to these as separate from now on.

2.2.1 The Municipal Departments

The municipal departments are self-governed administrative units, and are the highest administrative units for their respective sectors within the municipal government. Their toplevel leadership is politically appointed, and the job includes a position in the Executive Board.

These departments are highly autonomous, like their counterparts at governmental level. With few exceptions, most cases passing through these departments will be processed and settled there. Within each department, a varying amount of cases will be sent for further political processing, “higher upstream”.

When a department wants to forward a case for political treatment it is fully responsible to get the case through the correct formal proceedings. When a case has been properly prepared for political treatment, it will eventually be forwarded to The Executive Board’s Office for the next stage.

The Municipal Director is the highest non-political leader of a department. They usually have their own set of administrative staff, that interact with the various secretarial staff in the different units of the department. All incoming mail to a department is usually processed through the Municipal Director’s office. Although the practical handling of this may vary from department to department, the Municipal Director also has the formal authority on what information should be exempt from public access.

All the departments in the central administration use the DocuLive system, and have been doing so since April 1994. The primary users of the system within these departments are the secretarial functions in the anterooms, the archive and the case-workers themselves.

2.2.2 The Executive Board’s Office and the Executive Board

The Executive Board’s Office is a section in the department “Office of the Chairman of the Municipal Executive Board” (BLA). This department is described in the following manner in an information leaflet from the City Council [23]:

The BLA department does jobs related to the adaptation and following up of the City Government’s meetings and cooperative work

related to the leadership of the City Government. The department is responsible for superior supervision in the municipality of Oslo and for development of the municipal organisation and governing form, information technology, profiling of the Municipal government and personal and leadership issues. The department takes care of necessary internal administrative support functions for the other departments of the central administration

The Executive Board's Office administers the case flow from the municipal departments to the Executive Board and back, as shown in figure 2.1. A certain amount of these cases will require further political processing when the Executive Board is finished with them. These will be sent from the Executive Board's Office to the City Council. The Executive Board's Office keeps a centralised control of what material leaves the municipal departments and the executive board for the City Council.

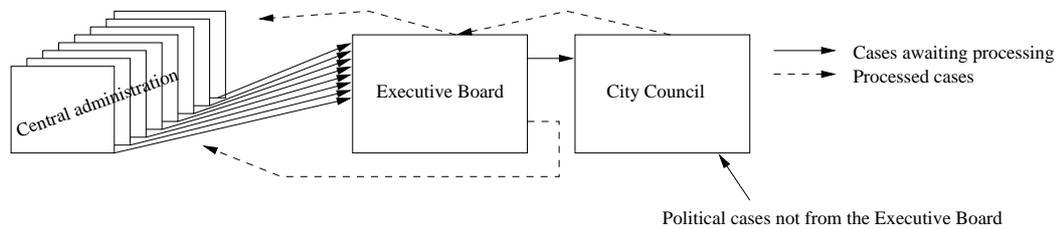


Figure 2.1: Logical case flow from the Central Administration to the City Council. The square boxes are departments/sections of the administration.

The Executive Board's Office employs seven people, most of which are working with administration of case flow between the Central Administration, the City Government and The City Council.

The office employs three lawyers and four secretarial positions. The four secretaries and one of the lawyers are practically full-time occupied with handling the case flow. Before the reorganisation of the Central Administration in 1993, the office also had the anteroom function for the different departments of the central administration.

Typical case processing time within the political part of the City Government is within the range of one to three weeks, with the majority of the cases passing quite quickly through the office. All cases processed by The Executive Board's Office are handed off from one of the departments of the central administration. Some cases will pass through the City Government for processing in the City Council, while the majority are directly processed by the City Government. Cases are typically processed in two or three meetings, in a single week, before completion. The City Government does not have committees and other external groups processing cases. To the extent it is required, "committee work" is to be handled by the originating department.

Primary work tasks

The Executive Board's Office handle a number of administrative work tasks, primarily focused around the needs of the City Government. This includes handling case flow from the central administration to the City Government and the City council, and vice versa.

Another important function that The Executive Board's Office provides the departments of the City Government is finding and retrieving historic case information. If a case worker wants to find out if there has ever been a case relating to a certain subject, they will in all likelihood be able to tell her if this is the case.

The majority of documents *produced* in The Executive Board's Office related to the case-flow are agendas and protocols from the City Government meetings. They also perform centralised quality control of produced cases, and to a certain extent they keep track of where cases *are* in the municipal system.

The Executive Board's Office is currently using an older case processing system called KSS. They are in the early phases of acquiring the DocuLive system.

2.2.3 The Central Administration's Archive

The *Central Administration's Archive* provides archiving services to all departments within the City Government. Their work consists of doing the actual archiving, registration of all incoming mail and a number of other tasks. Organisationally they are a part of the BLA department, and the job also includes the administration of DocuLive system in the entire organisation. Another organisation dealing with archives is the *City Archive*. They are the central professional authority on archiving in Oslo, also handling the historic archives. The day-to-day responsibilities for recent case material are handled by other units, such as the Central Administration's Archive. The Central Archive has also handled the introduction and adaptation of the DocuLive system, which they have been using since February 1994.

Although the administration of the DocuLive system is a part of their work tasks, it does not give the Archive any *formal* rights to specify usage guidelines for the system in the eight municipal departments. The details of how to implement the system in each department is not delegated from the Archive, but they will assist anyone asking for assistance.

2.2.4 The City Council and their administration

On the other side of town hall, and organisationally a part of the City Council, the City Council's Secretariat administers the case flow around the City Council. This office is a direct parallel to The Executive Board's Office, but they serve the City Council instead.

Their work includes administration of the case flow before a case can be processed by the city council. This task includes processing by a number of sub-units, typically committees and external organisations. The exact case flow is determined by the content of the case in question, although there are standardised paths for a large number of typical cases.

A large majority of the cases arriving for processing at the City Council have their origins in the City Government, typically 80–90%. These are submitted from the Executive Board's Office, and will sooner or later be returned. The City Council has monthly meetings, and processing time for a case will typically be in the area of three months or more, depending on the total workload and case complexity. The remaining cases arriving at the City Council are typically initiated by political parties outside the City Government.

The City Council's secretariat has been running a computerised system called BSAK. This system is in the process of being replaced by DocuLive from Siemens Nixdorf Information Systems (SNI). This process has included numerous special adaptations to the DocuLive system, and has been going on for several years.

Their current system (BSAK) has a modest level of integration with the technological solutions in use at City Hall. BSAK is run in text-mode with Windows, and the other applications in use are a part of the city standard package.

2.2.5 Other supporting administrative units

To this point I've given a brief presentation of the departments involved in case handling from the Central Administration to the City Council. This relationship can be illustrated by figure 2.1 (on page 18).

All of the functions within the City Government share a common support apparatus. In this section I'll present some of the most central of these.

The *Information Service*² (no. Informasjonstjenesten) is supposed to handle most external information from the city. The mandate of this agency was in-

²A part of the external agency (no. etat) called "City Hall Administration Services", connected to the BLA department

creased substantially in the 1993 reorganisation of the central administration. This was partly due to long standing complaints about the difficulty of navigating in the complex organisation of the City of Oslo. Their current intended audience includes just about everyone likely to want information about the City of Oslo, including departments within the City Administration itself. In some central areas, providing information is defined as supplying the actual information in question. In other cases, the job consists of locating the correct source of the required information and pointing the customer in that direction.

The *section for organisation and information technology*³ is responsible for creating long-term strategic plans and make strategic product choices. This includes selecting appropriate standards, as well as creating product-standards for specific needs that may not be covered by proper standards. This section provides services to the Municipal administration in general, not just within City Hall. The “information technology” part of this section employs 4 people. The existence of this section was another result of the 1993 reorganisation of the central administration. Before this time, there was an IT staff of approximately 120 people, with an additional supplement of approximately 30 people at the City Electric Company (Oslo Lysverker). These sections were sold or converted into municipally owned companies as a part of this reform, moving them out of the system. This distance has increased over time, and they are now just like any other supplier of services.

The *Information Technology section*⁴ primarily provides end-user support and maintenance services. This includes maintenance of all centrally run administrative systems and databases, in addition to the current selection of standard administrative packages. Supporting work related to the customisation and implementation of new computer systems is only included in their work to the extent of available capacity.

An omission in this support apparatus is the specialised capability for handling issues related to the actual implementation work for new information systems. As a part of the 1993 reorganisation, it was decided that this knowledge should be located in the separate departments of the city administration — closer to the knowledge of case work. A disadvantage of this approach is that whoever decides to use a *new* type of technology has to take a large part of this burden.

³A section of the BLA department

⁴Same organisational connection as the Information Service, see footnote 2.

2.3 System related background

2.3.1 Administrative tradition

Oslo, at that time named Christiania, became the nation's capital in 1814. The current Town Hall building was completed in 1950. If there is one thing that characterises what I have seen in this system, it's the large amount of tradition present in case processing work.

Legal concerns, best-practice work procedures and rules of conduct, both in matters of internal organisational politics and externally towards their "customers" seem to be very closely integrated into the tradition of this system. Although a lot of these items are formalised in different places in the organisation, the extremely similar response patterns I had from my interview objects in some specific types of questions lead me to the belief that a lot of these formalisations are heavily encoded into the tradition of this system.

One area where tradition is weaker, is within the parts of this system affected by the 1986 reform to the municipal parliamentary system. The 11 year old parliamentary tradition in the City of Oslo is quite new when compared with the over 100 year old tradition in state government. In matters of administrative tradition within a parliamentary system, the City of Oslo is lacking *some* of the tradition that has evolved over a much longer time in state government. This observation is based on statements from individuals I spoke with that had changed jobs from state government to city administration, and were as such quite aware of the differences. It may very well be that some of these differences are justified by the relative differences in *size* and *importance* of the case work done. State government sets premises that may have very far-reaching consequences. This is also true for the City Government, but perhaps on a more local scale.

Another interesting aspect of the integration of the non-political administration and the politically appointed leadership, is that organisational change can become political decisions. The 1993 reorganisation within the municipal departments is a good example of this. The reorganisation was to my knowledge initiated by a 1991 City Council resolution which asked the City Government and the administrative part of the City Council to suggest new arrangements that would better coordinate the common city hall functions. This was handled by a project group that produced a case that was forwarded from the Executive Board to the City Council. I have not investigated any further implications of this type of arrangement.

2.3.2 Delegated authority

Although not particularly related to the Municipal Parliamentary system, delegated authority is an important part in understanding the workings of the system. The City Council has delegated authority to decide some cases to the Executive Board, often cases related to daily business of running the city. These are often defined as “typical issues” with limits for financial impact or other types of constraints. The Executive Board can further delegate decisive authority to the political leadership of each department, on a case-type basis. These may in turn as a part of their internal work-arrangements further detail responsibilities, creating a tree of delegated authority that allows the system as a whole to process a large amount of decisions, a lot of which are governed by the rules and guidelines typical of bureaucracies. Typically, in this system, the intention is to not overload any single part of the organisation with too many tasks, while still retaining control and responsibility. If viewed as a tree, the number of decisions taken at each level of the tree grows quickly. This distribution also causes increased complexity of organisations. Fortunately, the number of levels of delegation within the central administration is not too large, with 4 clearly defined entities identified, as shown in figure 2.2. An important part of this delegation is that the City Council still retains all authority to decide any case it wants to decide.

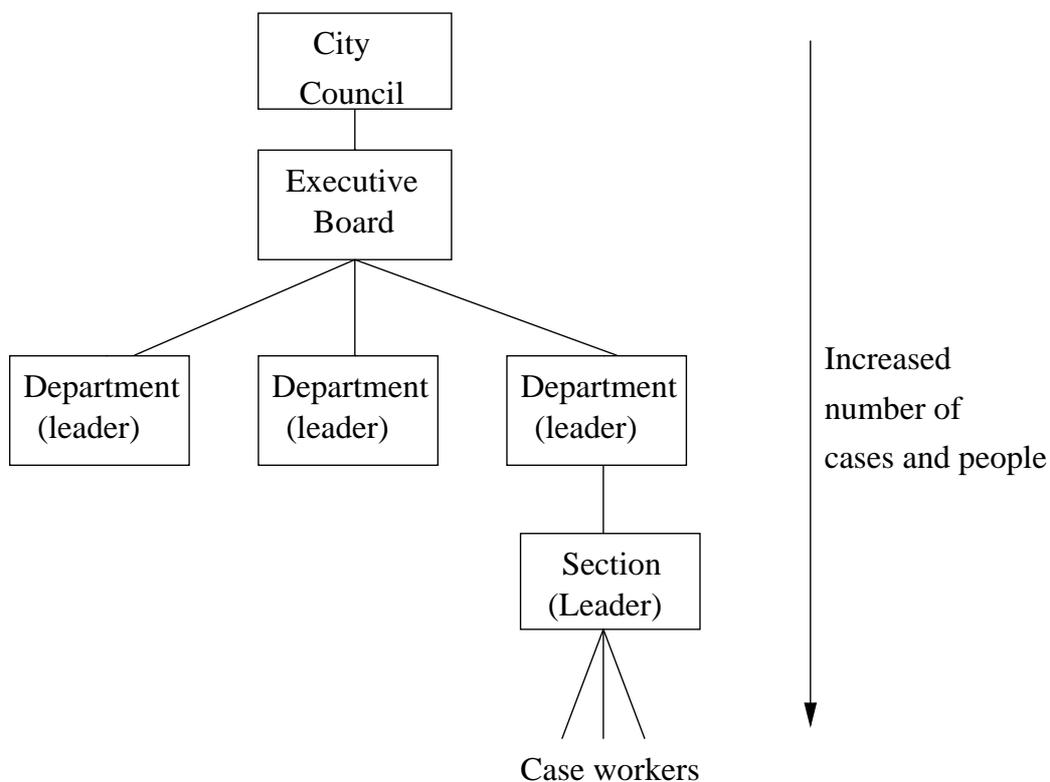


Figure 2.2: Schematic illustration of delegated authority

2.3.3 Interdepartmental case processing

Most of the research done for this thesis has been focused on case-production and case-handling. Describing every aspect of these two activities would be an enormous job, so I have made a selection. The scope of *case handling* is further limited to the relatively small number of cases that get political treatment. Case production has been limited to those fitting the same constraints — with the addition of whatever topics I felt necessary to pursue in order to understand the basic operation of the system.

There is one important point to note regarding these limitations. Since the intention of delegation is to spread decisions, only a small part of the material most people work with actually follows this flow. Some case workers may have cases like this very infrequently, perhaps not even once yearly. Others will have a much higher part of such cases, and there is no single norm as to what amount of cases goes along the case path I am examining. This is a very important piece of background information that is necessary to keep in mind.

2.3.4 Political process

My studies have primarily been focused on document production and handling processes within the municipal departments. The term *production process* can have a number of different interpretations. The focus of this work has been on the technical and organisational matters related to the production of case documents and the handling of these. As a further limitation it has more specifically only been focused on that material processed by the political apparatus. To a certain extent I have also looked at the underlying rules governing the content of the produced documents. This has concerned matters of production and the rules governing content and presentation. Political content or meaning of documents has not been a part of this study.

My work has shown quite clearly that tradition plays an important part in an organisation like this, and the intent of examining document content has been to see if this can reveal additional information that is not necessarily formally specified.

The work processes are a part of the political decision-making process, which can be illustrated as shown in figure 2.3.

This political process occurs on several levels within the city administration in Oslo, where the effectuation phase of one process level can start the case preparation phase on another level. The primary political decision process is within the City Council. With the parliamentary reform, a large amount of political decisions were delegated to the Executive Board. The Executive

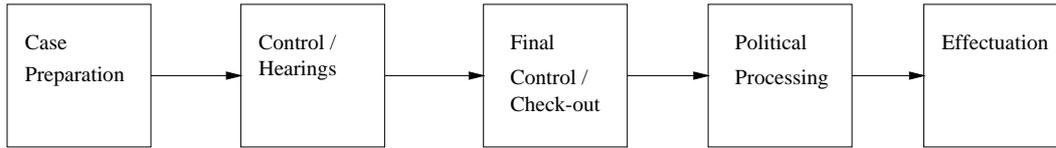


Figure 2.3: Logical task-chains related to the political decision process.

Board has its own political process, based on most of the same principles. The municipal departments initiates the majority of all cases in this system, through the Executive Board. Approximately one third of all Executive Board cases are passed on to the City Council, constituting approximately 80-90 percent of *their* cases.

The primary focus of this study has been the production processes within the municipal departments. The biggest difference between cases going to the Executive Board for processing and the City Council are case volume, which is larger in the Executive Board, and the case complexity, which is higher in the City Council. The two production processes are similar enough that both contain the same work tasks, but to different extents. The “effectuation” stage at The Executive Board’s Office will start the “preparation” phase at the City Council if the case is passed on to them.

2.4 Standards and systems

In this section I’ll present the KOARK standard and the DocuLive system. Both of these are central to the case study. KORAK because it is a municipal standard governing case processing systems, and DocuLive because it is the system in use. The DocuLive system *has been chosen* in Town Hall, this means that choosing alternate products is not currently an alternative.

2.4.1 The KOARK standard

The KOARK standard [15] is a source of many regulations and recommendations about case processing systems in municipalities and counties. Most of the information in this chapter is taken from the introduction in KOARK.

KOARK is a municipal standard for electronic case and archive systems. It covers systems for case and document administration, electronic case archives, E-mail and workflow support for committee processing. The specifications primarily regard what information is to be registered and the relationship

between these. End-user functionality and seek-mechanisms are also a part of the standard.

Purely technical issues of information technology are not a part of the standard, and it does not dictate matters of user interface, platform or vendor.

The KOARK standard also complies with most of the relevant laws within archiving, municipal administration, safety and protection of personal privacy.

The name KOARK bears a certain reference to NOARK. NOARK is the *national* standard covering the same area, for use within state government. The KOARK standard is heavily based on the NOARK standard, but “it has been seen in the light of municipal traditions and needs” [15, p. 14]. The KOARK standard has a stated goal of merging with NOARK to a common standard, on the condition that it turns out to be practically possible and the NOARK standard can cover the needs of municipalities and counties. NOARK introduced the concept of a *case* in public administration in Norway. To that point, documents had been archived thematically and by serial number.

2.4.2 The DocuLive system

DocuLive is a client-server based system, where the client part is written in QBE Vision⁵ and supports all Microsoft Windows based platforms. The server side is a relational database, which can be any one of four mainstream commercial database applications.

In use, DocuLive is a system for creation, maintenance and storage of documents, where creation is done in concert with a separate word processor. The system is modularised, and there are a multitude of different modules available: Technical documentation, Meeting & Committee, Case Worker, Plan & Budget and Workflow modules are available as an addition to the basic DocuLive system. The system also handles fully electronic documents if the customer desires this functionality, with support for scanning, electronic document storage and various direct forms of output of the electronic documents.

The system is to a large extent conformant with the NOARK and KOARK standards.

Technically, the DocuLive system offers tight integration with the wordprocessor. The system stores *document information* in the database part of the system. This document information includes items such as recipient, case worker, public exemption status, internal document state (indicating what stage in the process the document currently is at) and archive key, indicating

⁵QBE Vision is a tool for developing database front ends, developed by the Norwegian company Sysdeco

type of subject covered in document. The actual *text* of the document is stored in Word Perfect format in a free-form database field. Access to documents is seamlessly integrated into the DocuLive system, users need not bother about file names or file locations.

DocuLive is a *document centric* system. This means that the creation and handling of documents are the primary tasks this system is focused on, as opposed to for instance decision support or other possible points of focus.

DocuLive is technically implemented as a set of API⁶ calls, and currently supports two different interfaces. The model used at City Hall is that of a stand alone application that starts the word processor as a separate application. The other interface is more tightly integrated with the word processor. Using the word processor's built in programming language it attempts to merge with the word processor's user interface, showing DocuLive information integrated into the standard dialogue boxes. The functionality in these two versions are supposedly very similar or identical.

2.5 Summary

In this chapter I have presented some background information about the organisation and the systems used in this study. This was done by initially presenting the City of Oslo, and continuing on with a more through description of the organisational units involved. I presented some information on the traditions of this system. At the end of this chapter I presented some information on the KOARK standard and the DocuLive system. In the next chapter I will discuss some relevant theory for the further understanding of this thesis.

⁶Application Programming Interface, a specification (and implementation) of the points of interaction between different modules in a system

Chapter 3

Initial theory

In this chapter I will present some theory that is relevant for the understanding and interpretation of my empirical work. The structure of this chapter is similar to others in this thesis — I start off with some selected theory about documents, continue with elements of organisational theory and end off with some theory on technology.

3.1 Genres of organisational communication

Asking the question of *what is a document* inevitably leads to a multitude of answers and in my opinion these may be equally valid. Yates and Orlikowski [33] talk of *genres* of organisational communication as a means of sorting out different meanings of groups of documents. Applying the literary concept of a genre to organisational communication they evolve theory about both.

They define a *genre of organisational communication* as “a typified communicative action invoked in response to a recurrent situation. The *recurrent situation* or socially defined need includes the history and nature of established practices, social relations, and communication media within organisations [...]”.

Their initial classification of a genre is that “[a genre] may be applied to recognized types of communication (e.g., letters, memoranda, or meetings) characterized by structural, linguistic and substantive conventions. These genres can be viewed as social institutions that both shape and are shaped by individuals’ communicative actions” [33, p. 300]. Yates & Orlikowski use the type of genre defined by Miller (1984) as a basis for defining the genre organisational communication — “[...] typified rhetorical actions based on recurrent situations” [33].

They further suggest that genres can be characterised by *substance* and *form*.

Substance is based on the social motives, topics and themes in the communication. Form are the observable physical and linguistic features. Form is further subdivided into structural features (agendas, lists etc), communication medium (pen, paper, telephone etc) and language or symbol system (linguistic traits — specialised terminology, jargon, formality). Parts of this classification is shown in figure 3.1.

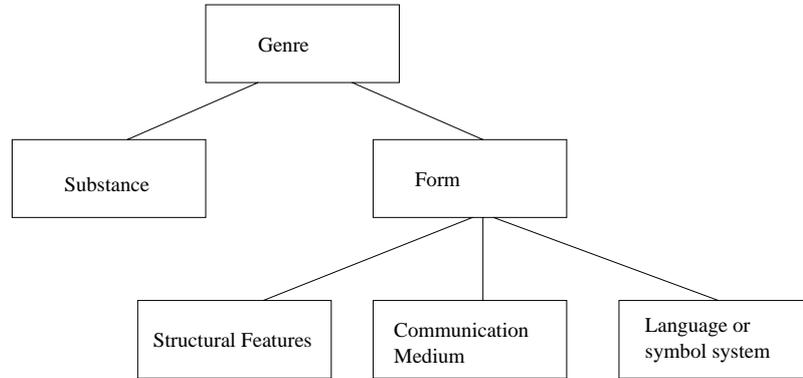


Figure 3.1: Yates & Orlikowski’s classification of Genres of Organisational Communication

Yates & Orlikowski further suggest that genres are enacted through *rules* which connect elements of form and substance with specific recurrent situations. These *genre rules* can be used for inferring opinions about subjects related to the genre. This process also serves to reproduce the genres over time, and reinforce and sustain the legitimacy of these genres. Genre rules can be seen as self-reinforcing.

A communicative action need not use *all* the rules of a genre to be classified as belonging to a particular genre. Yates & Orlikowski suggest that *enough* distinctive genre rules must be invoked for the communicative action to be identified. As to the manifestation of genre rules, they suggest that these may operate tacitly or be codified into regulations controlling form and substance. These rules may also be embedded into a medium.

3.2 Documents

According to Yates & Orlikowski [33], organisational communication can take place in the form of documents that are shaped by genre rules. Yates & Orlikowski suggest that genre rules may be embedded into a medium, and paper representations of documents may be seen as such. While a number of media can be used to encode such rules, one subject of this thesis is their encoding into case processing systems. Genres of documents cover traditions

and arrangements that influence documents and there are aspects of these subjects that can be thought of as the study of documents. If the documents are handled by computer system, assumptions about the genre and the genre rules can, and in all likelihood *will* be embedded into the “medium of the system”.

D.M. Levy has for some time researched on documents and the nature of these. In his paper “Fixed or Fluid? Document Stability and New Media” [18] he discusses the notion of documents and fixity. A *fixed* document is thought of as unchanging and static, while *fluid* documents would indicate that it changes over some aspects of time. The background for this discussion is Jay Bolter’s arguments that documents “in the digital age” will become fluid, and that the fixed, static document we are used to eventually will disappear.

Levy suggests that at least three different perspectives from which documents can be viewed. Viewing documents as *artifacts* is to focus on the documents themselves, as physical and social artifacts. The *technology* perspective focuses on the technologies used to create, manipulate and distribute documents. Pen, paper, computers and aerosol spray paint are examples of such. The last perspective is that of *work* — documents cannot be understood without taking human practices and institutions into account.

Levy suggests that this, together with Yates & Orlikowski’s genre concept, is an appropriate framework for approaching the subject of documents.

Levy challenges Bolter’s assumptions by attacking the premise, that traditional documents *are* fixed. He points out that traditional documents usually go through phases of fixity and stability, and that it would not be uncommon for even stable documents to “soften up” every now and then for revision. Levy suggests that digital technologies might change the *speed* at which these transitions take place, but not the fact that they exist.

Levy uses the U.S. Constitution as an illustration of fixity and fluidity. This, and other similar documents, are typically thought of as stable and unchanging. In reality, it is changed every now and then, and there is no reason to think of this as an entirely *static* document.

Levy concludes that most documents will pass through phases of fixity and fluidity during their useful lifetime, and that one of the challenges facing designers of computer systems will be one of assuring fixity in documents.

In this section I have presented some theories on the nature of documents and organisational communication. In the next two sections I will present some organisational theory.

3.3 Interdependence in Organisations

The term *interdependence* is frequently encountered in literature on computer supported cooperative work (CSCW). Document and case processing systems like DocuLive establish electronic lines of cooperation between different units of an organisation. In this section I will initially discuss how this relates to interdependencies, and I will start off within the field of CSCW in the first part of this section. In the second half I examine a selected aspect of this theory, the notion of interdependence.

A term originally used by Irene Greif and Paul Cashman in 1984 [11, p. 32], CSCW has been used in a number of contexts to mean quite different things. I will not go into the multitude of these definitions in any detail, but since “computer support” and “cooperative work” will be frequently used terms in this thesis I will cover the theoretical perspective I have chosen.

Schmidt & Bannon [22] have in their article “Taking CSCW Seriously” given a suggestion for a definition of the research field CSCW. Their paper is basically a suggestion of what the research field of CSCW should cover, and proposes several research agendas for the field. Numerous other definitions of CSCW also exist, and in my judgement, this definition has the advantage of being reasonably “middle of the road”.

CSCW can be seen as a research area with the *approach* of computer support within the *scope* of cooperative work. Schmidt & Bannon initially stress that CSCW should be focused on the computer support *requirements* of cooperative work. The emphasis is put on computer support to distinguish CSCW from research on cooperative work with other primary points of focus. It is also meant to focus CSCW on issues of design and implementation of computer systems related to cooperative work arrangements. This leads to their initial formulation of the research scope of CSCW:

CSCW should be conceived of as an endeavour to understand the nature and requirements of cooperative work with the objective of designing computer-based technologies for cooperative work arrangements [22, p. 11]

Their definition of the term cooperative work is based on Schmidt:

“People engage in *cooperative work* when they are mutually dependent in their work and therefore are required to cooperate in order to get the work done” (Schmidt 1991, cited in [22, p. 13])

Their term mutually dependent in work is defined as

“[a person] A relies positively on the quality and timeliness of B’s work and vice versa and should primarily be conceived of as a positive, though by no means necessarily harmonious, interdependence” [22, p. 13]

They complete their definition of cooperative work by including the concept of *articulation work* as a central demarcation line between cooperative work and individual work. Articulation work, which is based on the works of Anselm Strauss, is the work that takes place when people divide, allocate, coordinate, schedule and perform other activities that are usually not strictly a part of formalised work procedures[26]. Cooperative work is by definition distributed among two or more actors, and articulation work are the activities to manage the distributed nature of cooperative work. “Articulation work is work that gets things back «on track» in face of the unexpected, and modifies action to accommodate unanticipated contingencies. The *important thing about articulation work is that it is invisible to rationalized models of work*” [26, p. 275].

There has been a lively debate on the scope of CSCW, as can be seen in [24, 22]. It is my opinion that the situations I have studied fall into most suggested categories, and I will for now leave this discussion. I will, from this definition of CSCW, focus on the concept of interdependence in organisations.

James D. Thompson [29] suggested the following definition of dependence: “Dependence can be seen as the obverse of power”. Obverse in this context refers to the back-side, and Thompson expands on this “an organization has power, relative to an element of its task environment, to the extent that the organization has capacity to satisfy needs of that element and to the extent that the organization monopolizes that capacity” [29, p30-31]. The advantage of this definition is that it is somehow connected to work tasks, and, as Thompson also says, it does not rest on any assumptions of intent or usage.

Thompson proceeds to define three classes of interdependence¹, pooled, sequential and reciprocal. According to Weiseth [32] this work is the basis of much subsequent work within this field, and I will now give a description of the elements of this theory.

Pooled interdependence is where each part of an organisation renders a contribution to the whole, and each part is also dependent on support from the whole. Because of the contribution to the whole, the support from the whole is justified. I have tried to illustrate this situation in figure 3.2. According to Thompson, all organisations have pooled interdependence.

Sequential interdependence, shown in figure 3.3, is the case of a directed dependence. It should be possible to specify the order of such a dependency, for instance “A supplies B with input”. To stress the direction of this dependency,

¹Thompson uses the term interdependence to denote the situation of mutual dependence

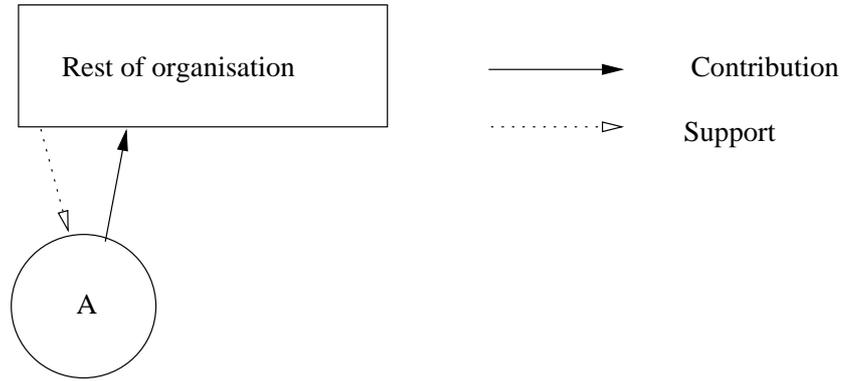


Figure 3.2: Pooled dependency, where unit A contributes to the whole organisation. A depends on the rest of the organisation for support.

it is B that depends on A.



Figure 3.3: Sequential dependency, where unit A contributes to unit B

Thompson's third type of dependence is reciprocal dependency, where the output of two organisational units become the input of the other - as shown in figure 3.4. In this case both A and B are dependent on each other. Webster's 7th edition dictionary defines reciprocal as "inversely related", a description I interpret as less mathematical and quantifiable than "inversely proportional". Reciprocal interdependence can be phrased as "inversely related mutual dependence".



Figure 3.4: Reciprocal interdependence.

Thompson also connects these three levels of interdependence to the overall complexity of the organisation, where pooled interdependencies are found in all organisations and reciprocal only in the most complex. According to Thompson, the more complex interdependencies also contain the less complex.

Reciprocal interdependence also contains pooled and sequential interdependence, and sequential interdependence contains pooled, as illustrated in figure 3.5. Thompson’s classification is an ordinal scale of interdependence.

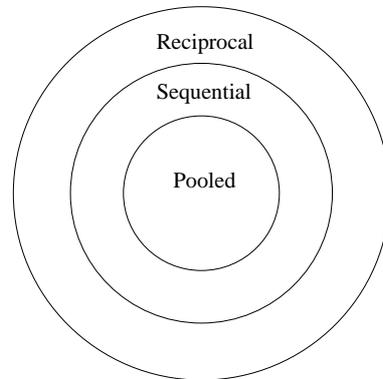


Figure 3.5: Thompson’s three classes of dependencies

In practice, this means that the complete interdependency relation for reciprocal interdependence can be illustrated as shown in figure 3.6.²

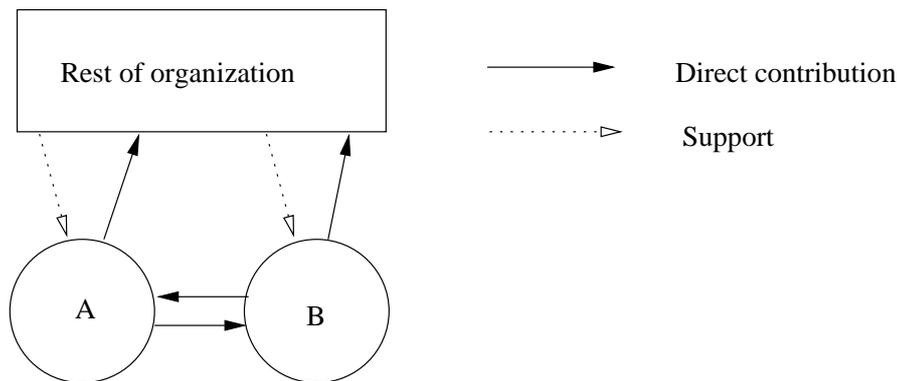


Figure 3.6: Reciprocal interdependence with all relations shown

Thompson’s definitions are expressed in terms of organisations or organisational units. The question of which *system level* these interdependencies apply to should be raised. I understand Thompson’s theory as a classification of interdependency types that can, and will, occur on a number of different levels in whatever subset of an organisation one chooses. Weiseth also makes a point of this by saying that “Thompson’s sequential and reciprocal dependence corresponds respectively to Weick’s (1979) sequential and mutual dependence and can be viewed as the same generic type of dependence, even though their illustrations represent different system levels” [32, p. 10].

²Although Thompson originally did not use figures to represent dependencies, a number of later commentaries on his theory does [21, 30].

An attempt at expanding Thompson’s theory has been made by Van de Ven *et al.*[30], that adds a *team* type dependency to expand on the basic classes. This is an aggregation of the three previous types, but it also includes notions of *time* not included in Thompson’s three original definitions.

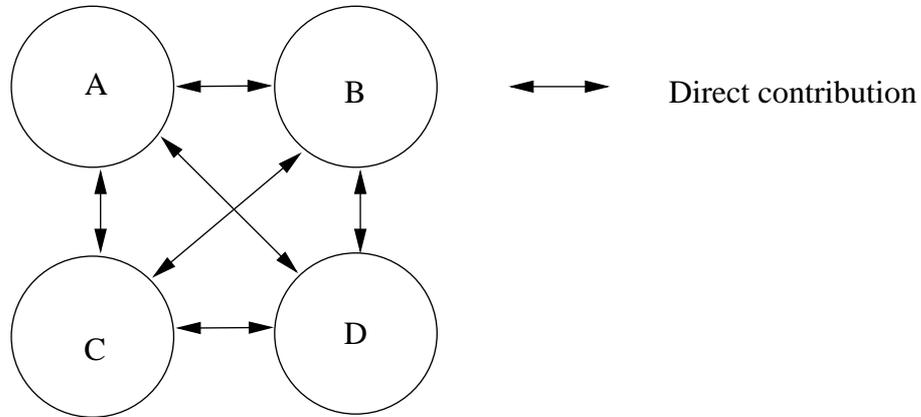


Figure 3.7: Team interdependency

This definition can initially seem to be just a composition of the three other types. The only difference is the added constraint that “the work is acted upon jointly and simultaneously by unit personnel in the same point in time” [30, p. 325]. This definition fulfils the inclusion criteria that Thompson applies, in the sense that pooled, sequential and reciprocal dependencies can be found in a situation like this. Team dependency is basically a combination of the three other types, with the additional constraint of “time”.

Subsequent researchers attempting to expand on this theory has found it very hard to do. Galbraith, at one time one of Thompson’s doctoral students, and McCann express it very aptly in their 1981 article “Interdepartment relations” [21, p64]:

Like any good theory, Thompson’s paradigm raises as many questions as it answers

As to Thompson’s ordinal classification of dependence, they raise the question of the value of this type of scale:

Are three pooled interdependencies greater or less than one reciprocal interdependency? Cannot a single pooled interdependency pose a greater contingency for an organization than a reciprocal one? [21, p. 64]

Furthermore there is the question of system level, where a sequential dependency at one level may be viewed as a reciprocal one if viewed one level higher up. McCann & Galbraith use the manufacturing-sales cycle (of shoes) as an example of such.

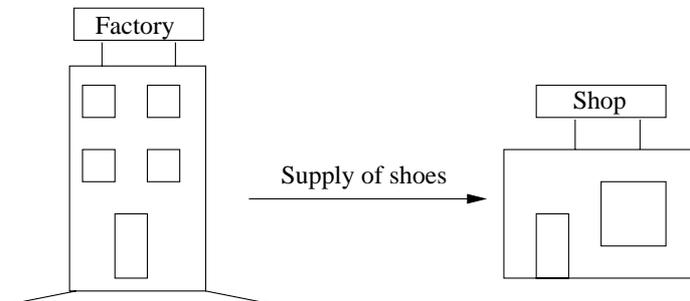


Figure 3.8: Sales can be seen as sequentially interdependent upon manufacturing

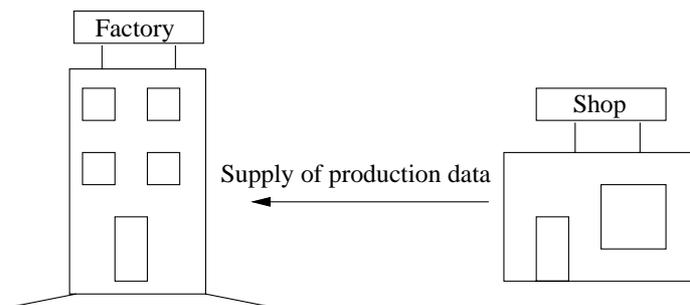


Figure 3.9: Manufacturing can be seen as sequentially interdependent upon sales

In their book about SSM, Soft Systems Methodology, Checkland & Scholes[4] define the concept of a root definition. Root definitions are used for “modelling human activity systems” with a “declared perspective or worldview”. For any single system, there may be several plausible root definitions, and the intention of these is to create an explicit declaration of the perspective used. The manufacturing-sales illustration is an example of how three different root definitions can lead to different results. I will be using such root definitions later in this thesis to declare perspective.

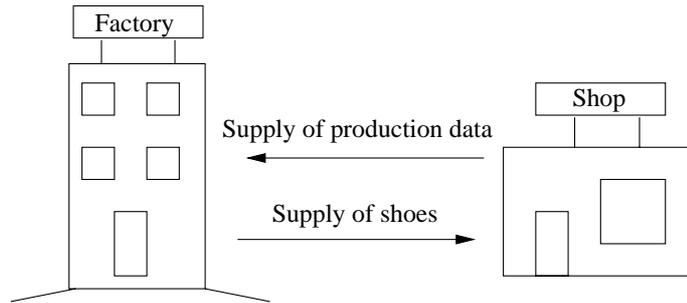


Figure 3.10: The same situation seen as a reciprocal interdependence

3.4 The Integration of Computing and Routine Work

Most of this section is devoted to Gasser's work [9] on how people using computers adapt to shortcomings in these systems. Using Thompson's theories [29] and a number of later works, Gasser develops theories on the subject of work and organisation of work in the face of exceptions. Gasser's work is clearly an evolution of Thompson's [29] work and seems to be inspired by Galbraith's theories [8], so I will briefly start with these.

Thompson also talks about technology use in organisations. His views on the role of technology in organisations may be illustrated with the following citations:

One or more technologies constitute the core of all purposive organizations. But this technical core is always an incomplete representation of what the organization must do to accomplish desired results. [29, p. 19]

Under norms of rationality, organizations seek to buffer environmental influences by surrounding their technical cores with input and output components [29, proposition 2.2 on p. 20]

[...]

Thus while a fully buffered technical core would enjoy the conditions for maximum technical rationality, organizational rationality may call for compromises between conditions for maximum technical efficiency and the energy required for buffering operations [29, p.21]

Galbraith, at one time one of Thompson's doctoral students, has developed theories of how organisations handle complexity [8]. He suggests four ways in

which complexity can be handled, the creation of slack resources, self-contained tasks, vertical information systems or lateral relations. The creation of slack resources is done simply by reducing the required level of performance [8, p. 15], creating what amounts to free resources to smoothen out unforeseen complexities. In relation to technical systems, creating slack around the input and output of a system has close parallels to Thompson's buffering.

Gasser combines issues of buffering and organisational complexity with the inadequacies of computing. Most computer users will at some time encounter programming faults — “bugs”. Some may also be at the receiving end of design errors — where the system performs the task in an inappropriate manner. A lot of research has gone into the questions of why both these types of errors come to exist in computer systems. Gasser has taken a different approach. When errors *do* occur and remain in Computer Systems, how is work *still* able to take place and evolve?

Gasser's Assumptions about organisations are that they have

- limited resources,
- actors with bounded rationality,
- unevenly distributed knowledge and
- that meaning of events and artifacts are not static and created through interaction among actors.

The assumption about actors' bounded rationality in Gasser's article can also be seen to have another underlying assumption. Knowledge of “rational behaviour” may not always lead to the behaviour one expects, there may be other factors causing opportunistic behaviour as well. I intentionally quote “rational behaviour” because it is quite obvious that there is little reason to expect this to *have* any single definition. Therefore, Gasser's assumption can be interpreted to mean that actors' norms of rational behaviour at least to some extent contain goals related to the performing of work tasks.

In analysing the work situation, Gasser uses the unit of a *work task* as the most basic unit. Gasser defines work as a process which goes on for a certain time, not just a singular event. Work tasks have agendas, which will usually be related to the intended *goal* of the work task. Work tasks also require resources, are performed by a person or a group that perform this work in a place and over time. Furthermore work tasks can have varying characteristics in terms of recurrence and task variation. Some tasks may be of unique character and single occurrences while others may be repetitive, routine, or both.

If viewing work along the axis of a particular work task Gasser suggests that this may be called a *task chain*. Task chain describes the sequence of events

involved in the production of an object or an event. The smooth operation of these task chains can be disturbed by contingencies. Intersection with other task chains may be a cause of such contingencies. Within traditional house-building, the task of “building a roof” normally depends on the construction of at least a framework of walls.

Tasks can be seen as having a place in a larger system of tasks, and there is a relationship between these tasks. Gasser suggests that each task can be seen as a part of the division of labour in an organisation, and that some of these tasks remain stable over time while others change. The coordination of work tasks often involves a commitment to keeping certain aspects stable.

Most complex forms of interaction thus involve a large number of intersecting task chains. Gasser defines a *production lattice* as a *coordinated structure* of such task chains. In the same manner that the individual task chains in these production lattices have stable elements, the production lattice can also be seen as containing combinations of task chains with higher stability than others.

On the subject of work and computing, one of Gasser’s most important distinctions is that of primary work, articulation work and computer work, where the use of computers in most cases is performed in desire to perform the primary tasks efficiently. Primary work tasks could typically be writing letters, billing clients or calculating the size of oil deposits. Gasser proposes that at least parts of the reasons for using computers in these contexts is as a rational attempt to employ computing as a resource for action. Most people use computers as means to an end, not as an end in itself.

Articulation work can be seen as the activities involved in creation, maintenance and breaking of task chains or combinations of these, renegotiation of work. Gasser describes these management activities as supplements to the *primary* work tasks.

Gasser points out that Work is a contingent process, but that not all activities contain the same degree or types of uncertainty. In the process of using Computers to support contingent work, Gasser also observes some typical work situations. He names these fitting, augmenting and working around.

Fitting work is when computing work is changed to accommodate a misfit between a work task and the computer support. Gasser classifies fitting as *making changes to computing arrangements* and *adjusting work schedules and commitments*.

Augmenting work means performing additional work to make up for misfit. This often happens by adding extra steps to a task chain. Verification of supposedly correct data is a good example of such.

Working around means intentionally using the system for other purposes than

it was meant for, or simply avoiding the system entirely. Inputting incorrect or biased data to account for situations the computer system does not handle is a typical example of working around the computer system.

The amount of fitting, augmenting and work-arounds may vary with stable systems, potentially changing organisations and external influences.

A practical example of additional work performed to keep “iron out” irregularities caused by external events is shown by Suchman [28], who has studied practical office work where accountants try to sort out an accounting problem that turns out to be caused by a missing page in an invoice. In her transcript of the accountants’ dialogue it is clearly illustrated what the system can’t do, and shows how contingencies in the input material are solved by workers. This may be seen as augmenting, because the system in question does not support the type of exception that showed up.

3.5 Information technology infrastructure, standardisation and flexibility

In this section I focus on theory related to information technology. This is primarily about information technology infrastructure and standardisation.

The term *infrastructure* can be taken to imply a great deal of different things. In everyday speech we comfortably talk of roads, railroads, power lines and similar as infrastructure.

As it sometimes can be observed, our road networks seems to be able to sustain themselves reasonably for at least a few years without maintenance. While pot-holes may be avoided, the equivalent of a pot-hole in the railroad track may not be acceptable, and the consequences of neglecting railroad maintenance may be dire. Electricity is perhaps yet another level higher up on the maintenance scale. How long does the unmaintained power grid run, weeks, days, hours or seconds ?

The point this leads to is that while infrastructure may be seen as a *thing* in many cases, it obviously takes more than just *things* to make and sustain an infrastructure. This is the question of defining borders for an infrastructure. Before answering this question, there is another one that is more fundamental and a prerequisite, what *defines* an infrastructure ? *When* is something eligible for the title “infrastructure” ?

Star & Ruhleder [27] suggests that infrastructure is a relational concept. Something becomes an infrastructure in relation to organised practices. In Star & Ruhleders example, the water system is infrastructure for the cook in the process of mak-

ing dinner. For the City Planner it is a variable in a larger, complex equation. I feel compelled to add that this means the water system is infrastructure for the city planner when he makes dinner at home.

Information technology networks such as the Internet are infrastructure. Star & Ruhleders definition also include corporate internal networks as infrastructure.

Hanseth et al. [14] examine the use of *standards* in infrastructure. They discuss what they describe as the tension between standardised information technology infrastructure and change.

They describe situations where components *designed for stable* interdependence are forced to change. Each member in a selected group of components has interdependencies internally, but the individual components also have separate, external interdependencies. A desire to keep the ramifications of change low implies that change should be contained locally. The fact that this may be very hard or impossible is the tension between standardisation and flexibility.

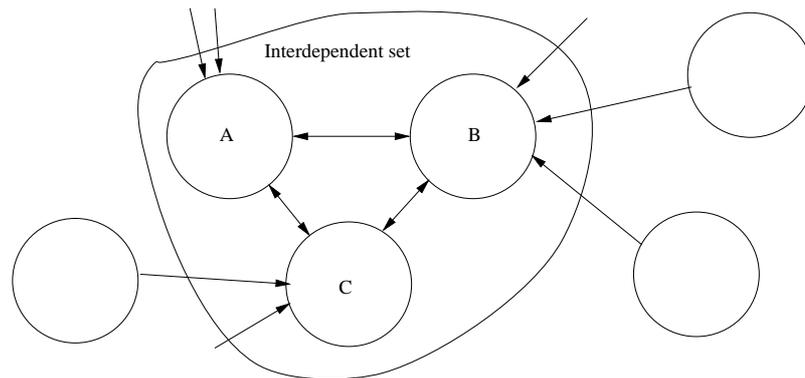


Figure 3.11: Interdependence between components

Figure 3.11 illustrates an example where three standards are closely interlinked, and each makes assumptions about the operation and implementation of the other two. I call the three standards A, B and C in this figure an “interdependent set” because they have tight connections to each other and may have been designed with each other in mind. Because each single standard within the interdependent set also has *other* entities “outside” the set that makes assumptions about it, change is restricted. If no outside assumptions were present, then change would be contained to the three in the interdependent set.

Hanseth et al. also use the notion of an *installed base* to further elaborate on this problem. The existing users of the infrastructural standards effectively accumulate resistance against changes. The larger the proposed change in standard, the higher the resistance. The potential upgrade to version 6 of the Internet Protocol (IP) is an excellent example of this. Due to a fundamental

flaw in the original protocol, it *must* be upgraded. A change that forces *all* users to change is an extremely hard task³. Not only does the change in the IP protocol affect the implementation of other, related protocols, but all these protocols are implemented and used daily by millions of users around the world. A radical but unlikely solution to this is that *everyone* switches to the new version at the same time.

Because of numerous such interdependent standard sets and a number of other entities that depend on these sets, any change in these will have large ramifications. Change should be contained locally, but this cannot be done. This is the tension between standardisation and infrastructure.

3.6 Summary

In this chapter I have presented some theory relevant for the understanding of my problem area. In the next chapter I will present my actual research questions as well as discuss some methodological issues related to these.

³Most current RFC's on this subject view this as an unrealistic alternative, see for example RFC1752

Chapter 4

Research methods

In this chapter I will discuss methodological issues related to my work. This is an important part of all research, as it may have a significant impact on the reliability and usability of the results from such work. A research method is a systematic way of examining reality [13].

The research problem of this thesis says something about what basic problem I am trying to solve. The intent of my research was to collect enough reliable data to be able say something about the research problem. Since *solving* a problem based in uncharted territory is a pretty ambitious goal, I set charting the territory to be a primary aim. Due to the largely unexplored nature of the subject matter I decided that a case study would be the best approach. Yin [34] says that case studies can be either exploratory, descriptive or explanatory. In respect to “charting of territory” this is an explorative study. Within certain limits I also attempt to *explain* some of the phenomena I found in my empirical work, using theoretical material. This means there is also an aspect of explanatory research to this study.

The information in this thesis is based primarily on my empirical work within the Municipal Executive Board (no. byrådet) within the central city administration in Oslo. This work has been done in the 7 month period from November 1995 to May 1996.

The original plan was to participate as much as possible in the actual everyday work being done. My initial point of focus was the Executive Board’s office, which turned out to be a fast-paced work-environment where work schedules were tight at certain times. This was quite often the case when working with those matters I wished to examine. This had the effect of limiting my possibilities of participating in the actual work.

4.1 Research problems

Halvorsen [13] says data can be collected either in an inductive manner or in a hypothetical-deductive way. The inductive manner implies approaching a certain situation without too many predefined questions, often with an unclearly defined problem statement. The hypothetical deductive approach implies the evaluation of specific theories by the testing of certain hypothesis.

This study has largely been based on gathering data about a few initial ideas, and most of the process has been an inductive effort.

I started this study with several ideas of subjects to investigate. Letting my initial studies select the focus of this research effort has at a minimum ensured that the situations studied have a firm grounding in reality. Quite a few of my original assumptions turned out to be irrelevant in the organisation I studied. For me, this emphasises that relevance is not easily seen before meeting with *real* users of *real* systems.

In the rest of this section I will present the research questions I will say something about in the discussion chapters of this thesis.

My first research question regards what kind of system support that is possible to build,

is it *possible* to create systems support for practical action?

Gasser [9] and Suchman [28] both discuss the differences between formalised descriptions of work procedures and the actual work that takes place. While I find the idea of examining what people *do* sound, can systems be made to support this? This question will be discussed within the limits of the empirical work, namely routine work and quite large amounts of regulations governing these.

The next research question is focused on documents used in conjunction with these computer systems. It is, in many ways, a specialisation of the foregoing research question:

How are documents frozen?

This question is also a question of how document states and organisational states are related. The DocuLive system in use in this organisation defines document states, as does the KOARK standard. How are these reflected in the actual work? I will in particular examine the process of *freezing* — what is it, and how does it happen?

The third research question pertains to the evolution of new local standards for document production systems, and the effect of current systems upon new standards.

How is tension between new and existing systems be observed?

I will examine this question, as well as try to find out strategies for decreasing this tension.

The fourth research question is one of genre rules and systems development:

How does domain complexity affect systems development ?

And finally, I will investigate the use of standards.

What is the relationship between document genre rules and the use of standards?

This will result in a discussion on the use of standards in an organisation like this. Since “standards” by itself is a pretty large issue, I will focus on document standards, such as SGML¹.

4.2 Unit of research

Based on my problem definitions, I had to make a choice of a suitable unit of research. The complexity of the organisation at hand can be illustrated by the words of one of my preliminary-stage interview objects: “When I started working here, it took a year before I felt I understood what was going on in this organisation, and I’m still learning”.

Initially I had decided to focus my attention on the different organisational units involved in handling a specific case flow, namely the flow of cases for political processing in the City Government.

This involved a relatively low number of different organisational units, where primary focus could be kept on one organisational unit, the City Government’s Office, and their “neighbours” supplying and receiving case material, as well as a number of other general support units.

¹ISO standard 8879, SGML is an acronym for Standard Generalized Markup Language

In the course of my research, I gained additional insight in the problem domain, and my focus on *interdependenc*ies between organisational units and technical systems became clear. This resulted in an expansion of scope to also cover other cooperative work supported by the DocuLive system. Focus remained within the same basic set of organisational units, but this time I also tried to identify various types of cooperative work arrangements, and examine them in terms of interdependencies.

The units of research in this study are organisational units participating in computer supported cooperative work arrangements, related to City Government case processing.

Organisational units are administrative entities that do not *do* things by themselves and examine my two primary areas of interest I have relied on individuals working within these organisations.

There is also quite a large amount of *documentation* related to this organisation. I have been studying documents relating to case processing, organisational changes & restructuring, information folders about the City, documents related to desired changes in the DocuLive system and the all-helpful organisational chart, which has seemed to me to really never be *quite* up to date.

4.3 What is being researched?

In the previous section I summarised *where* I gathered my data. In this section I will present *what* kind of information I attempted to get in order to answer my questions.

Determining the perspectives on computer support of practical action turned out to be an investigation into the legal and technical fundamentals of the routines in practice. This was mostly done in conversations and interviews, and observation.

The freezing of documents was primarily researched in the interviews, querying the interview objects of their various attitudes and actions in this respect.

All the other research questions were brought up in some context, and I followed these up by examining the current situation, querying people and observing what was going on.

4.4 Time perspectives

My empirical work started at a time when my main organisational unit of study was converting an *idea* of a need for a new system to a *will* to actually try to obtain one. This was not the first time such efforts had been attempted — but due to the general level of diffusion of DocuLive in the rest of the administration there is reason to believe this attempt will get off the ground.

Other units of the organisation have been using parts of the DocuLive system for longer time, some up to 2 years. My studies of these have made it clear to me that this type of project in itself is a moving target, and things have changed literally as I wrote this thesis. Assessing effects of such a system is an even longer-term activity, where new effects may show up after years of usage. There is little doubt that research on projects of this type ideally should be longitudinal studies. My study also has certain longitudinal elements, going over a 7 month period. A common strategy for longitudinal studies is to examine the evolution of a certain phenomenon by enquiring about its status at certain intervals. In the process of my empirical work I followed up on most of my interview objects. Although I did not design interviews to be repeated later, most of my interview objects were more than willing to tell me about what had happened since we last spoke. This was a great source of information that at the same time made it painfully clear to me that there will probably always be something new to learn.

Although the administrative tradition in this organisation has developed locally, there is also reason to believe that the administrative tradition may have several common characteristics when compared with other organisations performing the same type of work. In the discussion section of this thesis I try to connect these findings to existing theory on the subject. In areas where no such theory is known to me, I try building theory out of existing theories based in the same problem type.

4.5 Data collection

This has been an explorative case study. According to Yin [34] this type of study can basically choose from the entire spectrum of research methodologies. A common problem in most types of research is the selection of quantitative versus qualitative methodology, both of which are suitable for case studies. Although these are not mutually exclusive, there is always the question of which method to choose. Quantitative methods have the advantage of being able to obtain results that can be statistically significant and therefore support hypothesis about the problems at hand. This is scientifically a very desirable goal. The disadvantage of quantitative research is the possible loss of detail,

where the researcher in the end may end up getting the right answer to a wrong or irrelevant question.

Qualitative methodology is often used when the understanding of the problem domain is smaller. It will typically be used in situations when finding the right question is a bigger part of the answer. Van Maanen defines qualitative methods as “an array of interpretive techniques which seek to describe, decode, translate and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world” (Cited in [7, p. 71]).

The data collected in this study have been of a highly qualitative nature. This means that the data are not easily enumerable, an example of this are subjective opinions of how well a certain cooperative work arrangement functions.

In the following section I will present the different forms of data collection I have been using

Interviews

According to Yin[34], interviews come in three main categories, open-ended, focused and surveys. An open-ended interview is described by Yin as a situation “in which you can ask key respondents for the facts of a matter as well as for the respondents’ opinions about events” [34, p. 84]. This is done so the researcher can create an image of the various perceptions and opinions of the interviewee. Focused interviews may still be open-ended, but will usually have a stronger connection to a predefined list of questions connected to the research agenda.

The interviews I conducted were focused and open-ended, all based on interview guides, containing a list of the questions to ask. Where I felt it necessary, I continued with follow-up questions. An interesting trap that I almost fell into was that of accepting a certain answer as generally applicable once a certain amount of people had given the same answer. This applied to especially one interview in the early stages where I *thought* I knew the answer because my four first interview objects had all give almost identical responses. After an unsettling experience in this interview I decided to *always* ask a standard group of questions. From that time and on, I always completed all applicable questions, but let interview objects speak freely if they wanted to.

I interviewed a total of 21 people in different parts of the organisation. Eight of these were within the departments of City Government, where I interviewed anteroom personnel and case workers. Six interviews were taken within the Executive Board’s Office and the remaining were performed in various support functions. In both of these last two categories there was a large variety in

the job descriptions for each individual, leaders, consultants and secretaries were the most common. Seven of these interviews were tape recorded. This was primarily done in situations where I knew there was going to be a high data density in the interview. All interview notes and transcripts were written straight after the interviews.

The transcripts of the interviews are not included in this thesis, but are available from my tutor, Pål Sørgaard. Because of contractual agreements with the administration, these cannot be used without their permission. Individual guarantees of anonymity have also been given.

Observation

Observation means to use your senses in a more disciplined and reflected way than we do in our everyday life [13, p. 82]. Yin [34, p. 79] makes a distinction between direct observation and participant observation. Direct observation is where the researcher passively observes the situation, participant observation can include a certain level of involvement in the situation — such as joining discussions or otherwise voicing opinions.

The primary difference between a meeting and an interview is that the researcher's relative control of the situation decreases, since most matters of interest will be controlled by the meeting's agenda. During the course of my work I participated in five different meetings, with various subject matters. The level of participation in these meetings varied from silent observation to active participation.

On the subject of interviews and observations, I also enjoyed quite a few lunches, coffee breaks and I partly took up smoking to participate in smoking room discussions. I sincerely hope this last point has not induced any undue kind of bias into my data. I kept informal notes of these occasions as recollections, since this sometimes provided information that was unavailable otherwise. This material has provided me with much insight about the culture of this organisation, and has provided an excellent source of background information.

Study of source material

Studies of documentation produced within the organisation to explain changes or emphasize routines has been used as background information for the rest of the empirical work.

Documents of particular interest have been political cases on the (re-)organisation of the central administration, internal memoranda and various specialised in-

house publications. Case files related to the DocuLive-implementation, organisation charts and in-house newsletters are examples of such source material.

As a part of the work with this thesis I also supplied the Executive Board's Office with a report regarding concerns when implementing a new case systems.

Literature studies

There are not very many books on the municipal parliamentary system, probably due to the relatively new nature of this system. Where appropriate material is available, I have gained insight into some of the fundamental principles of public sector case processing and procedures, that otherwise would have been hard to find.

As for literature on more theoretical aspect, I have seeked theory in quite a few types of research literature, ranging from systems development literature, literature within the Office Automation tradition, theory about documents, management literature, sociology and research methodology.

4.6 Analysis

Since this research is based on qualitative empirical work, there is little reason to expect general validity in a broad, scientific sense. The work has although been carried out in an organisation with a certain amount of tradition. It has been evident for me through this work that quite a few elements of this tradition are present in similar types of organisations, especially among other public institutions doing case processing work. My work has shown me that tradition has a very strong influence on the way this organisation works, and I find it fair to assume that quite a few of my findings are applicable within similar settings in other organisations of the same basic tradition.

One interesting point about interviewing people about their work is the possibility that people often *say* things about work that does not actually correspond to what they *do* when they actually use the system. I tried to avoid this problem by letting all the users I interviewed about system usage actually show me what they were doing at the same time.

Within the terminology used by Yin, this study attempts to do what he describes as "Analytic Generalization". Yin describes this as a situation in which "a previously developed theory is used as a template with which to compare the empirical results of the case study" [34, p. 31].

The composition of source material in the form of interviews and observation

has had a certain effect on the *presentation* of the empirical work in this thesis. The complexity of the organisation studied has been unveiled to me like layers of an onion, and this has meant that my current understanding of the situation is based on information from many sources. Unknown details about one particular subject have come up while talking about completely different subjects. While wanting to present as rich a picture as possible, this has been a problem because some part of the picture is extracted from a different context that would require substantial background information to be understood.

The richness of my source data would make it quite suitable for a Grounded Theory type of analysis [26]. Due to the overall constraints of this thesis, no such attempts have been made.

4.7 Possible sources of error

Sources of errors is an important issue in research. Analysing data for possible errors gives hints as to the usability of the results and their scope. Especially in a case study like this, there are a number of possible sources for errors.

- All observations are single instances. The exact same situation is not easily replicable. The conclusions of this thesis can thus, in the strictest sense, only apply to this case. They may not necessarily have any generalisable qualities that I can assume valid as a result of this study.
- The details of the various production processes are very complex. It may be hard for an outsider to gain the proper insight. I can only argue that by triangulation of interview questions I have achieved a proper outside insight.
- All observations and interpretations are my own, which influence their contents because of my own competence, experience, norms and similar issues.

4.8 Language

Writing in English about a Norwegian Organisation poses several challenges. There is the obvious problem of translation of phrases and parts of text.

All translations done in this document are my own. I have attempted to assure the correctness of these translations by getting second opinions and frequent usage of Webster's 7th edition dictionary. To avoid linguistic confusion, all

citations and parts of non English-language texts are translated into English. This also applies to all citations from interviews in my empirical work.

Subtle differences in semantic meanings of words and phrases can cause different associations depending on the reader's background. This is especially the case with some of the political terms in use, since a particular name for a typical system can, and probably will, have different implementations in other countries. This problem is basically a general problem of communication, language barriers or not. One example of such is the discussion of the term "parliamentary system" on page 14. A discussion of the nuances of differing parliamentary systems are political science, and far beyond the scope of this thesis. On the other hand, the difference in focus between Webster's 7th edition and the Norwegian dictionary does make it obvious that I must address the issue.

In general, I have attempted to use the administration's own English translations of the names of organisational units, where such exist. There was no single source of *consistent* translations of these names that I could find within the organisation in study. Several of the translations I found used different names for the same department.

Since some of these are almost always referred by their shorter nicknames in practice, I have taken the liberty of shortening some of these to resemble their nicknames. Where no translation is provided, I have translated the name myself, based on the general terminology used to describe similar functions.

4.9 Summary

In this chapter I have presented the actual research problems under study in this thesis, I have discussed how to study these questions and what data I have gathered to analyse these questions. In the next chapter I will present some empirical findings related to these questions.

Chapter 5

Selected Themes and Stories

In this chapter I will present the findings from my empirical studies in the central administration of the City of Oslo. The primary purpose of my research was to find information about document production and case handling. This included document and case related matters, organisational matters and technical matters. In the case of documents, how and when does a document come to exist, and what influences the contents of these? This means that my research has not focused solely on the technical aspects of this production, technology has been viewed as one of many factors in a larger system containing organisational matters, manual as well as computerised work routines. Evaluating the *role* of technology in such a perspective is a difficult problem. Initially I will point out that it has become clear to me during my studies that information technology plays a very important role in this organisation.

The presentational form is what Yin calls multiple-case report [34, p. 134]. This is because the different themes can be viewed as separate but related stories. Presenting a *complete* story would be far too much for a document like this. Citations and extracts are noted with superscript curly braces^{}, where the number in the brace represents the source of the material.

There are five themes presented in this chapter, some of them are broader themes and some are presented as stories. The stories are only parts of a larger whole, selected because they illustrate essential points about the problem domain. Although they may not always represent the *entire* story, I have tried to make them representative. Some of these stories are singular incidents, while others are only examples of phenomena also occurring elsewhere in the organisation. Where other alternatives exist I have tried to ensure that there is no contradicting knowledge in the stories that remain untold. The themes are presented in a slightly different style from the stories, which is partly due to the way research has been performed. Although I have performed quite a few interviews, I have had an even larger amount of conversations and other types of discussions. Although I have taken notes from most of these, these

are not citeable as such. The source material contains a wealth of material about these themes, but no singular “story” that illustrates the depth of the subject matter.

This chapter presents five different, but related themes and stories. Each one illustrates specific points in their own right, and at least the middle three can be read independently. All of them will be discussed more or less separately in chapters 6 and 7. Although they are separate, there is also a certain message in the collection of these. The first theme is about traditions surrounding the creation and handling of documents (section 5.1), describing aspects of a certain *genre* of documents. In the larger perspective this is background and preconditions for the subsequent four stories. The second is about the internal states of documents (section 5.2). The third story is about the historic and present state of case processing systems in this organisation (section 5.3). The fourth story describes the forces at work when defining standards within this organisation (section 5.4). The last story presents the findings specifically related to issues of both technical systems and documents. Although an individual story, this last one also represents a joining of the four foregoing ones, and for the full appreciation of the depth of this story it may be necessary to read the others first. The corresponding discussion of this story (section 7.3) assumes these are known.

5.1 The contents of cases

This section is a theme about organisational culture. In a sense, it is unique, because it describes some principles about *this* organisation and its culture. Through talks with employees coming from other organisations, I have been lead to believe that many of the principles may be common in similar types of organisations elsewhere. Although this theme represents findings in a single organisation, I think it is valuable because the principles it illustrates may have a wider applicability.

An early observation I made about this organisation is the fact that issues are handled through the notion of a case. This rather simple observation leads to the question of “what is a case” — which has turned out to be a very difficult question to answer.

In the words of one of my interview objects, “[Defining a case] is one of the most difficult questions [in this organisation], because different people have different perceptions of a case”^{20}. Describing one perspective on the *case* term she continues — “The Archive sometimes uses the case concept almost as a file cabinet where they put hundreds of documents within the same case, letting a single case span several years”^{20}.

This categorising of “issues” into cases is one perspective on the term “case”. Perspectives from the individual case workers were often quite different. Following this definition of a case, quite a few case-workers have cases that potentially can last for lifetimes. Issues of child care and town-planning are such matters, where following such a definition of cases leads to far too much history being included in a single case.

Some cases, such as permits to serve alcohol, are recurring applications that come at regular intervals^{30}. These are examples of cases that in *one* perspective have a history, while as single applications they will to some extent be treated separately^{30}. One entity processing such a singular case may be responsible for considering historic events, while all the others only consider the *current* application^{31}.

I acquired these perspectives on the nature of cases while trying to examine when a case *terminates*. This was “just as hard a question as that of defining a case”^{20}. Although the *initiation* of a case often is linked to a certain event^{12,13}, the termination is not similarly defined^{20}. I will quite readily admit that I had not given this much thought, but expected case termination to be a reasonably well defined state for a case. One thing I *had* expected was that there were many different *types* of case, and that is certainly true. There are many different styles of work in an organisation of this size^{14,20}.

I will from now on use the term case in the sense of a collection of documents related to a certain phenomenon. This document-centric definition is not particularly broad. In an organisation where the written word is an important means of communication, it may be seen as one of many definitions. Using this definition leads me to questions about the contents of the individual documents.

Upon starting my research on documents and document handling, I had little background knowledge on what to expect of this. One of my initial observations was that there is a very explicit distinction between document *creators* and document *handlers*^{4,5}. This means that document *creators* initially are the only people with the formal right to modify the documents they have created^{4,5}. Although this issue may certainly vary *within* the different departments^{20}, it is quite strongly adhered to between departments.

I tried to determine whether this arrangement was due to legal restrictions or as a practical way of dividing responsibility. The answer turned out to be that it was based on *both* of these. “There is no single regulation in the [Norwegian] law that says it *should* be done like this [...] This arrangement is primarily connected to the organisational model, each department is responsible for their area and the cases within.”^{20} The same person commented that “It is possible to show that there are laws and regulations governing the inter-departmental relationships. Additionally, there are organisational regulations and delegations. We cannot change someone’s case without the respective

party's agreement”^{20}.

It seems to me like this arrangement is chosen because it is a practical way of handling these work arrangements, since it encapsulates complexity. Although the distinction between creators and handlers is quite strong, there are times when practical work arrangements contrast these.

One example of this type of arrangement is when cases ready for political processing are handed off from the departments to the Executive Board's Office. They receive documents from all the departments of the City Government, and do not to any significant extent produce cases themselves^{2,20,30}.

When the Executive Board's Office modifies *anything* in case documents it is by consensus that these are only very slight changes that do not affect case contents, *minor* technical errors^{5}. Formally, any changes are to be done in the producing department, and non-trivial changes will cause the return of the document to the producer^{5,30}. “It is our task to perform quality control, so we are *required* to go through the cases and correct mistakes”^{20}.

This is an important premise for understanding some of the arrangements in this organisation. The next logical question to ask is *what* kind of changes these may be. This is indirectly a question of what controls the shaping of these documents?

The contents of documents is in general governed by regulations within the subject matter^{5}. These rules are often juridical or of economic nature, although there are many other types of regulations governing case contents, depending on the subject in question^{5}. The Executive Board's Office check these cases — “To the extent we understand the content of these cases, we attempt to check that the contents seems reasonable [...] We perform legality-checks, we try to determine if laws and regulations are applied correctly. We also check if the delegated decision-authority is correct [...]”^{5}.

In addition to laws and regulations, there are matters of style that should be adhered to when possible. “We examine the case proposal to see if its understandable, unambiguous and self-explanatory [...] Sometimes we have to make sure the standard template for these kind of documents are followed [...]”^{5}.

The presentations of these documents seem largely to be based on predefined templates in the word processor, or whatever the system outputs as standard^{31}. I tried investigating into the origins of these standards. Although no-one I spoke with knew for sure, all seemed to think that these document templates had evolved over time, and were not based on any known standard — “it has mostly been a question of the preferences of those “on the top”.”^{18}. The word processor templates used in all current systems were created by the system developers in cooperation with the case workers^{5,14,19}.

I tried to investigate to what extent these “standards” were inherited from previous case processing systems and/or based on any formal or official regulations on how these documents get their form and content.

With the introduction of the DocuLive system, the templates were recreated from scratch^{18}. In matters of layout I found that there was large similarities with previous templates. “Earlier templates and historic material has been the starting point of current templates [...] I don’t think there is any Norwegian standard that has been used as basis for these templates”^{18}. Since most of the software in use is specially tailored, these templates have been preserved by the case processing systems^{5,18}.

Also related to the production of documents are the control procedures involved in producing these. The work arrangements surrounding document production contain a large amount of activities that can be classified as quality control^{5}. The municipal departments depend on specialised institution such as Department of Finance and Planning and the City Attorney’s Office for control of case documents. Most documents relating to matters of finance or law will be passed through one or both of these offices^{5,32}. The Executive Board’s Office performs a *final* quality control on all these cases. They check that the necessary approvals are present and other legal and content-wise aspects — before political content is evaluated by the Executive Board^{5}. Most of these instances control selected aspects of case documents in respect to *their* area of expertise^{5}. It is my observation that this form of arrangement may be viewed as a necessity because of the number of regulations governing these matters. With several hundred people working in the City Government departments, there is bound to be a certain employee turnover which also justifies such quality control.

This section has presented some details about documents and cases in this organisation. The next section is devoted to the *state* of these documents.

5.2 The State of Documents and Cases

Upon starting this research, I wanted to investigate subjects related to document contents and states. In the previous section I examined questions such as “Who decides why a document looks the way it does”. In this section I will present a story on the status of documents. This will be about when documents are finished and “frozen”.

Initially, I observed that there are *two* aspects of freezing. One is the situational freezing of document information to allow further processing, although not *officially* frozen yet. The other is the official freezing of documents, where documents are *required* to go unchanged. In this section I will present findings

about both.

5.2.1 Internal freezing as practical work arrangements

One aspect of case documents is that of *when* documents are frozen — restricted from further change. Because the case handling is a continuous process, certain parts of the process need to have reasonably well defined points where work on collections of these documents has to stop. An example of this would be agendas for meetings. The Executive Board’s Office had specific times when agendas for meetings were frozen for further change, typically a certain point of time during the week that would be the deadline. If there was need for further additions, these would be performed on new, additional agendas. In the words of one of the secretaries, “there is always the additional agenda”.

Internal freezing as practical work arrangements are often supported by the system. Although not all of this support has been standard functionality in the case processing systems in use, it has been incorporated into these. Functionality for supporting sub-agendas was implemented specially in both the KSS ^{31}system and the corresponding (similar) DocuLive implementation in the City Council^{42}. These arrangements are interesting, but for this thesis, the other type of freezing arrangements are the primary points of focus.

5.2.2 System Document State and Freezing

This section is about case processing systems and document freezing. In the DocuLive system, there is state information stored for each document. Public exemption status is one of them, governing who has access to what information^{18}. There is also a specialised “document state” attribute indicating what internal state this document has^{1}, conforming to the KOARK standard, which defines three named states for documents. Since the DocuLive system implements these document states but with different names, I will use the DocuLive terms and specify the KOARK terminology in parenthesis in the following description.

The first state, “In progress” (K), means that a document is under processing with the case worker and considered to be a draft or an unreleased item^{1}. The “ready for journal” (F) state means that the document is released from the individual case worker and into the processing apparatus^{1,10}. Since the document is still unofficial, it is not frozen and changes may be made^{10}. The “to journal” (J) attribute is set when the case processing is finished, and the document is released for whatever distribution is deemed appropriate, public exemption taken into account^{10}. When the “to journal” (J) attribute is set, the document is frozen for further changes^{1}. This behaviour is in correspond-

ence with the KOARK standard¹.

It is important to note that both public exemption status² and the internal document-state attribute is stored on a per-document basis^{42}. At least the public exemption state is in violation with the KOARK [15] standard, which specifies that the case folder's status should apply to the documents contained within^{30}. The DocuLive system sets the case folder's status according to the status of the highest contained document within, according to military practice^{30}. This was known at the time the decision to acquire the DocuLive system was taken^{30}.

The actual implementation of the freezing process is also interesting, with regard to *what* is being frozen. Some initial background is needed in this respect. Upon creating a new document, the individual case workers in the departments enter document information into the DocuLive system. Recipients, document title, references, keywords, public exemption status and the archive code of the document is among this information^{12,13}. The DocuLive system then uses the word processors merging functionality to insert this information into the standardised document templates^{18}. This is a one time operation, and any changes made to the same information within the word processor is not propagated back to the DocuLive system^{18}.

The freezing functionality of the DocuLive system only freezes the stored documents, and most of the document *information* attributes are left unfrozen^{13}.

Legally, public documents *are* frozen^{32}. Once these are distributed to their recipients and stored in the archive, the possibility of recalling a document is lost. This is enforced by the DocuLive system, once the “to archive” bit is set, the document *must* go to the archive^{10}.

Most of the documents in this study have the common characteristic that they have an audience within town hall, in addition to whatever *other* audience these may have^{30}. The number of organisational entities involved may vary, but there is always a quality control aspect before a document is marked as “to journal”^{30}. Freezing does not apply to an internal document before it has been approved.

Although I have observed several different forms of freezing, there are some typical elements common in most of them.

The Executive Board's Office produces protocols from meetings. These are distributed internally first, including the archive^{30}. Because the internal distribution often includes various forms of attachments, this distribution is

¹This is also commented in Siemens Nixdorf's reply to the requirements specification set for the DocuLive system

²Controls availability of documents outside the organisation, defined in section 2.4.2, on page 26.

often quite a large copy job^{31}. The external distribution usually happens the day afterwards. If errors are caught in the internal distribution, a new copy will be distributed^{21}. The KSS system in the Executive Board's Office does not have any document states, so such a remedy for correcting errors is possible^{21}.

Other entities also distribute finished documents internally in the organisation^{42,44}. These are technically the final result, although the "To journal" state has not been set^{44}. This is due to the fact that eventual errors in these documents may be found by the receivers, who are usually familiar with their respective cases^{42}. If everything is in order, these documents will be the ones that are publicly available. Since the transition from the distributed document to the final document is practically invisible, it also has the effect that the "to journal" attribute is often long delayed in actually being registered in the DocuLive system^{44}.

I had several indications that the use of the "to journal" flag often was delayed until some time after a document was actually finished, since the wider internal distribution of these documents only happened straight after these attributes were *supposed* to be set. This allowed for the correction of errors caught in this last distribution, as an additional level of quality control.

Another issue regarding the ending of cases came up in an interview with a "recently" employed person. At the end of an interview, noticing a stack of case folders on a cupboard, I asked her what they were. "Oh, that's cases I'm finished with — I don't really know what to do with them"^{11}. Being a helpful spirit and at that time reasonably knowledgeable about how cases were handled, I suggested that the archive may be the appropriate place. A month later I had some follow-up questions to ask to the same person. Seeing what looked very much like the same stack of case folders on the same cupboard, I could not refrain from asking what had happened. Her response was "Well, I talked to the archive, but decided to keep them here for some time anyway. It's nice as a reference"^{11}.

As a contrast there were other (more experienced) case workers that sent some documents "to journal" the moment they were written^{12}. The stacks of cases I observed in *their* offices were perhaps just as large as the one I observed in the newly employed case worker's office. The reasons for keeping them were either because they didn't really know if the case was over, certain documents were at some other place or because of reference value^{12,32}.

5.3 The Story of Case Processing Systems

The introduction of DocuLive is in itself a story with an interesting background. Before the introduction of the DocuLive system in 1994, there were three different active case processing systems in what can be seen as the same document flow.

Before discussing these systems, some initial remarks about these systems are required.

Most of these systems come in modules, to allow the individual customer to use whatever modules they feel are appropriate. There are typically separate modules for case workers, the handling of meeting & committee and for archives. At least with the DocuLive system, these do not have to be implemented simultaneously.

Case processing systems as used in this type of administration are at a *minimum* adapted for the Country of usage. Because of differences in regulations pertaining to public administration, these are not systems that are normally produced for broad, international markets — at least not within public sector. All three of the original case processing systems were developed in Norway and at least initially targeted for Norwegian customers. Even for those systems targeted at the Norwegian public service customers, there are major differences in the capabilities of these systems^{14}.

In this section I will initially focus on the historic experiences with the different case processing systems, and I will show how this history has affected current choices regarding case processing systems, and how they will continue to affect them.

5.3.1 The Departments, NITSak and DocuLive

NITSak, developed by the Norwegian company NIT, was the previous case processing system used by the departments of the city government. In the words of one user, the system was “suited for the task, but largely unavailable”^{10}. The primary problem with NITSak was that the total system was quite incapable of handling the load generated by its approximately 200 users^{14}. This was for quite some time worked around by allowing users to use the system in *shifts*^{14}. The intention of this shift arrangement was to make sure there was at least a minimum of production in a rational manner^{14}. Several of my interview objects described 5–10 minute waiting periods to switch *between fields* in a single screen^{10,13}. Although I had no means of verifying the exact details of these claims, I have little doubt that the system was painfully slow for the users.

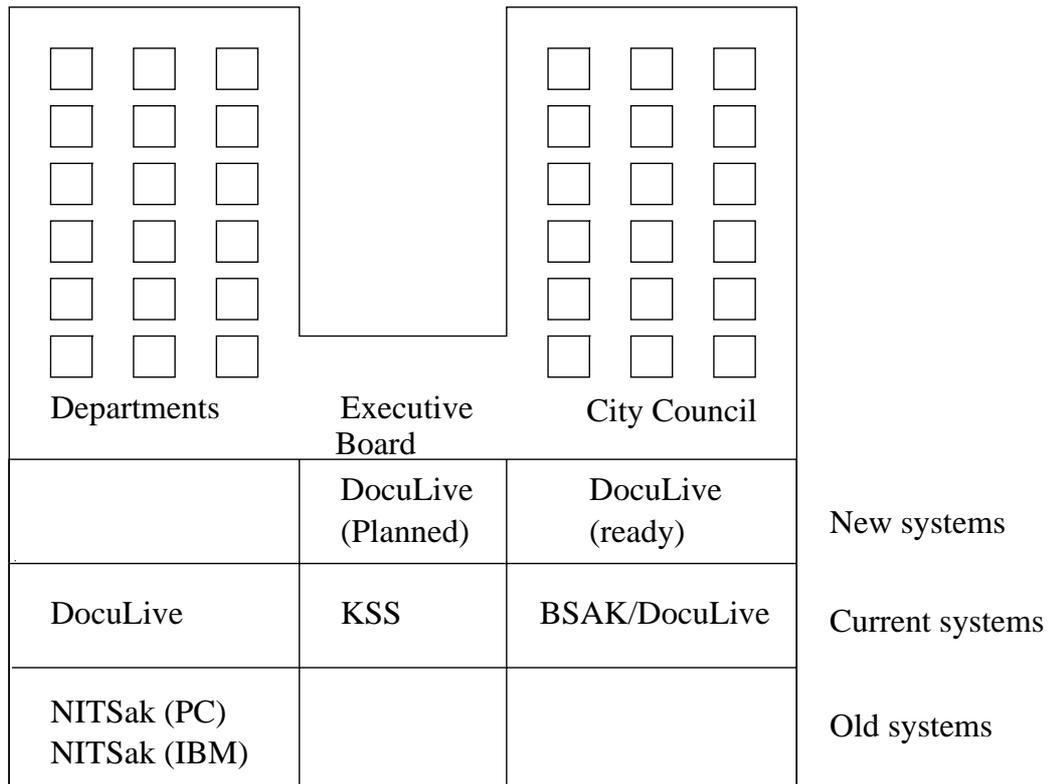


Figure 5.1: Overview of old (but recent), active and new systems

Technically the system was based on flat file storage, and the indexing mechanisms for search & retrieval were quite unstable^{18}. If the index became corrupt, it would have to be re-built. “Indexing the system took 17-18 hours. [...] It ended up with one of us bringing a powerful PC home, and starting the indexing. The system had to be indexed sequentially, it could not be done all in one go. We had to set the alarm clock at 2 am, get up and start the next indexing process”^{18}.

The situation got worse as the amount of data in the system increased, and in the end there was little choice left^{14}. The problem was regarded as fundamental enough to require a switching of systems^{18}. At that point in time, the City Archive had already decided that DocuLive was to be one of the two chosen systems that were to be the new product standards for case processing systems in the City of Oslo^{18}.

Another important factor that triggered the change was caused by external events in the market^{14}. One of the IT strategists described the early nineties as “a period of consolidation on the supply side”^{14}. Previously there had been a lot of different suppliers of case processing systems, and the market was complex due to shifting alliances and numerous products. Although there were several large suppliers, it was quite unclear which products and suppliers

would survive^{14}. “At that point in time, NIT had several competing development teams. They had one team maintaining NITSak, and another that was building the Office2000 concept”^{18}. In the consolidation phase a number of smaller suppliers were taken over by larger companies, and quite a few products were phased out^{14}. After this phase, the market for case processing systems became clearer, it became easier to make *committing* product choices^{14}.

The decision to change system was taken, and the introduction of DocuLive was done in a short 4–6 month period starting November 1993^{6}. This short time frame was possible because the DocuLive system contained a standard module that was usable with small modifications^{6}. Considering the fact that it *still* involved adaptations of the software and training for approximately 200 people^{6}, this was no small feat.

5.3.2 The City Council, BSAK

On the other side of City Hall is the City Council. At the time of this study they were also implementing the DocuLive system. They had been running an implementation project for a substantial amount of time^{32}. While the basic political process in the City Council is very much the same as the City Government, the *focus* is different^{42}. The City Council has a large number of committees connected to its case flow, whereas the City Government in a sense only has one — the Executive Board^{42}.

The City Council was also implementing more modules of the DocuLive system^{18}. The DocuLive supported cooperative effort in the City Council also spans more *organisations* than in the Executive Board^{42}. Their archive was operative using the system, while others were in their final steps of switching^{18}. Their implementation and design effort has been somewhat wider than what the departments of the City Government had to go through^{31}.

At the time of writing some were still using the old case processing system called BSAK. The City Council’s Secretariat were doing final testing of their conversion process from the BSAK system^{18}.

The design and implementation efforts around the DocuLive system in the City Council and the departments of the City Government have been largely independent efforts^{32}. The same technical people have been involved on both sides, but there has been little *case* related cooperation^{14}.

5.3.3 The Executive Board's Office, KSS

The KSS system is used by the Executive Board's Office to handle case activity related to the political process in the Executive Board. In relation to the document flow, the KSS system is the last link in the document production chain from the City Government to the City Council.

The KSS system has been in use since 1988, and was originally supplied by a company called Rjukan Data^{30}. According to its users it has been very well suited to the task at hand^{31}.

The biggest problem with KSS is the fact that it does not run in the Windows environment^{30}. This means that the system is very difficult to integrate with the standards that are otherwise set for administrative software in the city administration^{30}. It also has the effect of stopping the implementation of the standards in the cooperating departments, since they must make a certain effort to be compatible with the Executive Board's Office^{30,31}.

One example of this may be seen in the use of word processing systems. City Hall has set a local application standard for word processing based on Microsoft Word^{14}. The KSS system is based on usage of the MS-DOS version of Word Perfect (version 5.1). The DocuLive users in the departments use the Windows version of Word Perfect (version 5.2). As a result of a *later* decision to standardise on Microsoft Word, the same DocuLive users use Microsoft Word for non-DocuLive related word processing^{14}. To remain compatible with the Executive Board's Office, Word Perfect remains in the DocuLive system^{10}.

The MS-DOS version and the Windows version of Word Perfect are not fully compatible^{4}. The MS-DOS version cannot read tables created with the Windows version. Tables are quite frequently used in case documents^{4}.

The Windows version 5.1 of Word Perfect, which supposedly *is* compatible, was rejected because it was seen as too bug-filled and resource demanding. When moving to the Windows-based platform it was seen as gainful to switch to a Windows based word processor^{14}. At the time of the DocuLive implementation in the departments, version 5.2 was regarded to be the best choice^{18}.

As a consequence of staying outside the local standard software solutions, tuition and maintenance must be done specially for the Executive Board's Office^{32}. This gives the users a quite clear feeling that they're outside of the normal routines for support and updates^{4,32}. It also delays commitment to organisational technological innovations for all the other users that are connected to the same case flow, because they have to keep dual systems for compatibility^{30}. Many DocuLive users in the departments will also have to undergo *additional* Microsoft Word training, because their current Microsoft

Word usage has been very limited^{18}.

Another problem with the KSS system is that it has tendencies to restart or hang the computer at irregular intervals, often several times a day^{31}. The worst part about these hangs is that their frequency seems to be on the increase, and new types of crashes are showing up^{31}.

According to one of my interview objects, Rjukan Data was more or less swallowed by NIT (a competitor) in the consolidation phase mentioned in section 5.3.1^{31}. The same source commented that “most of what they had known as Rjukan Data disappeared in the merger. Finding the people with knowledge about their KSS system was becoming increasingly hard.”^{30}.

The KSS system has only partially been updated to handle recent evolutions in case processing^{31}. Further development on the system has been reduced to a minimum, including bug-fixes and all but the most needed maintenance. The decision is also based on the fact that the KSS system is not compatible with the City’s long-term strategy, and efforts are being made to stay with this strategy^{30}.

The DocuLive effort is in its earliest phases. At the end of this study, the leader of the Executive Board’s Office had located most of the parties involved in acquiring a new system, which leads to another interesting story.

5.4 The requirements setting of new case systems

In this section I will describe the organisational routines used to set requirements for new case processing systems. Since it has turned out that requirements setting is quite closely linked to creating arrangements that are possible to *maintain*, I will also discuss these arrangements.

The organisational routines for handling system implementation have changed substantially after the 1993 reorganisation of the service functions within the City Government (see section 2.2.5). Before this reorganisation there was a large IT-staff that could help handle systems development and maintenance^{14}. After this reorganisation there was only a minimal organisation left to handle these functions^{14}. To cope with this situation, it was decided to put the responsibility for these systems closer to the end users than earlier^{14}. The current strategy is based on a concept of a system *owner* and a system *maintainer*. The system owner is in charge of the system, and decides what (if anything) to do with it. The maintainer is responsible for the *professional area* covered by the system. Typically, the City Archive is the maintainer of the DocuLive system because it can be seen as an archive system. The depart-

ment of Culture and Town Development is the system owner, because they are one (of several different) parties that are responsible for the evolution of administrative routines^{14}.

This system of maintenance puts the responsibility for systems closer to the case-work knowledge, where it previously had been more in the hands of technologists. There was awareness of this shift in perspective and the possibilities and limitations of such a situation^{18,32}. While placing systems development responsibility closer to the end users, there is the problem of technical knowledge among these users. “[The people in the departments] are very knowledgeable about case processing, but they seldom have technical knowledge at the appropriate level”^{14}. It turned out that there was a more underlying problem to this situation: On several occasions I heard statements to the effect that “it is not hard to get people with intimate knowledge of *either* case work *or* in-depth computer knowledge. Finding people with knowledge of *both* has been a problem. When seeking this kind of knowledge we are in a large market, with quite a few other actors as well. There are not many people with this combination in this market”^{14}.

The decision to trim the size of the administration in 1993 was a political decision. Once this decision was taken, there is little the administration can do but to adapt to the new conditions^{14}.

5.4.1 Requirements

The new system has a complexity that is worth investigating. If one starts at the beginning of the process of acquiring a system like DocuLive, the following root definition of a system is possible:

“A system to create requirements for development of a computer support system”

This system is needed both for initial implementation efforts and for subsequent adaptations. With this root definition, I have made the following rich picture portraying the situation seen from this perspective.

The figure is largely focused on what influences the *requirements setting* of new systems. The different units all pose requirements for whoever wants to implement new technology.

I will now give a brief presentation of the different items in this figure. The KO-ARK standard (see section 2.4.1) is an important requirements-setter in this system. Stating a set of *required* and some *desired* functions for these systems,

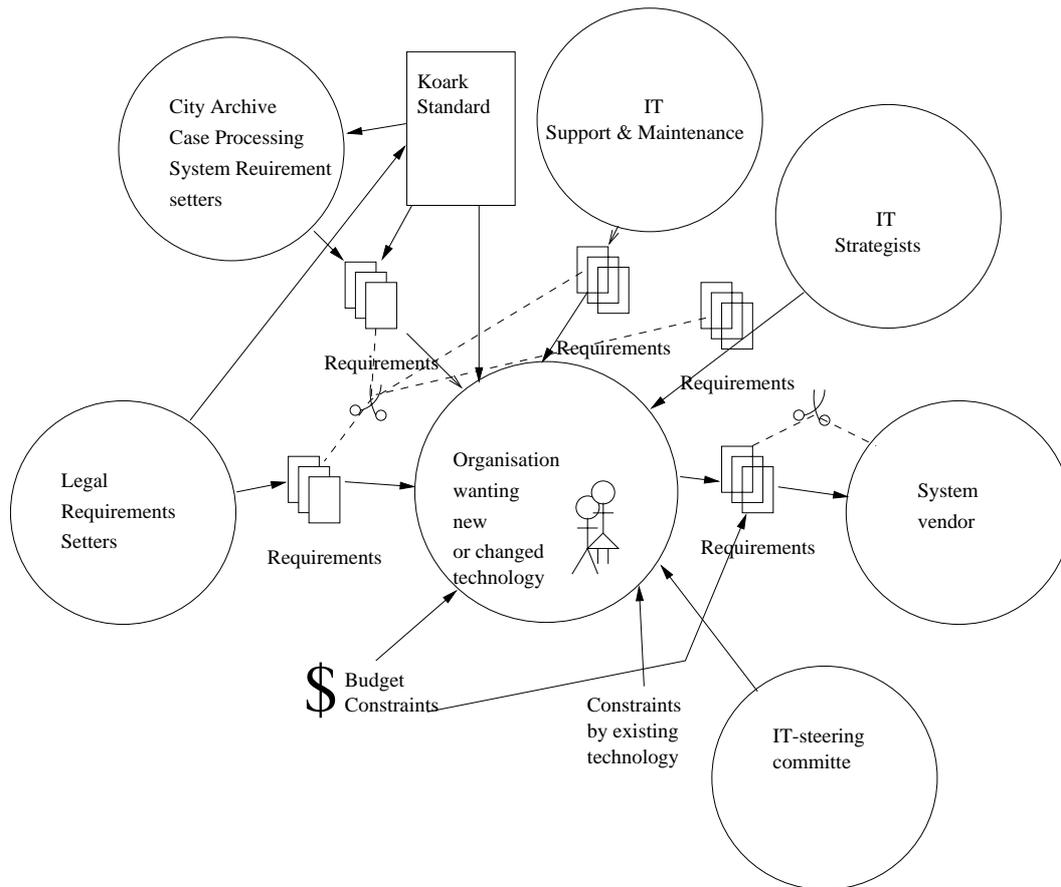


Figure 5.2: Rich picture of requirement setters of system

it was a document referenced by case workers, technologists and archivists alike^{6,14,30}.

The legal requirements-setters consider implications of new types of work arrangements. Many of the most common legal requirements for these systems are specified directly in the KOARK standard. Indirect requirements may be posed by other arrangements, and these will be considered. This is not a single group, but these concerns typically come from departments concerned with organisational structure and economy.

The City Archive is really a specific instance of a legal requirements setter, responsible for assuring that regulations concerning the use and storage of documents are upheld. The City Archive is also in a special position in relation to the KOARK standard.

The IT strategists have concerns about product choices and implementation of technical standards. These supply *one* set of technological requirements. The IT-maintenance department sets an additional set. While the IT strategists might suggest that *databases* be used for the storage of case information, IT-

maintenance might supply the additional constraint of using a *single* product.

All these requirements form the combined attributes for the requested system. If budget constraints have not been felt *before*, this is certainly one place they will be felt. Feedback from system vendors on *cost* will have a consequence on the priorities of these combined requirements. One example of this is when the departments decided to *stay* with the military grading system instead of converting to the KOARK-specified system of grading.

The difference between this new situation and the old one is not just one of moving responsibilities around. There is also a certain commitment going in the direction of standardised systems. As one of the secretaries put it: “To this point, we have always gotten the systems we wanted, because the systems were tailor made. This may change now, because we will be trying to implement a standard version [of DocuLive].”^{30}. As to the adaptation of standard systems, one of the technologists described the DocuLive effort like this: “It has been attempted to adjust routines with the implementation of DocuLive, but it is equally true that it has been attempted to find a tool that is suitable to the way case processing work is done. [...] There is little doubt that systems evolution has gone in the direction of satisfying the way case processing has been traditionally done in City Hall”^{14}.

All plans related to new systems also have to go through the IT steering committee, which has representatives from the City Government, the City Council and the City Hall administration services^{18}. “[These meetings] are where the contacts are made [...] All systems that are to run in the common City Hall network are to be accepted by this committee, although it is not exactly a strictly formalised procedure of acceptance”^{18}.

In designing new modules for the DocuLive system there was also a certain awareness that an optimal solution could not be reached on the first time, and incremental strategies were seen as sensible and necessary^{6}.

This has been a brief summary of the factors influencing the internal requirements setting of new computer systems. It should be warned that this definition is probably incomplete, but all the major ones are included. Relationships *between* the units external to the system developing group are not included.

The relationship with the suppliers also plays an important part in this scenario. A lot of the relations with the vendor can be contractually controlled. Experience with this had shown that there were some subtleties of systems development that could cause problems. During the initial adaptation of the DocuLive system, the external consultants that performed the requirements analysis had discovered that the internal classifications used by DocuLive as to *who* had access to *what* documents was unsuitable to the way work was performed in the municipal departments^{8}. The municipal departments controlled access by department and section as opposed to case worker. This

change had been made to the adapted version of DocuLive without actually notifying the municipal departments of this change. With the next version of the system, the same change had to be remade (and re-paid)^{8}.

Yet another type of constraint that can be observed with the implementation of new technological systems is the system's dependence on the appropriate technology^{14}. Most of the terminals in use at City Hall are PC compatible machines, and many of the machines I saw were quite close to the specified minimal requirements for the DocuLive system. A few machines were technically within the requirements for DocuLive *alone* but not together with the rest of the standard package in use at City Hall. This had, according to one of the IT-strategists, "the effect of reducing the positive effect of the investment in the DocuLive system"^{8}. While he thought most of the functionality he had used was reasonably good, he thought the overall lack of client machine capacity reduced potential productivity gains substantially for many users.

This first rich picture represents the implementation and change phase of system implementation. After this phase there is what I would call a "sustainment" phase, when regular maintenance and training are the most normal activities.

5.4.2 Maintenance

After the initial, acquirement phase of a systems development and implementation project, there is a more stable phase where a system is maintained for everyday operation. The DocuLive users in the departments of the city government were in this situation. I will suggest the following root definition of this system:

"A system to sustain efficient case handling through the use of computer technology"

With this definition, the users of the DocuLive system are dependent on the IT-department for support and the maintenance of DocuLive and the centrally run database system. As well as the central support from the IT-department, support has been distributed to the individual departments. This is mostly to the anterooms, and the local person in charge of support gets reimbursed for the added burden with one step up on the pay-scale^{10}. This solution seems to work well.

The dependence on the maintenance of the database system is totally directed at the IT-department. This dependence can also be seen as "dependent upon the proper operation of complex technology", which places the responsibility in the hands of the developers of the components that form the system. It can

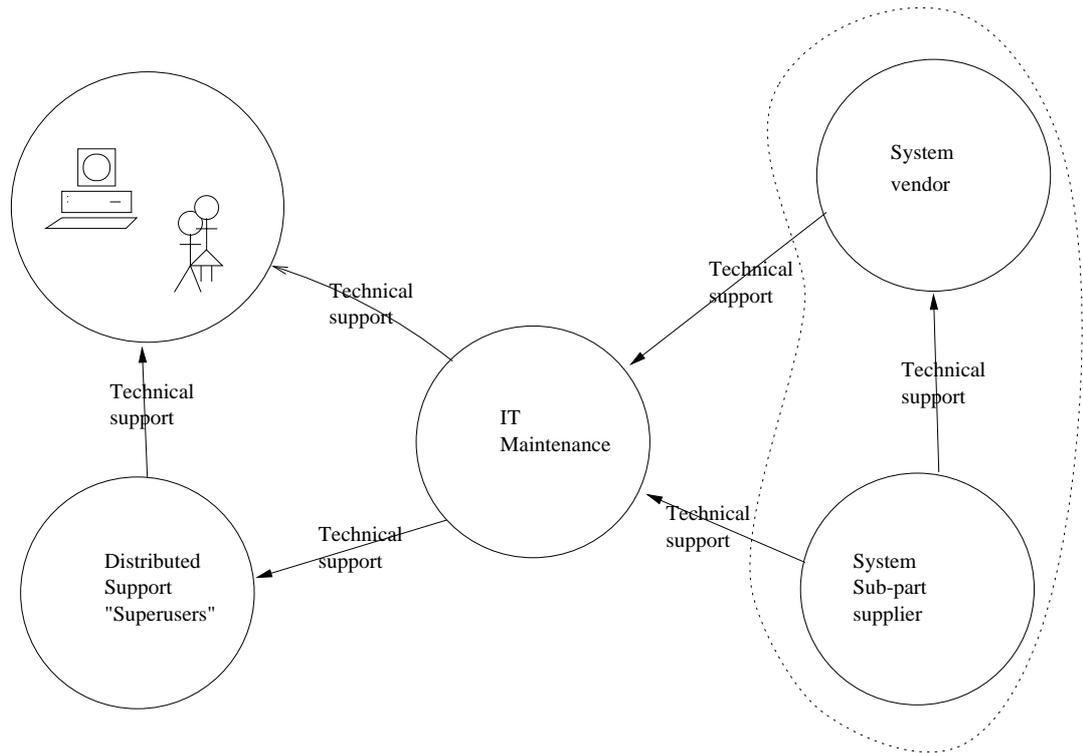


Figure 5.3: Rich picture of a system for sustainment of efficient case handling through the use of computer technology

be taken as a sign of trust in the IT-departments competence that most users perceived the dependency to be of the second type. From what I understood, quite a few of the problems with the DocuLive system *were* also of this type.

5.5 Case documents and technical systems

The Executive Board's Office currently distributes approximately 2 million copies of paper documents annually to the central administration, the Executive Board and other parties^{30}. A large portion of these documents go to a list of approximately 40 recipients. With this in mind, I performed some queries as to the intentions of implementing systems for electronic exchange of documents.

With the introduction of the DocuLive system, the subject of electronic documents and EDI had been under discussion in the organisation, but had currently been deemed infeasible. The reasons for this were numerous, the most obvious reason was perhaps the lack of resources to try such efforts^{1}. The lack of resources was to some extent justified by the more underlying technical reasons for why this could not be done. The singular most important

reason being the lack of longevity of electronic documents^{1}. Past experience had shown that there was no technology available that could guarantee the required document lifetimes, sometimes far in excess of 50 years^{1}.

The technical aspects of handling authorisation and authentication were also mentioned. Since to their knowledge there were no available products that would handle *all* of these functions with the required level of robustness it was generally regarded as something for the future by those I interviewed on this subject^{1}.

There is a large diversity among the users of the DocuLive system. *Most* of the current intended users *use* the DocuLive system^{14}. Some of these users may use it very infrequently, perhaps only a few times a week^{14}. The majority use the system daily, and some users spend a large portion of their workday using the system^{10}.

5.5.1 Official versus Product Standards

This is the story on the use of standards. My interviews and conversations on standards are largely represented by technologists in the organisation.

My first observation was that these technologists seemed to be quite aware of the problems facing the use of case processing systems^{14}. On the use of international standards, one of the technologists had this comment “IT is not exactly a highly standardised area, the standards lag substantially behind in time, and many areas are not covered”^{14}.

“[...] we want to use international and European standards, and supplement with Norwegian standards where necessary. But, IT is not really well standardised, the standards are far behind and some areas are not covered.”^{14}. In areas where the proliferation of the “official” standards were low, product standards were chosen instead^{14}. “We make a selection in the market, and make our choice, simply to be able to achieve a sensible form of interaction between systems”^{14}. The DocuLive standard is one such example, although it should be noted that DocuLive quite closely follows the Norwegian KOARK standards. The problem is that this is only *one* area of standardisation for such systems, and this is really just a minimum^{14}.

On questions regarding the use of such standards as SGML, I had several responses along the lines of “SGML is fine, but there are so many other things involved in changing systems, that the storage *format* of text is really just a very small one. Although SGML may be a solution to the document *format* problems, there are many other standards in systems like ours that are missing”^{14}. “It’s really as question of what we lose. We *know* that document conversion is imperfect, but we would also lose things with SGML. You really need

to ask what you *want* from your documents. Most solutions have different strengths”^{18}.

An interesting remark in on the subject of the process of *converting* between systems was on the role of external consultants. “We have also needed to spend time controlling hired consultants to perform certain tasks. It is not unproblematic to use these, also seen in relation to our own resources”^{14}. Another related comment was that “on the subject of documents, we have had *little* troubles hiring external consultants to do the conversion between systems and formats”^{18}.

While quite a few people knew of document standards such as SGML, enthusiasm was generally not an association I could connect to the way these were mentioned. “Why be enthusiastic about SGML when there are so many other problems that are unaccounted for and take much more time to handle ?”^{14} File naming and storage location conventions, appropriate data content (data quality) and similar were seen as issues that could take *months* to convert to a new system, conversion of formats was quite widely viewed as a *script* and the appropriate conversion tool^{42}.

In my interviews with “technologists” the enthusiasm for standards like SGML were moderate — since very few applications supported standards like this it was mostly seen as something for the future. Establishing local standards on proprietary applications, like standardising on *one* word processor, seemed to be the initial scope of ambitions. “Our initial situation was that we had six word processors and 13 databases in active use. Reducing these numbers was seen as the most important task. Although the cost of converting data is *present*, it is very quickly repaid in terms of less maintenance and conversion work. In our original situation, only a couple of weeks reduced maintenance cost might be enough to cover the cost of converting the contents of these systems”^{18}.

5.5.2 The details on stability

In all of the interviews where I spoke with my interview objects about dependencies, there was one very common theme — namely that of dependence on technology. Whereas system stability with the DocuLive system was much better than with their previous system, there had been enough incidents of technological instability to make most users aware of how dependent they were on this technology. Most work seemed to stop within a relatively short time after computer systems stopped, as I witnessed several times during my studies.

Most of the case workers I interviewed seemed more than happy enough to comment on the instabilities. “I think the entire City Hall Network has too

low up-time. Quite often we get a message that we have to stop doing whatever we are doing because something has to be done, or there is something wrong with the database and everything has stopped”^{13}. Curious about the nature of these instabilities, I inquired in the IT-maintenance department about these.

One of the IT-maintenance people aptly put it this way: “In terms of system stability, users have a short-term memory. It does not matter how good your historic achievements are, if your system suffers stability problems in a period of two or three weeks, your system is no good”^{18}.

“The users generally don’t care about the *reasons* for a system being down. If the system cannot be used, it’s down. If someone has decided to cut the supply of electric power on an entire floor of the building without telling us, things will stop other places as well, especially if they take the routers. It doesn’t matter if the database is crashed or someone working on the elevators suddenly needed to cut the power.”^{18}

The IT-maintenance department keeps logs of all down-time, and I examined these. The source data was divided into categories of problem and zones. The system *is* to be available all days from 08:00 to 19:00. I have excluded data from the logs that are outside this “red” zone.

The numbers in this table represents all types of incidents that affected users by creating down-time. The reader should be cautioned that these numbers include everything from one minute glitches to three hour stops. The numbers from 1994 are not for a whole year, since the log was started in 1994.

	1994	1995	1996
Database	2	2	2
Fileserver	0	4	10
Network	1	3	1
Other	2	2	0

One technical problem *not* included in this table is what was dubbed as “The Sunday Problem”^{33}. The system had stopped seven Sundays in a row in 1996 in conjunction with the full weekly backups. This turned out to be caused by incompatibilities in the server software. One component (NLM) on the server had been upgraded and there was an additional upgrade for another component that had to be done *because* the first update had been made^{33}.

5.5.3 The story of passwords

One of the most frequent complaints I heard about the technological system as a whole was on the subject of passwords. Logging on to the network required no less than *four* passwords to be entered. All of my interview objects that I asked to show me the system complained about these.

There four passwords are for:

- Network logon
- Electronic mail
- Database logon
- DocuLive logon

Discussing this with the IT-maintenance people, I was presented with the following situation. “Our file server, a Novell system, does not currently communicate security with the database server running on Solaris. We have investigated into the use of standardised password/security servers, and found that such a solution *may* exist. This still leaves out the e-mail system, which is an older application, which will certainly not be able to talk to such a server. And then there are some users using the IBM main-frames, which would also probably be outside such a system. This is a situation where both our knowledge of technology and the actual technological abilities combine to form the problem. This is also a question of resources”^{33}.

5.6 Summary

In this chapter I have presented some of my empirical findings. They have been focused around the subject of documents, organisational issues related to this and the technological systems in use. In the next two chapters I will discuss these stories, in light of theoretical findings in some of these areas.

Chapter 6

Documents

In this chapter I will discuss the use of documents and its relationship with document systems and the organisation using these. The first research question focussed on is if it is *possible* to create systems support for practical action. At a more detailed level I also focus on the freezing of documents, how are documents frozen?

This last question is motivated by the desire to connect electronic publishing to an existing document production and handling system. The empirical situation and the second research question is also an instance of the type of problems that are encountered in real systems, reflecting back on the first research question.

6.1 The Practical Action of Document Work

As shown in the chapter on my empirical work, defining the concept and scope of a *case* is not a trivial task. Since this is somewhat beyond the scope of this thesis, I will not discuss this definition.

Understanding documents is not much easier, but this *is* within the scope of this thesis. Initially in this section I will discuss some of the work arrangements surrounding document production. How well does the practical action of this type of document production work transport into computer systems?

The tension between formalised “proper” case handling procedures and the actual use of data is interesting in terms of system support. The distinction between document *creators* and what I in section 5.1 called *handlers* is interesting in this aspect.

The creator/handler principle is not based on explicit regulations. The *intent* of this principle is grounded in other regulations, such as delegation of au-

thority. If a department has received delegated authority to handle a case, it follows from this arrangement that people *outside* this department normally should not modify their cases on these subjects. The principle is justified by the *large* number of such delegations that exist.

Performing quality control is a central part of the Executive Board's responsibility. Not wishing to be a bottleneck in such a process, it is seen as practical to let minor modifications be done there. Information about such changes are to be provided to the document originators.

This arrangement is in contrast, but not necessarily conflict, with the principle of creator's sole right to change. Furthermore I have reasons to believe that these types of arrangements may be common, as negotiated arrangements between individuals or groups.

Building computer systems for support in this type of arrangement poses several interesting challenges. Systems can be built enforcing the principles ensuring the creator's unchallenged right to keep their documents unchanged. Since changes *do* occur anyway, such arrangements would probably lead to what Gasser [9] describes as work-arounds.

Suchman [28] has shown how practical work often diverges quite strongly from formalised models of work. Suchman suggests that the view of office work as *procedural* by nature has led to the belief that office procedures may be specified and represented as a prescribed sequence of steps. She suggests that this view has been enforced by views from Management Science implying that activities not representable in this form somehow undermine objectives of rationality and control [28, p. 321].

Suchman suggests that the weakness of procedural views of office procedure may be a problem for which there exists no cure. As a consequence of this she seeks to establish alternate measures. She suggests that the measure of *practical action* might be a good one.

The view of work as practical action involves examining what people actually *do* when performing work tasks. The practical model of work contains what Gasser describes as work-arounds. The practical action of the quality control arrangements contain complex organisational interdependencies, that may to some extent be individually negotiated. These may not be visible in strictly formalised descriptions of the same work. It is my opinion that ignoring such interdependencies is risky, because one is in effect ignoring the way work is done.

Laws and regulations are also subject to interpretations. Creating computer based work arrangements that uphold the intentions of these regulations is also a matter of judgement. Another issue in this problem is one of *precedence*, in which order should these concerns be evaluated? This type of administration

very clearly gives the legal concerns the highest priority.

It is my opinion that implementing a “practical action” model of work into a system for supporting this functionality is not a trivial task.

While observed practical actions taken in a certain situation reflect interpretations of intentions of these regulations. Practical action is not only based on the limitations of the computer system, but also on interpretations of the regulations in question.

Reaching an agreement on what types of such agreements that are feasible and allowable is difficult. In my opinion it *requires* the involvement of the actual users of the system. Their knowledge of the problem domain and the restrictions that apply is essential to developing good systems. Creating such systems implementing practical action is a highly moving target.

Assuming that the appropriate internal agreement can be reached, there are several interesting long term-perspectives in such arrangements: Implementing such an arrangement can be seen as a further *accept* of such an arrangement. Although such changes already are routine, creating system support further cements this type of arrangement. Unforeseen long term effects may also arise, since such built-in support may change the attitude towards modifying documents, since users of such an arrangement may lose contact with the original intent of the function. Such long-term effects may not be *undesirable* as such, but they need to be taken into account.

These issues are unfortunately very hard to determine up-front. Examining similar cases may reveal some information about such long-term effects, but only an actual implementation will tell what these actually will be.

It is my conclusion that yes, it *should* be possible to create systems supporting practical action in such an environment. On the other hand, if legal constraints have precedence in shaping formalised work descriptions and practical work, implementing such action may only be a theoretical possibility. The complex relationship between regulations and interpretations of these and work may be extremely hard to make sense of.

6.2 Document and Organisational States

With the emergence of electronic publishing and the availability of new media, there has been some discussion as to the nature of documents. Drawing distinctions between what *is* a document and what is *not* has become increasingly harder. Quite a few researchers, such as Levy [18] and Brown & Duguid [3] have long since left the notion that documents are by definition bound to paper.

Television broadcasts, Web pages and the like are included in their definition of documents. While an interesting question, the scope of the concept of a document is not a subject of this thesis. Certain attributes of individual documents may have implications for the design and use of computer systems for document use, and these *are* the scope of this thesis.

When examining the *attributes* of documents, a number of different issues come up. Levy & Marshall [19] suggest two important characteristics of documents, the rate of change and their duration. Over a certain period of *time*, the rate of change for a document can be fixed (unchanging) or fluid (changing). The useful lifetime of a document can be permanent, of long duration, or transient — of short duration.

The organisation studied in this thesis produces a number of different types of documents, most of them of the traditional paper based kind. The KOARK standard *demand*s that all case documents have paper representations. Almost all documents that reach the outside of this organisation are fixed documents with a long lifetime. The questions asked in this section will therefore not be whether these documents *are* fixed or if they *have* a long lifetime.

Levy [18] suggests that documents will fluctuate between the fixed and fluid state in the progress of a document’s lifetime. What can be fixed at one time can be fluid at another. I will focus on the subject of the *freezing* of documents, and what phases they go through before entering final fixity. How do these documents *become* fixed? Before these documents are frozen there are work activities involving the production of “freezable” documents. What implications do the work arrangements surrounding these documents have for the computer systems used for the creation of these documents?

Recapitulating the chapter on my empirical work, there are quite a few different states of documents within this organisation and the computer systems they use.

Public exemption state and document state are perhaps the two most important. Public exemption is a large subject by itself, and I will not go into this in this thesis. The internal document state is the focus of this section. This document state had three possible values within the DocuLive system, which is compliant with the KOARK standard.

KOARK	K	F	J
DocuLive	In progress	Ready for journal	To journal

With regard to freezing of documents, my empirical observations indicated that there were two distinct types of these — temporary freezing as internal work arrangements and permanent document freezing. I will focus on the latter type.

Manual freezing of documents is performed by delivering the documents to the respective archive. The electronic copy of the document is still available for editing. The freezing is controlled by *people* in the archive.

Because the DocuLive system freezes document on the “to journal” flag, this function in the system is often unused, or left until a later stage when the person in charge is sure that these documents are finished, perhaps when cleaning up excess papers in the office. It is not a part of standard procedure for the archive to *demand* documents from anyone.

The empirical work on this situation has revealed quite a few of what Gasser would call work-arounds to alleviate the situation around the freezing of documents.

Levy [18] suggests that the fixity and invariance are important attributes of documents. “Genre, by providing the characteristic form of the document for a particular kind of setting, clothes or dresses up fixity in a format that suits the kind of work it is being called upon to perform” [18, p. 26]. Levy suggests that documents will go through phases of fixity and fluidity, which is also the case in this context.

The final fixity of the documents in this genre is quite absolute, as these are documents of legal and political events that will remain. Although a given decision may be superseded by a new one, the original decision will remain as a historic record.

It is my opinion that the currently used document states to a large extent are based on the needs of the archive. In use for the rest of the organisation, only one of these transitional flags carries meaning, namely the first document state. In terms of document *use* there is at least one more state, that of a *finished* document. Although states are frequently forgotten, there is little problem with this in the current situation.

If introducing external publishing, matters become a bit different. In practice documents *are* frozen when they are *finished*. The problem lies in the work-arounds that occur related to the freezing process. The view of freezing as formalised action makes it instantaneous, the practical action-view of the freezing process makes it gradual. The problem is determining *when* documents are finished.

For the DocuLive users, the built in system support for freezing in the DocuLive system is from the “formalised action” perspective. The work-arounds sometimes cause case documents to go for a long time without being marked as frozen, although they may have been frozen a long time ago. There is little reason to believe that a correct and updated extract of information can be acquired. The extraction of data from such a system for the purposes of electronic publishing is hampered by this fact.

The solution to this problem may lay in accepting the existence of such a work-around and implementing the *action* of the work-around into the functionality of system. A possible strategy is implementing freezing by deadlines. This would allow changes to *still* be possible in the space between setting such a flag and the deadline. Although I would be wary to suggest such a solution across the entire system, it is clear to me that such a functionality may be one of the few ways of ensuring that documents are released at the proper time, and also ensure the options of last minute changes.

The formal classification of such a document state is interesting. Within the regulations governing public availability of such material there is no such thing as an *available* and simultaneously *potentially unfinished* document. Although this may be interpreted as a political statement, I think there is little reason for anybody to want documents with such a state.

Whatever solution one proposes, it is quite clear to me that the document states specified by KOARK and their implementation in the DocuLive system are insufficient for most types of simultaneous publishing. Extracting information based on attributes that are frequently subject to work-arounds will not give the proper result.

Furthermore, it seems to me that the attributes of digital freezing of documents are somehow different from those in manual routines performing the same task. In manual work tasks there is usually a practical option for making changes, even though the freezing supposedly is finished. Freezing in case processing systems is more absolute. Although it may *technically* be possible to change such documents, the means to accomplish this may not be available in the same manner that manual routines facilitate.

The actual freezing process has similarities to a real freezer, not to immersion in liquid nitrogen. In practice this is caused by the complexity of problem domain, and is a trade-off between efficiency concerns and formalised correctness. If such data is to be used for simultaneous electronic publishing, at least one more document state is probably required.

A further conclusion that is possible to draw from this, is that such publishing increases the dependence on internal, formalised document states that are correctly used. The legal and technical status of such states is a complex problem that is outside the scope of this thesis.

6.3 Summary

In this chapter I have discussed the value of a “practical action” concept of systems design. In the case of complex situations containing numerous regu-

lations and complex, individually negotiated organisational interdependencies the “practical action” view of creating systems may be quite hard to actually do. I also examined the *state* of documents, and found little correspondence between formalised document states and the actual work taking place. The abrupt digital freezing of documents causes work-arounds that will cause trouble if trying to extract information for other purposes.

Chapter 7

Technology

In this chapter I will discuss the tension between current systems and new, standardisation and the need for standards. I will discuss the tension between new and existing systems. I will also examine the effect of the complexity of the domain upon requirements specification and systems development. Finally, I will examine the relationship between document genre rules and the use of standards.

I will start with the tension between the installed base of systems, and new systems.

7.1 The Tension Between Systems

In this section I will discuss the tension between existing and the new systems, usually standards of some sort. How is the tension observed, and what can be done to alleviate these situations? This is based on the empirical information presented in section 5.3.

The organisational and technical preconditions are an integral part of any such situations. Previous experiences and decisions have strong influences over current choices. Before discussing the details of this situation, these preconditions need to be examined.

The first is that the change of case processing system in the departments was *forced* to happen within a short time frame. Due to constraints not discussed here it was decided to use *recent* technology. Windows-based software was another precondition. Although it would technically be feasible, it was not seen as an alternative to run the MS-DOS based Word Perfect on the Windows platform. This organisation has vivid knowledge of the problems of running “old” software.

The issue was one of word processors. Although there were six different word processors in use at the time, the DocuLive users were at a minimum to be able to exchange text with the Executive Board's office — which uses Word Perfect 5.1. At that time, Word Perfect 5.2 was the only practical alternative under the Windows platform, and this was chosen. Later standardisation set Microsoft Word as the standard product, and it was decided that the DocuLive users were to use Word for the word processing they were doing *outside* the DocuLive system.

Although there was a decision to start using Microsoft Word, it was not seen as possible because this would cut off the Executive Board's Office. The external preconditions also limit the number of possibilities.

In my opinion this is a question of focus on transitional versus permanent solutions. In the respective situation it was not known when (or *if*) a new system for the Executive Board's office would be in place.

If one assumes that the use of a single word processor is the optimal goal in this context, the presence of the old system has resulted in one of the lesser solutions possible. Unless one wants to attack the underlying assumptions discussed previously, there are not too many alternatives.

One alternative would have been choosing one (new) word processor in the departments (local optimum) and no textual exchange with the Executive Board's office (possibly local worst case). Because retyping of text was seen as a very poor alternative in terms of quality control and added work, this was rejected.

Seen from the perspective of the DocuLive users, there are only three different alternatives. The first possible solution is to continue using an old version of Word Perfect. This was not even considered as an alternative as far as I found out, probably because of the problems this would cause for the DocuLive users.

The “radical” approach would be to go straight to Microsoft Word for all the doculive users. This would be optimal for the DocuLive users and highly suboptimal for the Executive Board's Office.

As a consequence of the negative side effects of both of these possible choices, it was decided to select the current solution, namely running dual word processors in the central administration (suboptimal), one to satisfy the needs of the existing installed base (but still suboptimal because of minor format inconsistencies). This lets the users of existing systems continue unchanged.

Under the possible choices, all solutions have negative impacts. Letting a handful of users dictate such a choice for a few hundred people was generally not seen as rational. Equally important, it is seen as totally unacceptable to choose arrangements that severs cooperation significantly. The local solu-

tion chosen was to halt the Word implementation within DOcuLive until new systems were available or other options became available.

Hanseth et al. [14] suggest that the existing, installed systems impose constraints when modifying standards. As discussed in the theoretical chapter, this is primarily because existing, installed systems make assumptions about the operation of the standards. Since standards often have interdependent and related standards, change may be hard to contain locally. The point can be expressed the other way around, changing a standard that has no implementation can be done under much the same assumptions that apply when creating *new* standards. The moment implementations start depending on these standards, change is harder.

The situation in my empirical studies is one where the *installed base* of a previous system imposes constraints on a new. Hanseth et al. discuss the constraints imposed by the existing implementations of a current standard when this standard must change. It seems quite clear to me that the same situation also applies when replacing a current system with a new one.

The scope of this standardisation process is quite local when compared with international standards. Because of resource constraints and the wish to minimize costs, I argue that many of the same problems also apply in this type of situation. In a situation like this, where all actors are literally in the same building, it is possible to argue that more *control* is available over the situation. Radical implementation strategies *may* be possible in more closed environments.

Judging by the observations in my study, I will suggest that the tensions between existing systems and a new standard seem to be characterised by the choice of non-optimal solutions in the new standard. This is not exactly groundbreaking news. While there may also be several other symptoms of such tensions, I do find the selection of such suboptimal solutions to be a quite interesting problem for further discussions.

The issue of this problem is not word processors, but the *format* they store their documents in. Proponents of standards will argue that an application independent document formats such as SGML will remove or relieve this problem. While I certainly agree with this proposition, I will discuss this situation further in section 7.3. For now I will assume that this currently is not a possible solution. For now, I will suggest that this problem *of technology* possibly can be solved within the supplied limitations by throwing *more technology* at it. Using the *idea* of separating application from document storage format can possibly be taken further.

As an experiment I wrote a macro for Microsoft Word that replaces all word-specific document file formats with Word Perfect formats. The code can be seen in appendix B. I wrote this code to find out that it was *possible*, and to

assess how much work this involved.

It *is* possible and it did not take too much time. Such a solution represents a mixture of old and new that may prove to be useful in some of these situations. The only permanent solution is with well defined international standards, as will be discussed in section 7.3. I can only speculate as to why such solutions seem to be little used, but I think awareness of such possibilities must be an issue.

To this point, I have discussed an example of constraints between the existing, installed base and a new system. The suggested solution of dividing the problem into two parts presents the option of postponing certain parts of a decision to a later stage. This means that the currently defined standard makes assumptions about future additions, not an altogether uncommon assumption.

Such a solution has the effect of postponing document format to be primarily a secondary issue, while choice of application can be treated primarily in the first round. As can be seen from the size of the code in appendix B, it is not large and can be used to make sure the *consistency* of document format choice. This type of solution is possible because the proprietary document formats are quite similar in features, what can be represented by one system can reasonably well be handled by the other.

This can be seen from several perspectives, where the existing systems can be viewed as *imposing constraints* upon the new system, I will call these first order constraints. In the event that it has been decided that these old systems will be replaced by newer systems conforming to the new standard, there is a second constraint. The existing systems can also be seen as constraining the new systems (latecoming entrants into standard) that will eventually replace them, which is what I will call a second order constraint, as illustrated in figure 7.1

Trying to anticipate future needs is a tough challenge, because organisational change and external influences may very well change these assumptions quickly.

The word processor problem has the option of separating the decisions and time of implementation. Although I have not further experimented with other such types of division, it does give the option of *deciding* to be kept as first or second order constraints, or both. Each choice will have different scope and give different consequences for the users of these systems. My empirical studies show that these alternatives often will be in conflict, and the decision to solve a problem in certain manners will quite often create some kind of conflict of interest.

In a single case of this type of tension, I have shown how careful attention to the problems of transition can decrease the perceived problems with this.

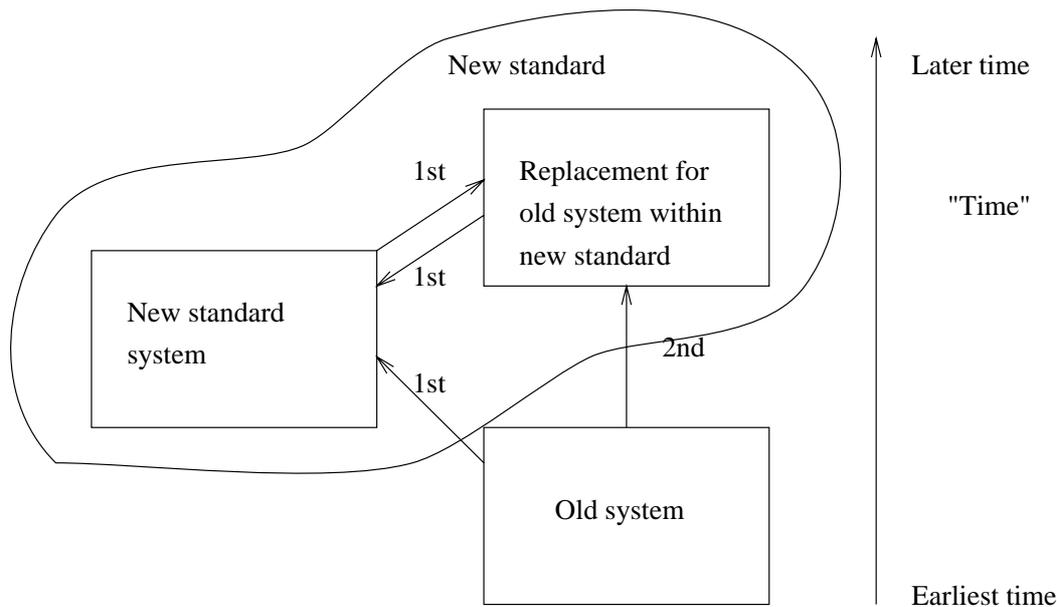


Figure 7.1: Example ordering of constraints between pre-existing systems, new standards and latecoming additions to standard

7.2 The implications of requirements setting for system

As shown in the section on the empirical studies, there has been a change in *who* develops systems and requirements for these in this organisation. Before the 1993 reorganisation there was a large staff of information technologists that handled most of these issues. After this reorganisation, the process has been distributed out into the organisation. Formally, there are two defined roles related to technology within the new organisational form. The first are the system owners, which for DocuLive is the department of Culture and Town Development. The other is the system maintainer, which is the responsible for developing the system. In performing their respective work tasks each of these roles draw on the resources of other departments.

In terms of organisational interdependence, there are many quite complex relations in this organisation. Quality control procedures are perhaps the best example of these.

Kyng [16] suggests that through cooperative design, system users and systems development professionals can have impacts in terms of “bridging the gap between tradition and innovation — between existing concepts and objects in the application area and the emerging future with new computer support and changed ways of working”.

While Kyng's suggestions certainly conform to many of the scandinavian system development ideals, the real life work situation seems to be evasive of such methods. Since getting people with knowledge of both case work and systems development was problematic, this creates an interesting challenge of creating long-term system development strategies that are not too dependent on single individuals. The expert-dominated model had produced an IT development & maintenance organisation larger than many of the departments in the central administration. A quite large proportion of the systems they introduced are currently being phased out. Although it is far too early to see any consequences of the user-dominated development process, it has some quite obvious strengths and weaknesses.

The organisational arrangement chosen for the development of computer systems certainly places responsibility close to the end users. It would seem to me that the strong user focus on this issue has impacts on the systems produced. Since the problem domain is complex it also ensures that the people with knowledge about these domains can be sufficiently involved. A negative effect of this type of arrangement is perhaps that knowledge of systems development within these organisations is not very high.

In the case of this organisation, and in terms of the given alternatives, user centred systems development seems to me to be the better choice. The complexity of the problem domain may be the reason for this.

A further observation that can be made from this is based on Yates & Orlikowski's [33] suggestion that *genre rules* are maintained and "refreshed" by their use in the organisation.

Genre rules can and in all likelihood will be further enforced and implemented into new computer systems. Whether this is a positive or negative function of such arrangements is a different issue.

7.3 Documents and Technology, the use of Standards

In this chapter I will discuss the use of standards such as SGML¹ in relation to documents and their genres.

My empirical studies have shown me that a standard like SGML has a tendency to "drown" among the other possible problematic situations. One reason for this was that the importance of SGML-like standards is seen as extremely low because of the lack of *other* standards. Furthermore, there was quite high

¹ISO standard 8879, SGML is an acronym for Standard Generalized Markup Language

awareness that new systems and new standards cause problems with regard to existing systems, no matter what solution is chosen.

Comparing the problems of local application standards with those faced by international standards may be regarded as comparing two slightly different things. The discussion is about what forces *influence* the propagation and evolution of these standards. In this section I'll discuss these differences. Since the "official" standards are not just international (for instance ISO) standards, but also include matters such as national profiles and national standards, I will hereby just refer to these as "standards".

Proponents of international standards might suggest that these are an important part of the solution to vendor-dependencies. Formats like SGML for the storage of documents can go a long way towards reducing the dependence on a single software vendor, at least for the data stored in the system.

Hanseth et al. [14] describe a situation where the existing, installed base of a type of system has consequences for the introduction of new standards. From my empiric studies, there also seem to be at least one more situation that applies to the diffusion and establishment of new standards:

With regard to potential SGML implementation, the situation shown in the empirical studies can be illustrated by figure 7.2. SGML is only a part of a *set* of required standards, as described in section 3.5 (on page 42).

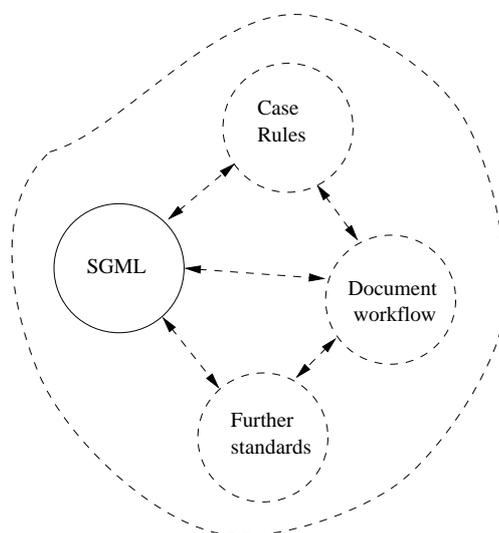


Figure 7.2: SGML as a lonely standard where others are needed. Some suggested standards are shown in dashed circles.

I have no reason to believe that the *standard* of SGML will be insufficient to handle this situation. An implementation of a specific SGML DTD *may* be influenced by the lack of the other standards.

This situation regards the *usage* of standards, not the standards themselves. It also illustrates why there is little motivation to change. If the goal of standardising on *one* word processor is reached, converting the data to a different format such as SGML may be regarded as further conversion work. This does limit the type of DTD² one can use, because of constraints in the existing data.

The standardising role of the *genre* of documents should not be overlooked either. The quite strong traditions on document content and presentation may be seen as both enabling and restricting any conversion process. Because documents are standardised in form and content, it should be easy to convert to standards like SGML. On the other hand, since the same documents already structure information, why convert? Converting to SGML invariably means losing some of the current possibilities as well as gaining new, is the gain greater than the loss?

The empiric stories on system stability also provides further input to the implementation requirements of such standards. The figures show that the current technological system has suffered approximately one unscheduled halt per month, large or small. Keeping in mind the *large* amount of different user types and the high demands for stability, it is my opinion that implementation of such systems depend not only on proper standards, but also on reasonably mature and user-friendly implementations of systems. This is even more complex because the software systems involved evolve at different paces. The story of passwords illustrates how application software evolves at different speeds, and why it may be difficult to achieve the same technological level on a number of these.

Putting all these requirements together in *one* package is currently not a realistic alternative. Due to the numerous different usage perspectives, there are requirements for the usability of such a system that will probably be hard to meet.

In terms of tensions, application standards face much of the same problems as the official standards. As shown, practical implementation dictates that current usage must be accounted for, and this will influence local standards. While technical standards can be seen as finite and closed, application standards face the challenge of continued organisational movement. Although it is technically feasible to analyse the future requirements for a certain group of users, there will be new requirements along the way. I find it reasonable to assume that it will not be possible to know *all* such changes up-front.

Returning to international standards for a moment, it is not hard to see that the exact same phenomena also appears here. Secure communications were far less of an issue at the time the Internet was used by academic institutions ex-

²A DTD is a "Document Type Definition", describing which elements a document can consist of, and the relationship between these, based on the SGML meta-grammar. HTML used in the World Wide Web is one such DTD

changed e-mail and files. Anticipating all future use of a standard is practically the same problem.

It is my conclusion that document genre rules may seem to provide structuring that covers a lot of the *needed* attributes of documents. The level of standardisation achieved is closely linked to the availability of mature application support, and as long as this remains unfulfilled, I see little room for the use of such standards in an organisation like this.

7.4 Summary

In this chapter I have discussed the relationship between new and old technology. I have discussed a quite typical situation, and have shown how careful attention to the problems of transition can decrease the perceived problems of transition. I have also discussed the effect of the complexity of the problem domain upon systems development. Due to the complex problem domain, user involved systems development may be a necessity. The strong user involvement chosen may also have effects in terms of ensuring that genre rules are brought into new systems. At the end of this chapter I also discussed the use of standards. The lack of sufficiently mature application support is perhaps the most important reason why standards are not more frequently used. The quite strong enforcement of the genre rules may also provide some level of structuring similar to SGML. The exact level of this structuring is not known to me.

Chapter 8

Conclusion and further work

The starting point of this thesis was to study transitional issues of establishing local infrastructure for electronic document production and handling. By means of interviews, conversations and to some extent active participation in the organisational work I established insight into some of the problematic issues involved in such a situation. The research questions that gradually evolved out of this situation were quite diverse. This has provided me with the perhaps most important insight of all: Asking single questions gives single answers. The complexity of organisations may not be fit for such single questions. While I do not doubt the value of asking single questions, it does little honour to the complexity of the whole.

In my work with this thesis I have studied the relationship between documents, organisation and the technology used by organisations handling these documents. In this conclusion, I will summarise some of my most important findings.

While the discrepancies between formalised action and practical action have been duly noted in research literature[28, 9], I asked if it really is possible to make system support for such practical action. While I have little data to support any general claims in *any* direction, my studies do indicate the following: Other constraints may have precedence in deciding what way work is to be performed. Implementing system support of practical action may only be a theoretical possibility in these cases. The complex relationship between regulations and interpretations of these and computer work may be extremely hard to make sense of. Furthermore, as a feature of cost and economic constraints, this complexity will potentially only be partially handled.

As a practical example of this I studied the *freezing* of documents, the process of going from fluid to fixed. It would seem to me that the attributes of digital freezing of documents are somehow different from the same manual operation. In manual work tasks, documents are frozen gradually and the quality control

operations continue even *after* a document is supposedly frozen. Although the system supported freezing also involves paper documents, there are fewer paths for going back. My studies seem to indicate that freezing in technical systems is more absolute, causing work-arounds. In practice, the manual operations facilitate for the complexity of problem domain, and is a trade-off between efficiency concerns and formalised correctness. The KOARK specified *document states* are quite clearly insufficient for non-trivial electronic publishing. Digital freezing of documents does not reflect the action of manual freezing, which is far less abrupt. If such data is to be used for simultaneous electronic publishing, at least one more document state is probably required. A further conclusion that is possible to draw from this, is that such publishing increases the dependence on internal, formalised document states that are correctly used.

On the basis of this study, the transitional problems of switching systems seem to be characterised by the choice of non-optimal solutions in the new system. While there may also be several other symptoms of such tensions, I have shown how careful attention to a single problem of transition can decrease the perceived problems with this.

The organisational routines for creating and modifying systems seem to be pushing in the direction of highly user-centred development. This has several possible explanations. The size of the previous expert-dominated organisation is one important factor. The complexity of the problem domain is another, important factor.

On the use of standards, such as SGML, I found that document genre rules *may* encapsulate most of the *needed* attributes of documents. To achieve any greater understanding of this would require another study. The level of standardisation achieved also seems to be closely linked to the availability of mature application support. Due to the numerous different usage perspectives, there are requirements for the usability of such a system that will probably be hard to meet. The standards themselves are not responsible for this situation.

8.1 Further work

The issues of systems supporting practical action perspectives on complex situations with many different priorities is an interesting question for further study. As system developers we are quite familiar with constraints of higher priority, for instance economic constraints. What happens as the number of such constraints increases, and how can systems *still* be developed within reasonable time?

On the subject of freezing of documents, there are questions of finding solutions that are both legally and technically appropriate. This is not just a practical

question, but also a methodological one — what are the proper procedures for determining *what* is allowable in an area where regulations and interpretations of these are in abundance?

In the discussion about genre rules and SGML, I think there is a very interesting point about how genre rules may provide structuring in a sense similar to SGML. I think further study of this situation may be warranted, especially for documents originating in milieus with strong genre rules.

The tension between the installed base of systems and new standards is also an exciting problem field. What happens when the latecoming entrants into the standards finally arrive? How do these affect the standards, and what characterises the problems that come up?

I also think that the same situations could need further studies in other environments. I suspect that complex environments such as the one studied in this thesis are more the rule than the exception.

Appendix A

Organisational chart

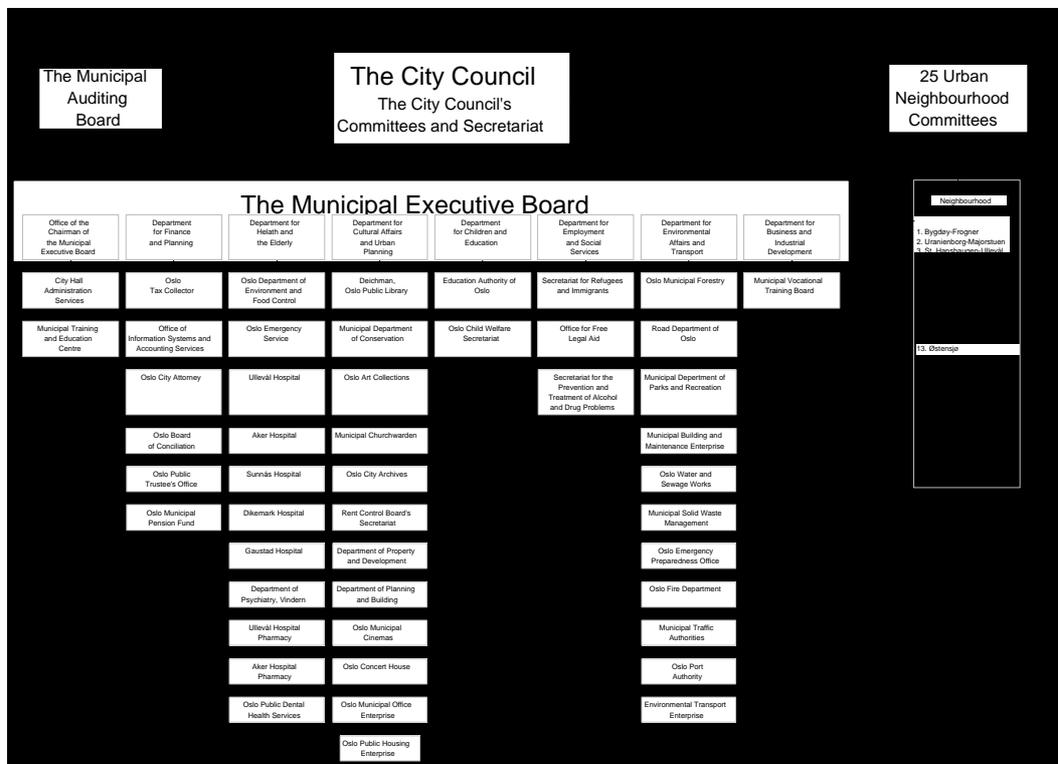


Figure 8.1: Organisational chart of the Central Administration

Appendix B

Source code for Word Macro

```
' Macros for changing default file formats in Microsoft Word
' There are basically three situations we want to deal with:
' 1. New documents
' 2. Seamless opening of existing documents in non-native format
' 3. Storing all new and current documents in a non-native document
'    format
'
' These three issues are handled in the following manners:
'
' 1. Is basically handled by changing the Document TEMPLATES that
' Word starts blank documents with. Although not demonstrated, this
' will work with both File | New and Ole Automation type activation
' of new documents (Instantiating through Ole Automation is typically
' what DocuLive does)
'
' 2. The first macro ensures that Word does not trouble us
' about file formats, and generally suggests a different
' file format than default.
'
' 3. The second macro deos much the same thing for the save
' functions.
'
' Installing:
' The two macros are different files. The first should be registered
' in the Tools | Macro menu as "FileOpen" abd the second as
' "FileSave" (without quotes). This will make them override default
' behaviour.

Sub MAIN          ' First macro, for File | Open
On Error Goto noopen
```

```

Dim dlg As FileOpen      ' Initialise proper data structure to pass
                          ' to Open function

GetCurValues dlg        ' Get whatever default values have been set
dlg.ConfirmConversions = 0 ' Signal that we don't want too much
                          ' noise about conversions

dlg.Name = "*.wp5"      ' Change extension as needed. *.* is
                          ' more correct for some versions of WP

Dialog dlg               ' Bring up this dialogue box
FileOpen dlg             ' Run the actual function in Word with the
                          ' user input data as parameters

noopen:                  ' Default "quit" label. Also goes here if
                          ' user presses "Cancel".

End Sub

Sub MAIN                  ' Second macro, for File | Save
  On Error Goto nosave    ' Catch the "Cancel" button, which is
                          ' signalled as an error

  Dim dlg As FileSaveAs  ' Get appropriate data structure
  GetCurValues dlg      ' Grab hold of "current" values
  dlg.Format = 118       ' SUGGEST appropriate file format
                          ' Wp 5.1 Dos = 118, Wp Windows 5.1 = 119

  Dialog dlg             ' Present dialog (user can change all
                          ' options, including file format)

  FileSaveAs dlg         ' If the user presses "Cancel" this will
                          ' fail by trapping through the 'on error'.

nosave:                  ' This is not really an error

End Sub

```

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